ARCHITECTURE HERITAGE and DESIGN

Carmine Gambardella

XIX INTERNATIONAL FORUM

Le Vie dei Mercanti



World Heritage and Design for Health

ARCHITECTURE | CULTURE | HEALTH | LANDSCAPE | DESIGN |
ENVIRONMENT | AGRICULTURE | ECONOMY | TERRITORIAL GOVERNANCE |
ARCHAEOLOGY | SURVEY | HERITAGE | e-LEARNING

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Carmine Gambardella
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Le Vie dei Mercanti
XIX International Forum

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Le Vie dei Mercanti

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Peer review

Scholars has been invited to submit researches on theoretical and methodological aspects related to Smart Design, Planning and Technologies, and show real applications and experiences carried out on this themes. Based on blind peer review, abstracts has been accepted,conditionally accepted, or rejected. Authors of accepted and conditionally accepted papers has been invited to submit full papers. These has been again peer-reviewed and selected for the oral session and publication, or only for the publication in the conference proceedings.

Conference report

300 abstracts and 550 authors from 40 countries:

Albania, Arizona, Australia, Belgium, Bosnia and Herzegovina, Brasil, Bulgaria, California, Chile, China, Cipro, Cuba, Egypt, France, Germany, Greece, India, Italy, Japan, Jordan, Lebanon, Malta, Massachusetts, Michigan, Montenegro, Montserrat, New Jersey, New York, New Zealand, Poland, Portugal, Russian Federation, Serbia, Slovakia, Spain, Switzerland, Texas, Tunisia, Turkey, United Kingdom.

WORLD HERITAGE anf DESIGN for HEALTH

The innocent eye sees nothing (Ernst Gombrich)

In this particular time characterized by a pandemic due to the expansion of the Covid-19 virus throughout a globalized world, the destinies of everybody have suddenly changed behavior, lifestyles, interpersonal relationships, production methods as well as the governing of the territory; the priority of investing in the healthcare sector has become increasingly urgent and indifferent with reference to a political management of the communities that prevents and does not suffer, as unprepared, the emergencies that increasingly afflict the community. Furthermore, in these months of “quarantine”, the Planet has shown a Resilience that makes us hope for the future. A response to the Culture of Emergency, which finds its generative ground not only in the healthcare sector but also in the governance of the territory, relates to the hydrogeological aspects, pollution of soils, air, water, illegal construction, the exploitation of energy resources faced with the use of the integral of scientific and managerial skills based on meritocracy. The XIX International Forum of Study ‘World Heritage and Design for Health’ addresses the issues related to the global pandemic in a multidisciplinary and systemic logic, as indicated by the UNESCO and the United Nations 2030 Agenda for the definition of projects and concrete actions that include the Welfare and Health of the Community. Therefore, the Forum aims to create a transversal critical dialogue, open to cultural contamination and ‘without limits’, in a logic of integration between skills that extends, and is not limited to, the following disciplines: Architecture, Culture, Environment, Agriculture, Health, Landscape, Design, Territorial Governance, Archeology, Economy, History, Sociology, Security, e-Learning. The Scientific Community of the Forum is composed of about seven thousand Professors and Researchers from one hundred Universities and Research Centers in the world, from institutional representatives, from the business sector and from the representatives of the 830 UNESCO Chairs (UNITWIN Program) thanks to the WebGIS created and managed by the UNESCO Chair at the Benecon University Consortium. The location of the Forum is of excellence. Campania Region with six World Heritage Properties, two Unesco Man and Biospheres, three assets registered on the Intangible Heritage List is one of the richest Regions in the world for cultural and landscape heritage, particularly ‘contaminated’ by Mediterranean cultures. No coincidence that the Forum takes place in Naples and Capri, with site visits and presentations of scientific research and operational projects by the Benecon University

Consortium, consisting of five Italian Universities, head office of my UNESCO Chair on Landscape, Cultural Heritage and Territorial Governance. The papers, selected by the Forum's Scientific Committee, will be published in the Proceedings of international relevance (candidate to be indexed Isi Web of Science). Furthermore, the most innovative research and projects will be published in the 'Quaderni' of the A Class international magazine 'Abitare la Terra / Dwelling on Earth'.

Prof. Carmine Gambardella
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WORLD HERITAGE and DESIGN for HEALTH

The innocent eye sees nothing (Ernst Gombrich)

In questo particolare tempo connotato da una pandemia dovuta dall'espansione del virus Covid-19 in un mondo globalizzato, i destini delle Persone improvvisamente sono stati modificati nei comportamenti, negli stili di vita, nei rapporti interpersonali, nei modi di produzione, nel governo del territorio; le priorità degli investimenti nel comparto Salute, diventa sempre più urgente e indifferibile con riferimento a una gestione politica delle Comunità che prevenga e non subisca, in quanto impreparata, le emergenze che sempre più affliggono la Collettività. Inoltre, in questi mesi di "quarantena", il Pianeta ha dimostrato una capacità di Resilienza che ci fa bene sperare per il futuro. Una risposta alla Cultura dell'Emergenza che trova il suo terreno generativo non solo nel campo della Salute ma nel governo del territorio per quanto riguarda gli aspetti idrogeologici, l'inquinamento dei suoli, dell'aria, dell'acqua, l'abusivismo edilizio, lo sfruttamento delle risorse energetiche affrontato con l'utilizzo dell'integrale delle competenze scientifiche e gestionali fondate sulla meritocrazia.
Il XIX Forum Internazionale di Studi World Heritage and Design for Health affronta le problematiche legate alla pandemia globale in una logica pluridisciplinare e di sistema, così come indicato dall'UNESCO e dall'Agenda 2030 delle Nazioni Unite per la definizione di progetti e azioni concrete che includano il Benessere e la Salute della Collettività. Il Forum si propone quindi di creare un dialogo critico trasversale, aperto alle contaminazioni culturali e 'senza limiti', in una logica di integrazione fra le competenze che si estende, e non si limita, alle seguenti discipline: Architecture, Culture, Environment, Agriculture, Health, Landscape, Design, Territorial Governance, Archeology, Economy, History, Sociology, Security, e-Learning.
La Comunità Scientifica del Forum è costituita da circa settemila Docenti e Ricercatori di cento Università e Centri di Ricerca nel mondo, da rappresentanti istituzionali, del settore dell'impresa e dai referenti delle 830 Cattedre UNESCO (UNITWIN Programme) grazie al WebGIS realizzato e gestito dalla Cattedra UNESCO incardinata al Consorzio Universitario Benecon.
La location del Forum è d'eccezione. La Campania con sei siti iscritti nella lista del Patrimonio Mondiale, due Man and Biospheres UNESCO, tre beni iscritti nella Lista del Patrimonio immateriale è una delle regioni più ricche al mondo per beni culturali e paesaggistici, particolarmente 'contaminata' delle culture del Mediterraneo. Non a caso il Forum si svolge a Napoli e Capri, con sopralluoghi e presentazioni di ricerche scientifiche

e progetti operativi a cura della Consorzio Universitario Benecon, costituito da cinque Atenei italiani, sede della Cattedra Unesco su Paesaggio, Beni Culturali e Governo del Territorio. I paper, selezionati dal Comitato Scientifico del Forum, saranno pubblicati negli Atti di rilevanza internazionale (candidati all'indicizzazione Isi Web of Science). Inoltre, le ricerche e i progetti più innovativi saranno pubblicati nei 'Quaderni' della Rivista internazionale di Classe A 'Abitare la Terra/Dwelling on Earth'.

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WORLD HERITAGE and DESIGN for HEALTH
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EDUCATION FOR CULTURE OF PEACE

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In the globalized society in which we live, it has assumed great importance to educate to the construction and maintenance of an international rhythm between different cultures and new connected histories; educating for peace does not only mean respecting other civilizations but also and above all knowing them and making them ours, in order to achieve a globalization of intentions. To make possible the peace hoped for after the fall of the Berlin Wall, it is necessary above all to educate the new generations to this new culture, which must first be instilled in students of all ages and levels: even before a pupil, every student is a person in path of formation and maturation and must be considered, as such, in its totality. In order to better educate, it is necessary to undertake educational paths that take into account not only intellectual abilities but also the best learning path, personalized as far as possible, and socio-relational insertion, without excluding students with educational needs from these paths. special or with learning disabilities or foreigners. The constantly evolving society requires continuous adaptation and particular attention to respect for others; in this globalized world, teaching and inclusiveness right from kindergarten play a fundamental role in education for the culture of peace: listening, sharing and empathy are all essential factors for the creation of social relationships functional relationals. Not only is education in the school environment important, but also the art of cinema allows us, in this globalized world, to understand new emotions and to deal with events and situations that can be very distant from the socio-cultural context in which we live. Cinematography also has, therefore, its pedagogical and educational value, which allows the discovery of multiple ways of representing the social, which influence people and groups, involved in continuous processes of identity definition, in order to educate the person at three hundred and sixty degrees. The culture of peace is not just a mere and abstract concept, but a concrete goal to which all humanity must strive in order to live in an evolved and cohesive society, in which each person is aware of what surrounds them and the importance of universal values such as respect for life, freedom, human rights and equality of gender and ethnicity. In this path of individual and social growth, inclusive education and openness to emotional sharing are of fundamental importance, through new teaching methods and the cinematographic language of universal connection.

Teaching and inclusiveness in schools

The student is first of all a person even before being a user of the educational institution or a number on the register, so he must be considered in its entirety, in the intellectual abilities, in the learning path but also in the socio-relational insertion and must be able to count on the reinforcement of self-esteem by the coente. In an ambia school it is necessary to undertake new didactic-educational paths, to produce targeted projects dedicated to students with special educational needs, BES, with specific learning disabilities, SLD, and to foreign students, activating all channels of innovation and above all of the network synergy between schools, in an opensource perspective, for the coding of good design practices. In the changing reality, it provides for a continuous and constant adaptation, attention to maintaining high levels of civilization and humanity which include respect for the person, the protection of children and in particular the insertion and reception of migrant minors in theour social fabric as they bring new life in cultural and demographic terms, in a geographical reality such as Europe which is afflicted by an aging population. In particular, migrant minors are bearers of rights, but they also have the duty to fulfill compulsory schooling, must ensure compliance with laws and customs, learn the language and get to know the culture of the host country in depth. Distrust towards can be mitigated by openness to dialogue in a daily exercise of equality, through a reading of the other as different but equal to us in his humanity, in his dignity as a person, in his uniqueness as a human being, in his being bearer of rights and duties like each of us. As the philosopher Todorov, a profound connoisseur of the philosophical theme of otherness, affirms "men depend on each other, not only to reproduce to ensure their own survival, like other species, but also to become conscious and speaking beings". The welcome in the classes requires that there is a deep listening on the part of the teacher, a sharing of the history and experience of the minor by the whole class in such a way as to create empathy, that is a common ground of feeling that can therefore favoring the inclusion and also creating socio-relational relationships functional to social inclusion. Therefore, "in fact, we currently speak of empathy, referring to the numerous forms of bond between human beings, fundamental for coexistence, as well as to the modalities of understanding and sharing, of thoughts and feelings that make altruistic behaviors possible, such as helping and solidarity ". When the migrant minor, in particular the unaccompanied foreign minor, arrives in Italy without a reference adult, parent or relative within the fourth degree, he is in a country other than his own, he must feel a relaxed, open climate, favoring intercultural dialogue. Newly arrived migrant minors, who therefore must not always enter in a simple and immediate way in the places where students speak Italian, must overcome the first barrier to communication by learning the Italian language. Instead, the pupil who comes from a family of immigrants already residing in the area for many years with a roots in the host country clearly compares with his classmates having the advantage of being able to also use the language of his parents, in fact some of these students are actually bilingual. For all foreign students, new arrivals or dated immigration students, however, it is necessary to understand the culture of origin, customs, habits, religion, in order to be able after a phase of knowledge of the differences, which adds value to the whole group class but also gives the teacher a new perspective of seeing teaching and learning paths. In fact, it is necessary for the teacher to review his own model of thought and action by adapting the didactic-educational paradigm, therefore his teaching method, thus accepting the new challenges of change, without fear of novelty but grasping the presence of the foreign pupil. as an opportunity for new opportunities. The "Europe 2020" strategy stresses that we must aim for an intelligent, sustainable, supportive society, unfortunately this is an indication that often remains unfinished, as currently there is considerable legislative selfishness on the part of Italy. In fact, immigration is first of all managed in the first country of arrival according to the Dublin III Convention, which is usually Italy. Failure to revise the aforementioned Convention does nothing but continue to burden Italy, in particular, for the management of immigration which should instead be managed in a shared manner by the 27 countries of the European Union, in order to avoid social pressures and related tensions. To the reception in particular of unaccompanied migrant minors without a family unit. Western civilization is the daughter of the French Revolution, but from 1789 to today the three pillars of Freedom, Equality, Fraternity have often been disregarded, and therefore our commitment is to continue each one in his own field of research, teaching or philosophical reflection to carry out, in everyday life as well as in the projection towards the future that indication already given by history. The presence of foreign students in Italian school classes, of all levels and levels, is a socio-demographic phenomenon characterized by a growing trend. The percentage is 10% of the school population, according to the MIUR Report in collaboration with the ISMU Foundation, Institute for Studies on Multi-ethnicity, of 2016. In each class, the teacher must relate to a foreign student, must program and plan learning but also favoring socio-relational insertion and scholastic integration, in fact “common values therefore are not the simple result of human will, but correspond to the human figure; they impose themselves with the force of evidence that simple conventions do not possess ". Italy is today a multiracial country as the flow of people from abroad is constantly increasing and, in particular, from the so-called Third World. This reality involves the need to devise mechanisms by which migrants can enter and integrate within the host country's society. In this perspective, the notion of “interculture” comes to light, understood as the complex of connections between different cultures. The phenomenon of interculture does not occur only in the hypothesis of migratory flows within Italy or other States but also in the hypothesis of comparisons between different experiences, of exchange of opinions and news between different areas of the world since interculture does not concern only migrants but every person sensitive to observation, comparison, change. Certainly, from an intercultural perspective, the migratory reality, currently in strong expansion also within our social and economic order, represents an opportunity for those who experience this reality firsthand and for the host states as it is a heterogeneous phenomenon. The

cultural and social heterogeneity represents a source of human enrichment, it nourishes the possibility of comparison and exchange so that it is not aimed solely at inclusion as the existence of a multiplicity of languages, religious and cultural traditions and so on, also favors interaction and must be considered an asset to be safeguarded. The intercultural aspect rejects, as a starting point, the idea that culture is a homogeneous and unitary entity since, on the contrary, it is a complex of different but shareable experiences. Through the knowledge and sharing of a cultural tradition it is possible to come into contact with other realities, other experiences and stories, other points of view and habits of life. The circumstance that different cultures coexist within a geographical area is fundamental in an educational and training perspective since in this way the enrichment and enhancement of the human being is favored. Subjectivity is gradually formed through the comparison with other members of the family, with friends, with the various aggregations and the propensity for hospitality favors a consideration of subjectivity as opposed to integralist philosophy; in other words, if the community is not homogeneous but colorful and differentiated, with fluid borders, it follows that the identities of individuals and aggregations will not be perceived as entities to be protected from external conditioning but, on the contrary, as entities to be enriched and to grow also through comparison and exchange. The subjects build their personal dimension through daily relationships with other people, using different means to communicate with the surrounding environment such as, for example, the body, material things, dialogues, stories, in a simple, immediate way. , persuasive where the story is not perceived as the result of a single and subjective mental process but as a result of collective creativity, as a means of evaluating events in a collaborative way. The subjectivity that comes out of the stories is not unitary, it is not homogeneous since the stories related can be dramatic and complicated to report with the consequence that migrants make descriptions incomplete, disjointed, confused, based on opposite experiences, characterized by inconsistencies and typical pauses of people who drift away. Multicultural training has as its premise the abandonment of Western ethnocentrism and the study of cultures involves the enhancement of the differences existing between collectivities, social aggregations, however, without erecting inaccessible borders, indeed, identifying and highlighting the possibilities of interaction both between individuals and between groups. An attitude very often recurrent in practice is that of putting indigenous people in contrast with migrants since the media erroneously lead to proceeding due to preconceptions and prejudices, ignoring the past and the constant relationships that exist every day, unlike interculture which, instead, proposes to transcend ethical diversities as divided zones. The intercultural perspective demonstrates how not to stiffen diversity according to an educational approach that has a supranational nature, according to a relational and open approach, also examining the connections between violent and non-violent exchanges. The gigantic mixture between cultural and social traditions, between different ethnic groups has determined the evolution of multiform communities within which human aggregations of different backgrounds coexist, who try with difficulty to find a balance between the sharing of universal principles and the inevitable differences. social and cultural. Prerequisites for an effective realization of the objective of inclusion, at an educational level, are interculturality and intercultural education. At the center of the interest of intercultural pedagogy there is still, as for general pedagogy, the human person who is attributed the right to develop his or her personality, both as an individual and within social groups, and to implement the own abilities. It follows that the propensity to interculturality is not a necessity only for certain categories of people, such as immigrants or various minorities, but constitutes the most valid and effective tool through which each person can measure himself with the difficulties and heterogeneity of the experiences of life. The overall European training system, both theoretical and practical, is currently crossed by a strong educational commitment and enthusiasm and has set itself the goal of building a capillary training network, suitable for disseminating both an international and transcultural knowledge and soul. that aims at achieving mutual respect and support. In the school environment, the bond between the person and the group involves the problem of integration; the path of adaptation is revealed through the creation of a group system but also determines rules of behavior, principles, visions. There are numerous elements that influence the adaptation process; in fact, the character of the person, his or her subjectivity, the existence of any physical, mental, cultural deficiencies, which can affect both negatively and positively on the training and inclusion path, are highlighted. The process of development and inclusion of the person begins in the family environment, continues, at the same time, in the school and collective fields; in this regard, the methods of communication and cooperation between the school and the family are very important so that it is possible to guarantee consistency and homogeneity in the training path, to promote the exercise of the right to study by both able-bodied and otherwise able students skillful and facilitate their inclusion in the class group. The primary objective pursued by the school is education, understood as the growth of the human person, enhancing and respecting personal propensities and abilities, enhancing intellectual abilities such as reasoning, mnemonics, socio-affective attitude, problem-solving skills: it follows that, based on a modern vision, the school cannot be considered exclusively as a means by which to impart and slavishly receive theoretical notions but as a place where dialogue and confrontation between the teacher takes place and students, in which principles and values are transmitted as the training path is a teaching and learning process. The method currently adopted by the school is to foster inclusion and growth based on a humanistic conception of the human being, of education and of the community as a whole and guides the person, in his / her evolution, from childhood to the university world and also of work; therefore, the efficiency and quality of the school cannot be evaluated exclusively on the basis of the organizational structure, technological capacity, human and personal resources available but a symptom of its validity is the ability to build human relationships, a situation that can only be achieved if people have an emotional experience, if they have the propensity to identify the truth and not to distort it, to accept and respect dissenting opinions. In this perspective, learning is the process that allows the person to progressively approach the culture of his social group and is influenced by the character of man, the peculiarities of his cultural

traditions, the habits of life, the teaching method, the charisma of the teacher who, while teaching, transmits his own baggage of principles and values to his learner. For this reason, we prefer to attribute a double value to the expression integration; in the first sense, it is understood as the improvement of a training method through changes, additions, cancellations; in the second sense, it is understood as a combination of the means present in the group of origin. In this second sense of coordination, integrating means intensifying a link between the school and the community, stimulating greater attention to the potential present in the area, solving common problems, establishing synergies between the various social partners and increasing the processes of growth.
These operations have the purpose of causing both individual and community change, a welfare state in reference to a specific social category or pupils. A social strategy is effective only if it produces prosperity, support and certainty for every member of the community.

1.1 TODOROV T., Gli altri vivono in noi, e noi viviamo in loro, Saggi 1983-2008, Garzanti, Milano 2011, p.16.
1.2 BOELLA L., Il coraggio dell'etica. Per una nuova immaginazione morale, Raffaello Cortina Editore, Milano 2012, p.34.
1.3 TODOROV T. Gli altri vivono in noi, e noi viviamo in loro, Saggi 1983-2008, Garzanti, Milano 2011, p.16.

Social Discomfort and the GEA Project

The progress of contemporary society, aimed at guaranteeing the development of global humanization, is rooted in the formation of consciences and specifically of professionals in the individual socio-psycho-pedagogical fields relating to the human and health sciences. These doctrines contribute to the education and promotion of the dignity of the person and his "Being", in his uniqueness and specialty and with all the expressions that characterize the personality. The essential principles and values of the person take shape if we learn to educate the heart, soul and brain, as it values the true innate quality of each one, as the vital structure of the "incorporeal self", which predicts without saying and expresses emotions. Responsible tasks are entrusted to a "participated citizenship", so that a process of solidarity growth, healthy coexistence and social cohesion is started, as a beneficial "cultural transfusion" of integration and inclusion, in favor of people living in discomfort. It manifests itself with different angles and consequently requires reassuring and resolving interventions, evoking a pedagogical care of taking charge of the person with his heritage of differences. The text, starting from a careful qualitative-quantitative analysis, examines the emerging problems of a context according to a multifactorial and dimensional vision of the discomfort, which requires a new profile of the professional educator, with multiple skills to face the complexity of a social system. The contribution offered by the author lends itself to scientific reflection for those who, invested with a professional function of mediator / facilitator of social intervention practices, can nourish the inner richness deriving from passion and motivation, as a human mission for selfless efforts. and a sense of duty, to "mature" in a responsible way one's own dignity. This work, which was created with the intention of dealing with the topic of "social discomfort", develops this theme not only through an overall look at its many facets, but also and above all by focusing attention on the relationship between its various manifestations and the realization of the project specified in the title. The entire work will be outlined following the theories and guiding principles set by pedagogy in the context of educational management of individuals who find themselves living and facing situations of this nature. In other words, it will be a question of analyzing the possible applications of special pedagogy and the so-called branch (of more recent development), of the pedagogy of hardship and marginalization to social hardship, understood in its many forms, within the initiatives produced in within the project itself. Starting from the analysis of the concept of discomfort and the definitions given in the field of pedagogical studies, the variegated phenomenology will be taken into consideration, which in turn represents one of the peculiarities of contemporaneity. In fact, discomfort has taken on numerous forms, primarily due to the complexity of times - of cultures and societies -, but also as a consequence of the lack of solid references of the past (replaced by a multitude of new systems of interests and values) , and also in relation to the modification of the structures of the community itself and of its way of being an educating community, which takes on the diversity of the needs and characteristics of the individual. In the first chapter of this work, this contemporary framework will be outlined, reread and interpreted in the light of the theories and studies of illustrious pedagogues and exponents of other human disciplines, who share with pedagogy the theme of discomfort and intervention in conditions of discomfort. In the second chapter, on the other hand, the different forms that the discomfort has taken over time will be dealt with in more detail, which include both individual manifestations (without, obviously, forgetting the implications they have on the experience of the restricted social network) and collective manifestations, which include - whole groups, categories, or even communities turn around. With reference to what is described, some forms of possible intervention will be subsequently presented (for the benefit of both individuals and communities), taking into account the peculiarity of the conditions in which the discomfort occurs, the individuality and the specificities of the needs, expectations and of the resources of those living in a difficult condition, of the characteristics of the territory and of the institutions, and

finally of all the elements that contribute to structuring those actions aimed at producing an improvement in the psycho-socio-existential well-being of these people. The goal will therefore be to outline the criteria and guidelines along which the design and implementation of educational courses and interventions must be oriented in order to obtain professionally coherent and socially effective results. Knowing these references and having recourse to them is certainly fundamental for activating interventions that produce the desired changes and effects; however, we must not forget another key element, namely the human factor. Today more than in the past, the specificity and relevance of the professional educator is recognized, who are required specific and important skills, both of a personal, relational, communicative and social nature but also professional. The ability to read the needs of each one, to maieutically guide individuals in the knowledge of their condition of discomfort, and, starting from this, to accompany them to the discovery / rediscovery of their needs, their expectations, but more than any other their potential and resources - also having the ability to communicate with other professional figures, with institutions and to operate directly in the territory and in the communities, to build networks and help shape their form and culture - are all skills required by the 'professional educator. In the course of the second chapter, these will be identified, described, grouped into broader categories and placed in connection with the tasks, which are assigned to this professional. Finally, in the third chapter, we will move on to the description of an experience of reception, assistance and support for discomfort, developed in recent years in the territory of the Sorrento peninsula by the Disabled Penisola Sorrentina Association and the GEA project, born within this association. After examining both these realities (currently operating and in continuous expansion), the principles on which they are based will be related, as well as the objectives they aim to achieve and the tools and initiatives adopted, with what was previously explained on the relationship. between pedagogy, social hardship and the role attributed and played by the professional educator.

The ability to get excited between the reality of cinema and the world of Pedagogy

The ability to get excited between the reality of cinema and the world of pedagogy", through an evolutionary excursus of narrative semantics, between cinematographic art and the new avant-garde of educational digitalization, focuses on the pedagogical value of emotions in a temporal reading of events, which provides new perspectives and motivational propulsion, centered on the pedagogy of debate.
In a historicized path between phenomenological visions, ranging from storyboards to online cinema, the possible frontiers of university teaching, based on the interdisciplinary paradigms of postmodern media education, are highlighted.
The pedagogical centrality of a re-education in cinematic reading represents the possibility of a re-understanding of learning to learn, making use of perceptions, interpretations and representations, through gazes on worlds beyond the borders.
The hyperreality, which is spoken of in the text (Baudrillard, 1996-1995), in its being an imaginary representation in the persistent balance of disconnection between reality, requires pedagogical interventions, which start from an awareness of the emergency of the new educational need : it is about managing the multiple ways of representing the social, which influence individuals and groups, involved in continuous processes of identity redefinition.
The text therefore presents an analysis not only of a linguistic-code type, but also of a historical-social one, which by investing in the educational value of cinema, highlights the possibility of experimenting transversal pedagogical-social paths of observation and awareness, for a re-reading of itself and of societies, through potentially analogous contextual views, which cross different cinemas.
What is the function of cinema in our society? What drives each of us to watch a film? Cinema, the most popular sign of modernity, the only one capable of speaking to the entire planet, was the perfect shape of bodies and desires, the incandescent melting point between image and imagination. Even today, to communicate, tell, excite, surprise and provoke, on the net as on the smallest of the infinite screens we surround ourselves with, to create worlds or record reality, it is difficult to find a language other than that of the images and sounds of films. . A great many things can be said about cinema: it is technical, it is an industry, an art or a show, but also and above all entertainment and culture. Each of these conclusions is important and indispensable, but perhaps cinema is still more. Knowing how to see cinema, on the other hand, means learning to observe a film taking the necessary distance from it, in order to be able to understand the mechanisms of functioning and production of meaning. Cinema, however, is not only an important means of communication, it also maintains close relations with history understood as a set of historical facts and as a discipline that studies these facts. Cinematographic art, together with other media, becomes an important starting point to introduce the teaching of different languages (cinematographic, sound, musical, visual, pictorial, artistic, etc.) at school through the dissemination of educational projects focused on media education (education "with", "to" and "through" the media). This work, limited to the use of cinema at school, includes some didactic proposals outlined with the aim of allowing students to reach a satisfactory level of knowledge of the cinematographic language . This allows

us to offer students an analysis not only of a linguistic-code type but also of an historical-social one, because cinema is a good starting point for observing ourselves and our society. In this work I will start talking from the origins of cinema, up to the present day, dealing with the various developments of cinema itself and how it has evolved over time and how important it can be as a storytelling tool. In particular, I will also focus on cinema as a pedagogical tool, and its role at the didactic level. Over time, cinema has always tried to grasp the sign in each of us more, it has always tried to make us move and make us believe that for a minute we were the protagonists of history. All this can happen thanks to the digital age, to the new forms of 3D cinema. In short, we can say that we, without cinema, cannot stay, however much I can evolve, however much our society may change, we love to sit there on that armchair watching a film and be carried away by the "sound effects" and what can send us.

The Project

The realization of the project «Social Discomfort, the GEA project and the Cinema[Fig.1]» develops a multi-faceted theme. The goal will be to outline the criteria and guidelines along which the planning and implementation of educational paths and interventions for children living in difficult situations must be oriented, in order to obtain consistent and socially effective results.
The complexity of the social reality presupposes that the school reformulates its organization, its planning and its teaching methodology to meet all needs.
The school must adopt the policy of inclusion as a social strategy, to respond effectively and efficiently to diversity, which must be considered as an added value and not as a nuisance.
The perspective of inclusion presupposes a pedagogy of the positive, of the promotion of personal skills.
To include also involves thinking about the person as a whole, not simply adapting them, in a reciprocal perspective.
The most innovative teaching methodologies emphasize the centrality of the person, personal learning and mutual help to enhance everyone's skills.
One of the most important means of communication is Cinema.
In schools, it would be necessary to dedicate a day to the cinema, to make it clear that this is a tool that can be used to start one's own personal project.
The use of cinema allows students to reach a satisfactory level of knowledge of the history of cinema and after this, as they age, they will be able to take a critical and reflective attitude towards the films viewed.



Fig. 1 Social Discomfort, the GEA project and the Cinema

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Capacity estimation of historical temples and shrines around Kiyomizu World Cultural Heritage site for supporting evacuation lives of visitors during disaster

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Abstract
Protection of health and lives of visitors from any type of natural disaster is indispensable to the protection and continuity of business of the World Cultural Heritage sites because safety is the most important factor for all the visitors. Most of the visitors are not familiar with emergency plan of each tourist sites; therefore, an evacuation plan should be established at all famous sightseeing places. In the case of historic city Kyoto, the number of famous historic temples and shrines, which are temporally designated as evacuation sites, is increasing. Although the required functions in these evacuation sites have not been officially clarified, the estimation of functions as evacuation sites for visitors is needed for practical risk management plan. In this study, we aimed to conduct research on the recent conditions of temples and shrines designated as temporary evacuation sites for visitors in Kiyomizu-dera World Cultural Heritage site from the viewpoints of physical and sociological aspects, revile the challenges of existing plan, and propose some improvement plans for the future.

Keywords: Kiyomizu-dera World Cultural Heritage Area, Evacuation Life of Visitors, Potential of Evacuation Sites, Historical Temples and Shrines, Kyoto JAPAN

1. Introduction

1.1 Background
The open spaces at numerous historical religious establishments that exist in the densely populated urban areas of the city are expected to be utilized as evacuation sites in the case of a large-scale disaster. In particular, the world cultural heritage sites have special significance as they act as gathering places for a large number of visitors, i.e., those who may get stranded in the event of an earthquake.
In the case of Kyoto city in Japan, it is estimated that more than 370,000 visitors[1)] get stranded and have difficulty returning home in the case of a large-scale disaster as public transportation is suspended and roads are closed either due to damage of roads and railroads or due to traffic restrictions. Kyoto is a world-famous tourist city with 15 world cultural heritage sites, and it attracts around 50 million visitors annually. Therefore, managing the stranded tourists is an important issue.
Therefore, the Kyoto city has established the “Kyoto City Council on Measures for Stranded Persons in Tourist Destinations” in collaboration with the relevant organizations and private corporations as the first council in Japan to explore the measures to help stranded persons, especially visitors. As the visitors from outside the city are unfamiliar with the region, places that are popular with the tourists can be good evacuation sites in the event of a disaster. In particular, temples and shrines in Kyoto city play a significant role as tourist attractions, and an increasing[2)] number of temples and shrines are being designated as temporary evacuation centers for stranded tourists due to increase in awareness among people. The “Kiyomizu-Gion Area Tourist Evacuation Guidance Plan”[3)] has been formulated for

the Kiyomizu-dera Temple World Cultural Heritage site where many tourists congregate, and many temples and shrines are being designated as the “Emergency evacuation squares and temporary accommodation facilities” for stranded visitors.
Although various disaster prevention measures are sought after from the temples and shrines in the event of a disaster, their capacity is unclear. In addition, apart from the independent operational capabilities of temples and shrines, operation and management of the temples and shrines as temporary evacuation centers should be done by considering cooperation with the government. However, such a specific management plan has been formulated only in a few cases.

1.2 Purpose of the study

In this study, we will focus on the temples and shrines that have been designated as the “Emergency evacuation squares and temporary accommodation facilities for tourists” in the Kiyomizu-dera Temple World Cultural Heritage site. We will evaluate their tourist-support capabilities (e.g., provision of facilities) in the event of a disaster and examine the status of the operations and management framework in which a cooperative relationship with the government is established.
The objective is to contribute toward the improvement of “Kiyomizu-Gion Area Tourist Evacuation Guidance Plan” by identifying specific problems that arise when each of these temples and shrines will be used as temporary evacuation centers for visitors and examining the cooperation among these temples and shrines or with the government.

2. Research Subject and Methodology

2.1 Overview of Kiyomizu-Gion Area of Kyoto city

The study area was Kiyomizu-Gion (Kiyomizu-dera Temple World Cultural Heritage area), which is designated by the Kyoto city as the target area for assisting stranded tourists in the “Kiyomizu-Gion Area Tourist Evacuation Guidance Plan.”
Based on the traffic survey of Kyoto city in 2012, the peak number of visitors in the Kiyomizu-Gion area was estimated to be about 48,000 persons.[3)] Furthermore, the main disasters suspected in this area, which are estimated to cause the highest damage to Kyoto city, are the urban inland earthquake disaster with the Hanaore fault being the hypocenter and the trench-type earthquake with the Nankai trough being the hypocenter.[4)] If these disasters strike, it is estimated that from the total number of tourists during a peak time in Kiyomizu-Gion area, about 29,000 tourists including approximately 23,000 “out-of-city tourists” who are unable to travel and approximately 6000 “persons requiring special assistance” would become stranded when the transportation facilities are suspended.[3)]

2.2 Temples and Shrines to be Surveyed

Figure 1 shows the stages of evacuation of tourists in the event of a disaster as assumed in the “Kiyomizu-Gion Area Tourist Evacuation Guidance Plan”.
The three stages that were assumed consist of restraining mass exodus of tourists from all tourist sites, guiding them to an emergency evacuation square for tourists (a place to ensure safety immediately after the disaster), and evacuating them to a temporary accommodation facility for tourists (a place that allows resting or lodging).
The following 5 temples and shrines were the study sites: Yasaka Shrine, Otani mausoleum, Kodai-ji temple, and Ryozen Kannon designated as the “Emergency evacuation squares for tourists”, and the Kiyomizu-dera Temple designated as the “Emergency evacuation square for tourists” and “Temporary accommodation facility for tourists” in the Kiyomizu-Gion area.

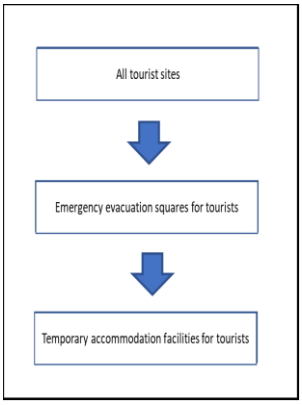

Figure 1: Stages of Evacuation

2.3 Temples and Shrines to be Surveyed

2.3.1 Evaluation of disaster prevention functions of the existing facilities of temples and shrines

First, the items to evaluate the disaster prevention functions of the existing facilities of the temples and shrines, which are necessary to aid the stranded tourists, are selected based on the past research, data, and interviews conducted in the temples and shrines that provided refuge to the stranded persons in the past. Second, the 5 temples and shrines chosen as the study subjects are interviewed based on the evaluation items to examine the actual disaster prevention capacity of the facilities owned by them, and the issues are identified.

2.3.2 Survey of the emergency operations and management of the temples and shrines

The operations carried out by the temples and shrines during evacuation providing refuge to stranded tourists are defined based on the past research, data, and interviews conducted in the temples and shrines that have experience in providing refuge to the stranded persons in the past. The 5 study subjects are interviewed about the operations defined below, and the issues are identified by conducting a fact-finding survey of the operations and management framework of the temples and shrines.

2.3.3 Suggestion of improvements by examining the present situation of the temples and shrines

The issues faced by the temples and shrines when functioning as evacuation sites for stranded tourists are consolidated based on the outcome of subsections 2.3.1 and 2.3.2, and the improvement measures have been suggested. Table 1 shows the details of the survey conducted in this study.

Table 1: Survey participation dates, subjects, and other details

Survey	Survey I	Survey II	Survey III
Subject	Hongan-ji Tsumura Betsuin, which provided refuge to stranded persons during the Northern Osaka Earthquake	Five temples and shrines that are designated as emergency evacuation squares and temporary accommodation facilities for tourists	Kyoto City Disaster Prevention Center
Survey perio	October 31, 2019	December 14, 2019 to October 1, 2020	December 23, 2019
Details	[1] Supplies or facilities that were necessary when supporting the stranded persons [2] Operations carried out when supporting the stranded persons	[1] Facilities or supplies of the temple or shrine [2] Operations and management framework of emergency evacuation squares and temporary accommodation facilities for tourists	Operation of emergency evacuation squares and temporary accommodation facilities for tourists

3. Evaluation of the disaster prevention functions of the existing facilities of the temples and shrines

3.1 Determination of the evaluation items of disaster prevention function

Evaluation items are determined to evaluate the disaster prevention function of the existing facilities of the temples and shrines that are necessary to aid the stranded tourists. Minami et al.[5] classified the evaluation items of disaster prevention function as “Safety of the facility,” “Accommodation capacity,” “Living facilities,” “Stockpile of supplies,” and “Management during emergencies.” These are further classified as evaluation items of disaster prevention functions that are necessary to aid the stranded tourists. The facilities or supplies that are required to support the stranded tourists are identified by referring to the “Guidelines for Dealing with Stranded Persons”[6] established by the Cabinet Office and the guidelines for aiding stranded tourists in the event of a large-scale disaster[7][8][9][10][11] established in the 5 regions comprising the main tourist destinations. The items mentioned in the majority of the guidelines (more than 3) were identified as facilities or supplies required to aid the stranded tourists and were classified based on the evaluation items of disaster prevention function classified by Minami et al. After interviewing “Hongan-ji Tsumura Betsuin,” which provided refuge to a large number of stranded persons during the Northern Osaka Earthquake of June 2018, “medical supplies” was added to the 9 evaluation items based on their response that the medical supplies were used for aiding the stranded persons, and a total of 10 evaluation items of disaster prevention function were selected (Table 2).

Table 2 Evaluation items of disaster prevention function of facilities of temples and shrines		Presence/Absence of item in the guideline					
	Detailed items	6)	7)	8)	9)	10)	11)
Safety of the facility	[1] Earthquake resistance	○	○	-	○	-	-
Accommodation capacity	[2] Accommodation space	○	○	○	○	○	○
Living facilities	[3] Toilet facilities	○	○	○	○	-	○
Ensuring stockpile of supplies	[4] Drinking water	○	○	○	○	○	○
	[5] Food	○	○	○	○	○	○
	[6] Blankets, etc.	○	○	○	○	-	○
	[7] Medical supplies	-					
Management during emergencies	[8] Means of communication with the government	○	○	○	○	○	○
	[9] Equipment for gathering information (radio, television, etc.)	○	○	○	○	○	○
	[10] Dissemination of information (bulletin board, etc.)	○	○	○	-	-	○

3.2 Method of evaluation of each item

Each of the following 10 evaluation items of the disaster prevention functions (Table 2) were evaluated:

[1] Earthquake resistance
According to the guidelines[6] drafted by the Cabinet Office, the buildings (including those that meet the same standards after seismic retrofitting) should be compliant with the new earthquake-resistance standards introduced in 1981 as the standard for earthquake resistance pre-established by the government. Therefore, to determine earthquake resistance of our study sites, we evaluated whether the stranded tourist accommodation space of each temple or shrine has been constructed, remodeled, or has undergone seismic retrofitting after the revision of laws related to earthquake resistance in 1981.

[2] Accommodation space
Accommodation space was evaluated based on the sufficiency rate obtained by identifying the number of individuals who can be accommodated in the existing space of each temple or shrine and comparing it with the required number.

[3] Toilet facilities
According to the "Kyoto City Stockpile Plan,"[12] there should be 1 toilet for every 100 stranded tourists. Therefore, we evaluated the number of toilets based on the sufficiency rate, which is determined by dividing the accommodation capacity of each temple or shrine with 100 to obtain the required number of toilets and then comparing it with the number of permanent and mobile toilets in each temple or shrine.

[4-6] Drinking water, food, and blankets
According to the "Kyoto City Stockpile Plan," drinking water (500 mL aluminum bottle), supplementary food, and aluminum foil blankets (portable blanket) should be stocked as the public stockpile for stranded tourists, and 1 bottle of drinking water, 1 portion (180 kcal) of supplementary food, and 1 portable blanket should be stipulated as the required quantities per stranded tourist. Based on this, the sufficiency rate of each temple or shrine is determined by comparing the required quantities of drinking water, food, and blankets for the accommodation capacity of each temple or shrine with the available quantity obtained by adding the public stockpile of each temple or shrine with the quantity stockpiled independently by each temple or shrine.

[7] Medical supplies
According to the "Kyoto City Stockpile Plan," medical supplies such as adhesive plaster, disinfectant, gauze, and bandage should be stocked and labeled as the emergency kit for first-aid treatment. Therefore, we decided to examine whether these medical supplies were stocked. As there are no general standards or indicators for the sufficiency rate, it was not included in this study.

[8] Means of communication with the government
According to the "Kiyomizu-Gion Area Tourist Evacuation Guidance Plan," some of the emergency evacuation squares and temporary accommodation facilities for tourists should be equipped with priority telephone links for disaster management or PHS. Therefore, to evaluate the means of communication with the government, we examined whether the temple or shrine was equipped with priority telephone links for disaster management or PHS.

[9] Equipment for gathering information
According to the "Kiyomizu-Gion Area Tourist Evacuation Guidance Plan," radio, television, and internet are considered as equipment to gather information. Therefore, we decided to examine the number of radios and televisions and the number of devices that can connect to the internet (e.g., smartphone). As there are no general standards or indicators for the sufficiency rate, it was not included in this study.

[10] Dissemination of information
Bulletin boards and whiteboards are required for disseminating the disaster information to the stranded tourists. Therefore, we examined this criterion to evaluate the information dissemination function. As there are no general standards or indicators for the sufficiency rate, it was not included in this paper.

3.3 Evaluation results of disaster prevention functions of temples and shrines

The 5 temples and shrines that were selected as the study subjects were interviewed about the details mentioned in [1] to [10] above. Table 3 shows the results of the survey. Among the 5 study subjects, 4 temples and shrines met the new earthquake-resistance standards, which shows that the safety of the facility is being ensured. Although Kiyomizu-dera temple was constructed in 1983, it does not meet the new earthquake-resistance standards. In the case of the number of toilets in the living facilities, 3 toilets were available in Kiyomizu-dera temple instead of 3.5 toilets, which is the required number. With regard to securing supplies, Yasaka Shrine, Otani mausoleum, and Ryozen Kannon, which receive public stockpile from Kyoto, had the required stockpile for drinking water, food, and blankets. However, Kodai-ji and Kiyomizu-dera temples, which do not receive public stockpile, might have a shortage of the aforementioned supplies. As the Kodai-ji temple does not have its own stockpile of food and blankets, it might end up with a serious shortage when compared to the required quantity. With regard to the medical supplies, since all the temples or shrines are equipped with emergency kits even during normal operations, it can be considered that the minimum quantity of medical supplies required for first-aid treatment during disasters can be ensured. For the operations management during an emergency, all the temples or shrines were equipped with PHS as the means of communication with the government. In addition, the Ryozen Kannon temple was also equipped with priority telephone links for disaster management. Furthermore, since all the temples or shrines were equipped with equipment for gathering information such as radio, television, and devices that can connect to the internet, as well as the bulletin board and whiteboard, it seems possible to disseminate the information to the stranded tourists.

Table 3: Results of the survey of disaster prevention functions of the facilities of temples and shrines

Temple/Shrine				1) Yasaka shrine	2) Otani mausoleum	3) Kodaiji temple	4) Ryozen Kannon	5) Kiyomizu-dera temple
Survey date				17-12-2019	20-12-2019	10-01-2020	18-12-2019	14-12-2019
Details	Safety of the facility	[1] Year of construction, renovation, or seismic diagnosis		Seismic diagnosis done in 2018	Seismic retrofitting done in 2011	Renovated in 2004	Renovated in 1989	Constructed in 1983
	Accommodation capacity	[2] Accommodation space (capacity in terms of number of persons)		465 persons	380 persons	170 persons	836 persons	350 persons
	Living facilities	[3] Toilet facilities	Required number (units)	4.7	3.8	1.7	8.4	3.5
			Available number (units)	6	31	9	41	3
			Sufficiency rate (%)	127.7%	815.8%	529.4%	488.1%	85.7%
	Ensuring stockpile of supplies	[4] Drinking water (500 ml bottle)	Required number (bottles)	465	380	170	836	350
			Available number (bottles)	2400	1080	80	2304	500
			Sufficiency rate (%)	516.1%	284.2%	47.1%	275.6%	142.9%
		[5] Food	Required number (units)	465	380	170	836	350
			Available number (units)	500	1100	0	2400	500
			Sufficiency rate (%)	107.5%	289.5%	0.0%	287.1%	142.9%
		[6] Blankets, etc.	Required number (blankets)	465	380	170	836	350
			Available number (blankets)	500	1030	0	2300	200
			Sufficiency rate (%)	107.5%	271.1%	0.0%	275.1%	57.1%
		[7] Medical supplies		Adhesive plaster, disinfectant, gauze, or bandage	Adhesive plaster, disinfectant, gauze, or bandage	Adhesive plaster, disinfectant, gauze, or bandage, cold medicines, and pain killers	Adhesive plaster and disinfectant	Adhesive plaster, disinfectant, gauze, or bandage, and ice-packs
	Management during emergencies	[8] Means of communication with the government		PHS	PHS	PHS	Priority telephone links in disaster or PHS	PHS
		[9] Equipment for gathering information (radio, television, etc.)		Radio - 1 Television - 1 Internet - 1	Radios - 2 Televisions - 5 Internet - 17	Radio - None Television - None Wi-Fi is Available	Radio - None Televisions - 2 Internet - 1	Radio - Available Television - Available Internet - Available
		[10] Dissemination of information (bulletin board, etc.)		Whiteboard - 1	Bulletin boards - 3, Whiteboards - 2	Whiteboard - 1	Whiteboards - 2	Bulletin boards - 20, Whiteboards - 3

3.4 Issues and proposed improvements

With regard to disaster management at temples or shrines, there are issues related to earthquake resistance or ensuring supplies such as drinking water, food, blankets, and toilets. Improving earthquake resistance is a future challenge since it would incur huge expenses such as cost of construction. Therefore, improvements such as stocking of supplies or ensuring toilets, which can be implemented at present, will be discussed in this study. As there is a shortage of supplies in the Kodai-ji and Kiyomizu-dera temples, which do not receive public stockpile from Kyoto city, sharing of supplies with Ryozen Kannon, which is of closest proximity to the aforementioned temples, can be considered. The stockpile of drinking water and food in Ryozen Kannon is 2304 units and 2400 units, respectively. Its sufficiency rate would be about 265% for drinking water and about 267% for food even if it shares its supplies with the Kodai-ji temple to cover the shortage of 90 units of drinking water and 170 units of food in Kodai-ji temple, and it would adequately meet the requirement even after sharing. Furthermore, the Ryozen Kannon has a stock of 2300 blankets. Its sufficiency rate would be about 237% even if it covers the total blanket shortage of 320 blankets of both Kodai-ji temple and Kiyomizu-dera temple, and it would adequately meet its requirements even after sharing. Based on this, it can be considered that the shortage of supplies can be met by sharing with other temples or shrines. About the shortage in the number of toilets in Kiyomizu-dera temple, it became clear that if one can obtain the cooperation of the souvenir stores or restaurants belonging to Kiyomizu-dera Monzenkai, which has formed a community with the Kiyomizu-dera temple during the normal times, 25 toilets can be ensured by assuming that each store has at least 1 toilet. In this way, an adequate number of toilets can be ensured.

4. Survey of the emergency operations and management framework of the temples and shrines

4.1 Determination of the survey items of operations and management framework

The survey items of operations and management framework are established by consolidating the necessary operations when the stranded tourists are given refuge in temples or shrines functioning as emergency evacuation centers in the event of a large-scale disaster.

4.1.1 Consolidation of the operations based on each guideline

Hayashi et al.[13] have consolidated the necessary operations of the evacuation site for each time classification after the disaster (Table 4), and it was used as a reference for the necessary operations considered in this article.

The scenario given in the “Kiyomizu-Gion Area Tourist Evacuation Guidance Plan” consists of evacuating the stranded tourists to the “emergency evacuation squares for tourists” in about 12 hours from the disaster outbreak, thereafter, relocating them to the “Temporary accommodation facility for tourists” in about 72 hours and sheltering them in the temporary accommodation facility. Furthermore, since the kind of support provided at the “temporary accommodation facility for tourists” differs from that of the “emergency evacuation squares for tourists,” the necessary operations are also different. Accordingly, the necessary operations at the respective sites have been established by referring to the various guidelines given in the following sections. By considering the operations (items pertaining to black colored circles in Tables 5 and 7) mentioned in the "Kiyomizu-Gion Area Tourist Evacuation Guidance Plan” as the standard, the operations mentioned in the following guidelines were added to the evaluation items, “Guidelines for Dealing with Stranded Persons” established by the Cabinet Office and the “Dazaifu City Guidelines”[7] in which a two-stage evacuation is being assumed at the tourist site similar to Kiyomizu-Gion area (target area). Consequently, the emergency evacuation square for tourists was set as the place that can provide shelter for about 12 hours from the disaster outbreak; the time classification of operations was set as shown in Table 4, and the operations were set as shown in Table 5. In addition, the time classification of operations of the temporary accommodation facility for tourists was set as shown in Table 6, and the operations pertaining to each time classification were set as shown in Table 7.

Table 4: Time classification of the emergency evacuation squares for tourists and overview of time

Time	Overview of time
Support in the emergency evacuation squares for tourists	It refers to the period of 12 hours after the disaster, when it functions as an emergency evacuation square for tourists

Table 6: Time classification of the temporary accommodation facilities for tourists and overview of time

Time	Overview of time
Opening time	Opening the facility approximately 6 hours after the disaster, ensuring the accommodation space, and preparing to receive the tourists
Accommodation	Receiving the tourists in the facility until 12 hours after the disaster and gathering information
Operations	Carrying out the tasks such as providing supplies or information to the evacuees by allocating duties and regularizing the management
Closing	After about 72 hours, supporting the tourists to return home when nearing the closing time of the temporary accommodation facility

Table 5: Definitions based on each guideline (emergency evacuation squares for tourists)

Time	Main operations	Detailed operations	Kyoto City	Cabinet Office	Dazaifu City
Support in the emergency evacuation squares for tourists	Restraining of mass exodus	[1] Making the tourists wait in the facility	●	-	○
	Carrying out preparations for opening	[2] Confirming the safety of the facility	●	○	○
		[3] Deciding to open the emergency evacuation square	-	○	○
		[4] Deciding the allocation of operational duties	-	○	○
		[5] Ensuring evacuation space (cleaning, etc.)	-	○	○
		[6] Guiding towards the evacuation space	-	○	○
		[7] Gathering information about the evacuees (confirming the identity or state of hea	-	○	○
		[8] Indicating that it is an emergency evacuation square	●	○	○
		[9] Reporting about the opening of emergency evacuation square	●	-	-
	Information support	[10] Providing information ・Providing disaster information ・Providing information about public transportation ・Status of the opening of temporary accommodation facilities	●	○	○
	Direct support	[11] Distribution of water and food	-	○	○
		[12] Provision of toilets (establishing rules for using toilets)	-	○	○
		[13] Multilingual support (distribution of guide maps, etc.)	●	-	○
	Other	[14] Providing guidance about the temporary accommodation facilities	●	-	-

Table 7: Definitions based on each guideline (temporary accommodation facility for tourists)

Time	Main operations	Detailed operations	Kyoto City	Cabinet Office	Dazaifu City
Opening time	Carrying out preparations for opening	[1] Confirming the safety of the facility	●	○	○
		[2] Deciding to open the temporary accommodation facility	-	○	○
		[3] Ensuring evacuation space	-	○	○
		[4] Providing guidance about the evacuation space	-	○	○
		[5] Indicating that it is a temporary accommodation facility	●	○	○
		[6] Reporting about the opening of temporary accommodation facility	●	-	-
Accommodation	Gathering of information	[1] Gathering information about the evacuees (confirming the identity or state of hea	●	○	○
Operations	Creation of management	[1] Deciding the allocation of operational duties	-	○	○
	Creation of management rules	[2] Establishing rules for using toilets and waste disposal	-	○	○
	Information support	[11] Providing information ・Providing disaster information ・Providing information about public transportation	●	○	○
	Direct support	[4] Provision of toilets	●	○	○
		[5] Distribution of water, food, blankets, etc.	●	○	○
		[6] Multilingual support (distribution of guide maps, etc.)	●	-	○
Closing	Support for returning home	[1] Providing information and guidance for returning home	●	○	○
		[2] Guiding the evacuees to return home (requesting to vacate, etc.)	-	○	○
		[3] Supporting the evacuees who need to stay back	●	○	-
		[4] Deciding about closing the temporary accommodation facility	-	○	○

4.1.2 Consolidation of operations that can be performed at the temples or shrines

The operations that can be performed by the temples or shrines are consolidated by examining the operations that were necessary in the past in the temples and shrines that provided refuge to stranded persons in addition to the operations given in each guideline.

In this study, based on the previous research[14)15)] and interview of “Hongan-ji Tsumura Betsuin” that had provided refuge to stranded persons during the Northern Osaka Earthquake of 2018, the operations performed in the past were identified from the operations shown in Tables 5 and 7, and consequently, the operations shown in Tables 8 and 9 were obtained. The items represented with black-colored circles are the operations mentioned in the “Kiyomizu-Gion Area Tourist Evacuation Guidance Plan.” In addition, the items mentioned in the guidelines of the Cabinet Office or the Dazaifu City and the operations performed in the temples or shrines in the past are represented as white-colored circles. It was decided to identify the entity that would be responsible to carry out the operations by interviewing the 5 temples and shrines selected as the study subjects and by setting 2 types of entities (Table 10) apart from the temple or shrine itself.

Table 8: Operations that can be performed by the temples or shrines (emergency evacuation squares for tourists)

Time	Main operations	Detailed operations	Kyoto City	Cabinet Office	Dazaifu City	Past experience
Support in the emergency evacuation squares for tourists	Restraining of mass exodus	[1] Making the tourists wait in the facility	●	-	○	-
	Carrying out preparations for opening	[2] Confirming the safety of the facility	●	○	○	○
		[3] Deciding to open the emergency evacuation square	-	○	○	○
		[4] Deciding the allocation of operational duties	-	○	○	○
		[5] Ensuring evacuation space (cleaning, etc.)	-	○	○	○
		[6] Guiding towards the evacuation space	-	○	○	○
		[7] Gathering information about the evacuees (confirming the identity or state of he	-	○	○	○
		[8] Indicating that it is an emergency evacuation square	●	○	○	○
		[9] Reporting about the opening of emergency evacuation square	●	-	-	-
	Information support	[10] Providing information ・Providing disaster information ・Providing information about public transportation ・Status of the opening of temporary accommodation facilities	●	○	○	○
	Direct support	[11] Distribution of water and food	-	○	○	○
		[12] Provision of toilets (establishing rules for using toilets)	-	○	○	○
		[13] Multilingual support (distribution of guide maps, etc.)	●	-	○	-
	Other	[14] Providing guidance about the temporary accommodation facilities	●	-	-	-

Table 9: Operations that can be performed by the temples or shrines (temporary accommodation facility for tourists)

Time	Main operations	Detailed operations	Kyoto City	Cabinet Office	Dazaifu City	Past experience
Opening time	Carrying out preparations for opening	[1] Confirming the safety of the facility	●	○	○	○
		[2] Deciding to open the temporary accommodation facility	-	○	○	○
		[3] Ensuring evacuation space (cleaning, etc.)	-	○	○	○
		[4] Providing guidance about the evacuation space	-	○	○	○
		[5] Indicating that it is a temporary accommodation facility	●	○	○	○
		[6] Reporting about the opening of temporary accommodation facility	●	-	-	-
Accommodation	Gathering of	[1] Gathering information about the evacuees (confirming the identity or state of he	●	○	○	○
Operations	Creation of	[1] Deciding the allocation of operational duties	-	○	○	○
	Information support	[2] Providing information ・Providing disaster information ・Providing information about public transportation	●	○	○	○
	Direct support	[3] Provision of toilets (establishing rules for using toilets, etc.)	●	○	○	○
		[4] Distribution of water, food, blankets, etc.	●	○	○	○
		[5] Multilingual support (distribution of guide maps, etc.)	●	-	○	-
Closing	Support for returning home	[1] Providing information and guidance for returning home	●	○	○	○
		[2] Supporting the evacuees who need to stay back	●	○	-	-
		[3] Deciding about closing the temporary accommodation facility	-	○	○	○

Table 10: Types of entities carrying out the operations

Responses are established by the temple or shrine by assuming the situation		Temples/shrines in which responses are not in place
Temples/shrines in which responses are in place	Temples/shrines in which responses will be established in the future	Responsibility (1. Government, 2. Local residents, 3. Others)

4.2 Fact-finding survey of the operations and management framework by interviewing the temples and shrines

About the survey items of the operations and management framework of the designated emergency evacuation squares and temporary accommodation facilities for tourists, temples and shrines are interviewed to clarify about the following, response to which parts can be done by the temple or shrine at present and what are the aspects for which response must be considered.

4.2.1 Fact-finding survey of operations and management framework in emergency evacuation squares for tourists

We interviewed the 5 temples and shrines including Yasaka Shrine, Otani mausoleum, Kodai-ji temple, Ryozen Kannon, and Kiyomizu-dera temple, which were designated as emergency evacuation squares for tourists, about the survey items of operations and management framework defined in Table 8 of the previous section and classified them according to the entity that carries out the operations shown in Table 10. Table 11 show the results.

Table 11. Survey results of operations and management system at the emergency evacuation squares for tourists

			Responses are established by the temple or shrine by assuming the situation		Temples/shrines in which responses are not in place
Time	Main operations	Detailed operations	Temples/shrines in which responses are in place	Temples/shrines in which responses will be established in the future	Responsibility (1. Government, 2. Local residents, 3. Others)
Support in the emergency evacuation squares for tourists	Restraining of mass exodus	[1] Making the tourists wait in the premises	Kiyomizu, Kodai, Otani, Ryozen, Yasaka		
	Carrying out preparations for opening	[2] Confirming the safety of the facility	Kiyomizu, Kodai, Otani, Ryozen, Yasaka		
		[3] Deciding to open the emergency evacuation square	Kiyomizu, Kodai, Otani, Yasaka	Ryozen	
		[4] Deciding the allocation of operational duties	Kiyomizu, Kodai, Yasaka	Otani, Ryozen	
		[5] Ensuring evacuation space (inspection or cleaning)	Kiyomizu, Kodai, Ryozen, Yasaka	Otani	
		[6] Guiding towards the evacuation space	Kiyomizu, Yasaka	Otani, Ryozen	Kodai (Local residents)
		[7] Gathering information about the evacuees (confirming the identity or state of hea	Yasaka	Otani	Kiyomizu (Government), Kodai (Government), Ryozen (Government)
		[8] Indicating that it is an emergency evacuation square for tourists	Kiyomizu, Kodai, Ryozen, Yasaka	Otani	
		[9] Reporting about the opening of emergency evacuation square for tourists	Kiyomizu, Ryozen, Yasaka	Kodai, Otani	
	Information support	[10] Providing information (information related to disaster or public transportation)	Kiyomizu, Kodai, Otani, Yasaka	Ryozen	
	Direct support	[11] Distribution of water and food	Kiyomizu, Otani, Ryozen, Yasaka		Kodai (Government)
		[12] Provision of toilets	Kiyomizu, Kodai, Otani, Ryozen, Yasaka		
		[13] Multilingual support (distribution of guide maps, etc.)	Kiyomizu, Kodai	Otani	Ryozen (Government), Yasaka (Government)
	Other	[14] Providing guidance about the temporary accommodation facilities	Kiyomizu, Kodai, Yasaka	Otani	Ryozen (Government)

(a) Items for which the response is already in place

Kiyomizu-dera temple and Yasaka Shrine have their own manual, and there were many items for which the response was in place by assuming the situation in advance. Even in the remaining temples and shrines that did not have manuals, there were many items for which the response for the items mentioned in the “Guidelines for Dealing with Stranded Persons” of Kyoto city was already in place, and the effectiveness of establishing guidelines and disseminating the information was evident.

(b) Items that are planned to be handled in the future

Items that are planned to be handled in the future were mainly listed in the temples and shrines that did not have a manual. Most of the items listed were not mentioned in the “Guidelines for Dealing with Stranded Persons” of Kyoto city as well. However, since response to these items can be done by allocating duties or establishing rules in the temples or shrines, it can be considered that it is necessary for each of the temple or shrine to come up with the response in future.

(c) Items for which response cannot be done by the temple or shrine

About the items for which it was responded that it is difficult for the temple or shrine to carry out the response independently, it became clear that they want the government to carry out the response for all the items except for “[6] Guiding to the evacuation space”. With regard to “[7] Gathering information about the evacuees”, most of the temples and shrines expressed their opinion that they cannot carry out this response independently as it may lead to invasion of privacy, and they wanted the government to handle it by becoming the main entity. Furthermore, with regard to “[13] Multilingual support”, it became clear that government support is necessary since the response cannot be done in the absence of multilingual staff.

4.2.2 Fact-finding survey of operations and management framework in temporary accommodation facility for tourists

We interviewed the Kiyomizu-dera temple, which is designated as the temporary accommodation facility for tourists with regard to the survey items of the operations and management framework shown in Table 9 and classified 2 types of entities other than the temples and shrines that are responsible for the operations (Table 10).

The operations and management framework from the time of opening to the time of management was same as that of emergency evacuation squares for tourists given in 4.2.1. Although the response for "Provision of information and guidance related to returning home," which is performed at the time of closing, was in place in Kiyomizu-dera temple's manual, aspects such as "Supporting the evacuees who need to stay back" and "Deciding about closing the temporary accommodation facility" were still uncertain. As the temples and shrines cannot carry out independent response for such items, it can be considered that it is necessary to decide the response by cooperating with the government.

4.2.3 Issues and proposed improvements

"Gathering information about the evacuees" and "Multilingual support" were listed as the current issues related to the operations and management framework, and most of the temples and shrines expressed their opinion that they cannot carry out this response independently. When asked about the entity that should manage these 2 works, most of them commented that the government should handle those works independently. Therefore, we interviewed the Kyoto City Disaster Prevention Center about these 2 items and received their response that the Kyoto city would provide support by handing out a form to confirm the identity of evacuees for "Gathering information about the evacuees." In addition, even for "Multilingual support," we were told that preparations are underway for handing out a form with the necessary phrases to be used in the event of a disaster.

5. Conclusion

5.1 Summary

5.1.1 Survey of disaster prevention functions of the facilities of temples and shrines

Lack of earthquake resistance and issues related to ensuring supplies such as drinking water, food, and blankets or toilets were pointed out as the current issues of disaster prevention functions in temples and shrines. Excluding the issues related to earthquake resistance, it is clear that the shortage of supplies such as drinking water, food, and blankets can be overcome with mutual supplementation among the temples and shrines. About the lack of toilets, the possibility of making up the shortage by cooperating with the nearby stores was presented. However, building close ties among the temples and shrines or with the local community during normal times is considered to be essential to achieve this level of cooperation.

5.1.2 Survey of disaster prevention functions of the facilities of temples and shrines

About the operations and management framework, it is clear that in the case of temples or shrines that had their own manual, responses to many items were in place by assuming the situation in advance. However, even the temples or shrines that did not have a manual that had kept responses in place for the operations mentioned in the "Guidelines for Dealing with Stranded Persons" of Kyoto city. Operations such as "Gathering information about the evacuees" and "Multilingual support" were presented as the issues that need to be improved. About gathering information of evacuees, it is difficult for the temples or shrines to carry out the response independently due to privacy concerns; about providing multilingual support, it is difficult for the temples or shrines to carry out the response independently in the absence of multilingual staff. Therefore, cooperation with the government is considered to be necessary in such cases.

5.2 Challenges in the future

5.2.1 Challenges related to the evaluation of disaster prevention functions of the facilities of temples and shrines

As the disaster prevention function was evaluated by interviewing the temples and shrines in this study, in the future, it is necessary to evaluate by gathering the opinions of tourists who would actually be the evacuees. In addition, only earthquake resistance was verified in terms of safety by assuming a large-scale earthquake. However, in the future, it is necessary to verify safety by also considering fire or other disasters caused by the earthquake.

5.2.2 Issues related to the operations and management framework of a temple or shrine functioning as an emergency evacuation center

As only temple/shrine or government was interviewed in this study, in the future, it is also necessary to gather opinions from the local residents about the operations that cannot be carried out by the temples or shrines independently and examine the possibility of the managers of the temples or shrines, government, and local residents to work together.

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Main architectonic structures in the Grecanic Area. A tourist-cultural route

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Abstract
The term "Grecanic Area" indicates a circumscribed land of the extreme South of Calabria, where until the last century the inhabitants still spoke a language of clear ancient Greek origin. The area includes about ten municipalities and is located on the southern front of the Aspromonte mountain. It hosts old villages having roots in the period of the Greater Greece. These villages have undergone a profound transformation starting from the second half of the 20th century, determined by the new and easier relations with the coastal cities and by the strong growth of the regional economic system which has also led to a general social reorganization. They have been depopulated and the traditional language has been supplanted by Italian, to the point that it now survives only in the cultural heritage of a few elderly people. Nevertheless, the Grecanic Area keeps a strong historical-cultural identity and looks very attractive also in terms of environmental, settlement and landscape aspects. Overall, there is a wealth of resources that could generate a strong tourist interest, relying in particular on a set of relevant architectonic structures and on a widespread reception capacity. The paper proposes an original contribution to the promotion of a tourist-cultural path, focusing firstly on the local architectonic structures and even on some not expensive measures to improve the accessibility to the Grecanic Area by two mobility alternatives: the English Trail, which recalls the experience of E.Lear, a British writer/traveller of the 19th century, who reached the villages by crossing the mountains on foot, and a path through the sea-mountain penetration roads along the valleys and hills close to the characteristic rivers (“fiumare”) of the Aspromonte.

Keywords: Grecanic Area, architecture, tourism, cultural route

1. Introduction
In the extreme south of the Calabrian peninsula, in Italy, there is an area identified as the Grecanic Area, which covers about 260 square kilometers and hosts a population of less than 20,000 inhabitants. The territory is largely mountainous and hilly, except for a modest flat coastal strip overlooking the Ionian Sea; the highest part is on the Aspromonte massif and it is included in the homonymous National Park. The reliefs are rather jagged and interrupted by the characteristic “fiumare”, torrential water rivers, which flow in the valley floor on narrow stony gravels upstream and gradually wider downstream near the mouth. The rivers appear dry in the summer; the rains, particularly concentrated in the winter period, give rise to impetuous streams and, at higher altitudes, to waterfalls. In the middle season the flow of water is less intense and take the form of stream. The modest population density is a reflection of the inaccessible nature of the sites, of recurrent flood phenomena, of a modest economy with a prevalence of agro-pastoral component, but also of migratory flows towards the richest cities or regions. There are a dozen municipalities in the Grecanic Area; they are often characterized by the existence of historic urban centers, in a hilly position, and coastal urban towns that arose at the beginning of the twentieth century (the "Marinas").
The paper refers to some identifying characteristics of the area, in particular to the cultural traces of Greek origin which substantially date back to two different historical periods, one relating to the colonization of the territory by communities from Greece (Magna Graecia period, first centuries b.C.. a second linked to a significant presence of Byzantine culture between the sixth and eleventh centuries).
The attention then focuses on some buildings of historical-monumental value located in the old hilltop villages, highlighting their historical and architectural connotations. Finally, the potential of the sites from a tourist point of view is highlighted in relation to the enhancement of cultural heritage and tourist

accessibility through two types of journey, one slow, focused on walking along ancient trails, the other easier with motorized vehicles on sea-mountain routes.

2. Calabrian Grecanic Area. Identity elements

The Grecanic Area extends from Montebello Ionico to Staiti towns, and includes the ancient villages of Bova, Palizzi, Condofuri, Pentadattilo, Gallicianò. The local communities are identified as Grecanic or “Greeks of Calabria” because, according to various scholars, the inhabitants are direct descendants of the first settlers who came from Greece. Although it tends to get lost in recent decades, ancient Greek, a language that has remained unchanged for tens of centuries, is still spoken by older people; and old customs and liturgies are still practiced such as the Greek Orthodox Rite introduced in Calabria by the Basilian monks. In the same area there are other expressions and references to Byzantine culture and architecture. The names of some inland towns such as Roccaforte del Greco, Roghudi, Chorìo, but also the strategic fortress of St.Aniceto (or St.Niceto), in the municipality of Motta San Giovanni, are evident signs of this; the Byzantine admiral Niceta lived between the seventh and eighth centuries in Sicily and was a symbolic figure for people.
The Byzantine presence in Calabria prevails with the "second Greek colonization" and dates back to 535 a.C. with the beginning of the Greek-Gothic war. In the 6th century Justinian founded the Duchy of Calabria and in the 9th century Byzantine Calabria extended from Reggio Calabria to Rossano. The Byzantine domination lasted until about the year 1000 when the Norman troops settled to stem the Arab invasion.
During the Byzantine domination, Calabria was a destination for pilgrimages of ascetics from Greece and the East regions. It was the favourite region to welcome these monks as Greek was spoken locally and it was a mountainous region and therefore rich in places in which to build monasteries and other places of worship. As for other inland areas, the villages of Calabria have kept alive the cultural and identity characteristics of ancient civilizations that have not overlapped or contaminated over time. Thus it happens that in visiting them it is possible to grasp old time atmospheres, also recalled by traces of music, songs and crafts handed down from father to son.

3. Buildings of cultural-monumental value of Grecanic value

The hilly morphology of the Grecanic area territory is characterized by reliefs and strategic sites facing the sea useful for positioning the defensive architectures from external attacks. The cultural dimension of the sites is highlighted by the presence of numerous monuments of historical and architectural importance. In particular, architecture of the Byzantine period, architecture with Byzantine stylistic elements and structures with defensive purposes of the Byzantine or Norman period emerge.
Some of the most interesting architectural emergencies, distributed among the municipalities of the Grecanic area, are described below. The list also includes two monuments in Reggio Calabria, a reference city, in relation to a hypothesis of tourist itinerary that starts from the capital and follows stages corresponding to old villages in the 'Grecanic area. Concerning the proposed architectures, the relationship with the territory, the historical-architectural dimension, some characteristics of material and immaterial identity, hints on the conservation state are illustrated.

3.1 Aragon Castle and Ottimati Church (Reggio Calabria)

The castle (Fig.1) is located in the inner city of Reggio Calabria, on a hill from which the Chalcidian Chaldicians in the Archaic era (VIII century b.C.) could better protect the defensive walls that were extended with the Hellenistic expansion reaching the port and whose traces are still visible in the city's waterfront.
It is thought that in the Byzantine era a first fortified building was formed, most likely characterized by a single tower dated 536. Occupied by the Normans in 1059, the fortress was later enlarged several times by Frederick II of Swabia and then by the various kings who followed one another. in time until 1458, with the Spanish domination of Ferdinando D'Aragona to whom we owe the term “Aragon Castle”. There have been various reconstructions of the original structure; according to archival documents in its moment of greatest glory, the fortress was composed of a square building with four towers at the corners, other sources even refer to the presence of six towers.
Following the Turkish invasions, who conquered it in 1543, the building was transformed into a prison. From 1806 first due to the fights between the Spanish and the French and then in the Bourbon era, demolitions and reconstructions followed one another until in 1860 it was conquered by Garibaldi. With the drafting of the city master plan, the hypothesis of its demolition to allow for the creation of a large square was avoided as the castle assumed the role of a national archaeological monument. Of the parts remained unharmed after the earthquake of 1908, despite further significant demolitions over the

years, there are today two imposing towers connected by an intermediate linear building, used today as a venue for cultural events.




Fig.1 Aragon Castle

Unfortunately Reggio City has lost many of its Byzantine era vestiges. Today there is a specimen of architecture represented by the Ottimati Church (or church of St.Maria Annunziata); it is an ancient Byzantine-Norman church located near the Castle (Fig.2). Built around the 10th-11th century, it took its name from the ancient crypt of the Ottimati adjacent to the 12th century Norman church dedicated to St.Gregory the Great. It is a small structure that recalls Byzantine shapes and styles; in fact the architectural canons are clearly of Byzantine matrix, but several changes have been made over the centuries, in particular following the disastrous earthquakes that hit the city of the Strait. The building dates back to between the 10th and 11th centuries, and this is confirmed by a quadrangular plan with three naves surmounted by five small domes, preserved by the Superintendency of Calabria [1]. There is an architectural similarity with other Byzantine religious buildings such as the Cattolica Church of Stilo.
In the Norman period (11th-12th century) the building lost its domed roof, assuming its current form with a single dome. The church played an important role for its function
n as a palatine chapel, being connected by an underground passage to the castle discovered in 1857. The term Ottimati also refers to an ancient brotherhood of Norman nobles from Reggio, who had their headquarters from the sixteenth century on this site. The current church is a reconstruction of the ancient structure (always close to the castle) which took place following the earthquake of 1908. It preserves an ancient floor mosaic in Cosmatesque style of the twelfth century, appropriately recomposed, which represents one of the few surviving examples of medieval Calabrian age. It is a work made in "opus tassellatum", that is, with polychrome stones of black and white marble and red and green porphyry, which is characterized in the central squares by a geometric division with curvilinear weaving motifs.




Fig.2 Ottimati Church *(Ph.G.Lombardo)*

3.2 St'Aniceto Castle (Motta St.Giovanni)
The fortified site of St.Aniceto is located on the top of a rocky hill a short distance from Reggio Calabria (Fig.3), in the Niceto area within the municipality of Motta St.Giovanni. Built in the late Byzantine period, the castle enjoyed a strategic position being placed in front of the Strait of Messina; it made it possible to control a large territory that stretched from Taormina, in Sicily, to Capo d'Armi on the Ionian coast of Calabria, and therefore to spot any Saracen raids and allow the defense of the local population to be organized.

Having become an important military garrison during the thirteenth century, in the period characterized by the fights between the Angevins and the Aragon people, the castle was part of the fief of Motta St.Giovanni from the beginning of 1500 and then, around 1660, of that of the Ruffo family until at the end of feudalism. The castle was finally occupied by the Aragonese. Over time the structure underwent adaptation work on several occasions.
The castle is reached via a path on the internal hillside. From its only access, flanked by two square-based towers, it is possible to reach an area bounded by a characteristic defensive wall, still largely in good condition; a transverse barrier wall defines a second fortified area that lies on the top of the hill where a cistern tower and some residential buildings are located; these structures, suitably connected by large walls, create a third protected area. Some traces of two stone stairs are still visible, located one at the main entrance and the other lower down near the tower of the northern building; on the southern side of the walls there is a ladder carved into the thickness of the wall.



Fig.3 St.Aniceto Castle

3.3 Piromallo Castle (Montebello Ionico)

The Piromallo castle (Fig.4) was built at the entrance to Fossato village, not far from the town of Montebello Ionico; at the end of the eighteenth century the local feud was owned by the Barons Piromallo, Princes of Capracotta, residing in Naples. It was used as a summer residence, overlooking the sea, and overlooked the lower part of the town and the adjacent properties rich in citrus groves.
The castle “with towers” was built by the owners to better manage the property and the local interests of the family, becoming also the place where to collect the proceeds deriving from the sale of agricultural and forest products. In the summer it also hosted musicians and artists who enlivened the evenings of the noble family.
With the fall of the Two Sicilies Kingdom and the birth of the Italy Kingdom, the castle was gradually abandoned and the property was sold to wealthy local families. The decay has also affected a majestic garden with an oven and access gates.
More than a century after the last restoration work (between 1882 and 1892), the castle appears in a precarious state of conservation, with the pitched roof and red tiles partially collapsed; the façades, made with very thick walls in red stone, have degraded and variously detached plasters. After the 1908 earthquake, the structure was consolidated by inserting chains with metal plates.
The building, with its unique turreted conformation, or with towers at the corners, covers an area of about 300 m². In the main façade there is a central rectangular body with two floors, between two side towers. The central body is characterized by three doors on each level; the upper ones open onto wrought iron balconies; the wall of the ground floor has a light masonry shoe. In an advanced position, on the sides of the central rectangular body, there are two corner towers characterized by a shoe base, probably added later to the first plant.
The towers are the most significant element of the structure from an aesthetic-architectural point of view. They are also equipped with an access door on the ground floor, but elegant windows can be seen on the upper floor. The ground floor was probably used for the servants, while the first floor, with the more stylized façade, was intended for the family's accommodation.
The two levels are connected by a band marked by two curbs placed one in correspondence with the string course and the other to emphasise the sill-mark of the upper level on which the openings framed by relief shapes rest. Of particular importance are the decorations, which embellish the top curb of the castle and in particular that of the two towers, composed of Guelph battlements used in medieval times to protect soldiers from attacks by enemy archers.



Fig.4 Piromallo Castle

3.4 Church of St.s Peter and Paul in Pentedattilo (Melito Porto Salvo)

The ancient village of Pentedattilo (pènta-daktylos in Greek of Calabria) developed at the base of a Monte Calvario cliff which, due to its shape, recalls an open hand with five fingers pointing towards the sky. Chalcidian colony in 640 B.C., in the Greco-Roman era it was a thriving economic and military site. In the Byzantine era a long period of decline began, caused by the continuous looting by the Saracens and other invaders. Upstream from the town there was a fortified castle which at the end of the 16th century was restored and enlarged with the construction of bulwarks and a drawbridge; over the centuries, also due to the violent earthquakes of 1783 and 1908, the fortress has deteriorated, although it retains an imposing image characterized by the profiles of the battlements that crown the top of remaining façades. Evocative ruins of houses recall the ancient village, some of which have recently been recovered and converted into traditional craft shops, determining a tourist impulse especially in summer, but also new functions (cultural festivals, film settings, laboratory in situ to test materials and structures, etc.).

In the centre town stands an interesting architectural structure, the Church of Saints Peter and Paul. To be positioned in the upper part of the village, it emerges from the houses and also stands out for the height of the bell tower. The church overlooks a square from which a staircase leads to the castle. Of Byzantine-Norman origin, the building consists of two naves and is laterally adjacent to the cliff wall. The elegant side bell tower, with a square base and two orders, covered with majolica, ends with a high base on which four small corner pinnacles and a spire with an octagonal base rest. Inside the church there is a statue of the Madonna with Child, a statue of St.Anthony child and an organ from the 1700s. In the main altarpiece there was a precious canvas depicting Saints Peter and Paul which was stolen in the 1980. Rebuilt after the earthquake of 1783, the church has undergone numerous restorations, but it remained uninhabitable for years; it was only in 2001 that it became accessible again in conjunction with the redevelopment of the village.

The plaster of the surfaces of the façades, and in particular that of the main façade worn in various parts, together with the brick parts left exposed, such as those of the corners of the bell tower and those of the string courses, give an image of the monument that harmonizes well with the natural landscape and that of the surrounding buildings.



Fig.5 Pentedattilo and Church of Sts Peter and Paul

3.5 Amendolea Castle(Condofuri)

The Castle is located on the crest of an impervious rocky ridge, located adjacent to the confluence of the Amendolea and Condofuri rivers, chosen for the dominant position that allowed the defense against Saracen raids. The surrounding village, whose origins seem to date back to the end of the first millennium, is now in a state of complete abandonment and only ruins of the castle are visible today.
Repeatedly devastated by invaders, the village was a fiefdom of Riccardo of Amendolea, of the Abenavoli and finally of the Ruffo to whom the name of the castle is owed. It has been the subject of restoration actions several times, with the addition of new and elegant rooms and buildings. The village and the castle still retain evident signs of the medieval era; among the other ruins there are those of four apsidal churches, St.Annunziata (XIV century), St.Catherine (XIII century), St.Sebastian (XV century) and St.Nicolas (XI century). Of the St.Sebastian church there is still a three-tiered bell tower from the 17th century, which closes at the top with a hexagonal spire.
The origins of the castle are Norman; the construction of the castle is attributed to Riccardo di Amendolea, although it is presumed that its construction took place in several phases by the various peoples who dominated the area during the Late Middle Ages. Renovated several times over the centuries, the castle was involved in power struggles between local noble families, often changing owners. Today few traces remain: the perimeter walls, a tower and what once must have been a chapel.
The castle can be reached via a long staircase. At the entrance, on the right, there is an area that once served as a cistern for collecting water. The central part of the castle was occupied by a large room, the floor of which is now prey to grass and rocks; on the wall facing east there are still three large windows near which were placed niches that housed the sentries. From here, the guards could spot the enemies long before they reached the top and thus having time to warn the population and organize the defense. Around this room there are some towers, one of which has a curious peculiarity: its entrance is not on the ground floor, but on the first floor, and it was accessed via a drawbridge. Further south are the houses of the Amendolea community and the most important religious building: the protopapal church. The walls of the castle are made of a mixture of rocks and a paste of sulfur and iron, which ensure compactness. Several telluric events, particularly in 1783 and 1908, caused extensive wounds to the original structure.




Fig.6 Amendolea Castle ruins

3.6 Orthodox Church of Gallicianò (Condofuri)

On the top of the Gallicianò village stands the small church dedicated to the Madonna of Greece (Panaghia tis Elladas) which, recently, was entrusted to the monks of Mount Athos who govern the monastery of St Giovanni Therestis in Bivongi.
Opened for worship in 1999, inside it houses an icon representing the Madonna of Greece, while on the outside, a simple bell tower emerges surrounded by ancient houses. In the same church there is a statue of St Giovanni (16th century), a baptismal font, two bells from 1508 and 1683 and some clay lanterns.
The Byzantine church, with a peasant layout, was built by renovating a stone house in the upper part of the town; it is open to worship and represents the testimony, in a renewed ecumenical climate, of a return as pilgrims of the Orthodox to sites of Greek worship.

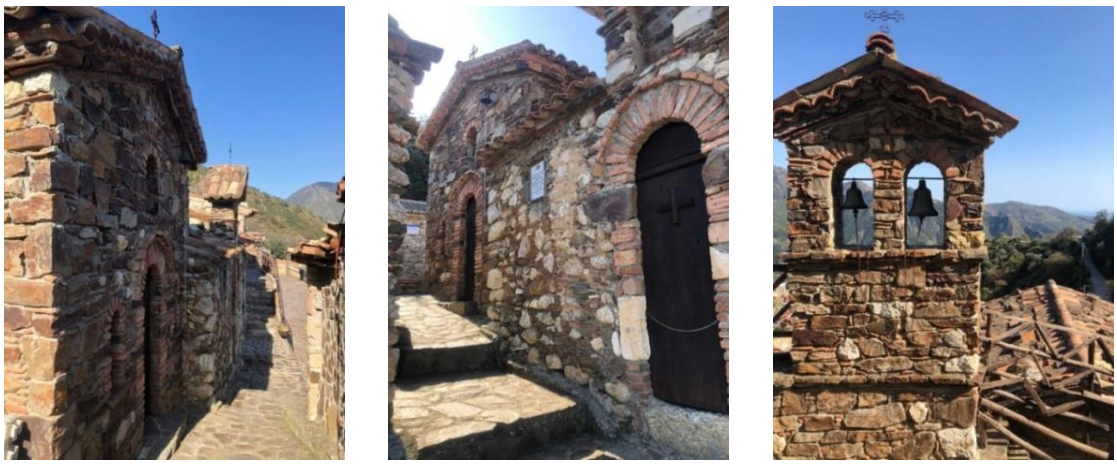

Fig.7 Orthodox Church Madonna of Greece

3.7 Bova Castle

The Castle of Bova, is located in the ancient village of the town, located on the top of Rotondo Mount from where it is possible to observe the middle valley of the Amendolea river on the southern side of the Aspromonte; it consisted of a fortified component and a part carved into the rock, and was built to offer protection from possible enemy incursions from the Ionian Sea. Unfortunately today few vestiges remain visible to the visitor.

The sources describe an imposing castle founded in Norman times and strengthened at the end of the 15th century by the Aragonese. The large amount of archaeological finds found near the fortress allows to affirm that Bova must have been frequented already in the Neolithic era. Some data about its existence according to documentary sources refer to the period between 1040 and 1064 when the town, after having suffered the Arab and Byzantine dominations, had been acquired by the Normans. There are, in fact, still present architectures and active cultural traditions.

However, the scarce existing documentation does not allow to reconstruct the original structure of the castle; there are not enough elements to draw the planimetric development or to identify any subsequent construction phases concerning the system as a whole.



Fig.8 Bova Castle

3.8 Palizzi Castle

The castle of Palizzi stands on a cliff and dominates an ancient hilltop village. It enjoys an extensive panoramic view towards the Ionian sea and the coast. It has been declared a National Monument by the Ministry of Cultural Heritage.

The castle can be reached by following a trail among houses, pergolas, Mediterranean scrub, characteristic prickly pears that grow between protrusions and inlets in the rock, creating a unique setting typical of the Ionian area.

Due to its strategic position and the imperviousness of the site, the castle was considered a safe haven for the population as it allowed control of the coast and therefore a better defense against attacks from the sea. The main entrance and the terrace overlooking the town below are located, with respect to the masonry, on an advanced body with rounded edges.

The cliff may have been inhabited as early as the first millennium, but it is likely that the castle was built in the 14th century by the Ruffo family; it has undergone, several times, over the centuries,

renovations that have resulted in changes, use and image. The complex was also equipped with prison cells dug into the rock.
Acquired in 1886 by the De Blasio family, wealthy landowners of the area, the castle was largely rebuilt and transformed into a residential building with the addition of a load-bearing masonry building on the west side. In the last postwar period it became a summer residence. Although the De Blasios have tried to recover the habitable part, carrying out small restoration works, the deterioration process of the castle already damaged by alterations made on numerous events, has not stopped.
Parts of two towers are still preserved today from the ancient military structure, one cylindrical with characteristic battlements on the east side and one angular on the opposite side, which protrude from the curtain walls of the main building; it is possible to see "guns" arranged on several levels that follow the course of the rocky ridge.
The elevations have round-arched windows on the ground floor, more complex ogival windows on the upper floor and end with moldings, defined by string courses and projecting cornices, characterized by narrow oval windows placed in axis with the windows.
On the ground floor there are traces that suggest an ancient use of the spaces for service activities and for animal shelters. The other rooms on the upper floor are currently unusable due to the collapse of the roof; and a reconstruction work is underway that could give new value to the whole building.
The wall structure is composed of stones arranged in horizontal beds made regular by mortar, while the more decorative parts such as bull, cornices and corbels were made of limestone.



Fig.9 Palizzi Castle

3.9 St Maria de'Tridetti (Staiti)

St.Maria deTridetti is a Norman church of Basilian style with some Arabic elements (triumphal arch with an acute shape) located a few kilometers from Bova, but in the municipality of Staiti.
The building is not in good condition; the main façade faces the mountain, so whoever arrives on the spot first encounters the rear façade. It was probably part of a monastic complex. The dating of the church is uncertain. According to Paolo Orsi, a celebre historian and archaeologist, it dates back to the second half of the 11th century; for others the building dates back to the 12th century and for others to the Norman era. The abbey of Tridetti is mentioned for the first time in 1060 when Count Ruggero d'Altavilla ordered the assignment of part of the abbey's income to the Chapter of Bova.
According to some sources, in the eighth century the Byzantine monks built a church which they called St Maria del Tridente (trident), which later became Tridetti in jargon. More recent studies, however, state that the name derives from the Greek "tridaction" which means three fingers [2]. The reference is to the raised hand of Jesus who blesses with the three fingers, as is often seen in Byzantine iconography.
The church has a basilica plan with three naves which correspond to three apses, a central one with three windows and two lateral ones each having a single window. The roof was wooden, a dome surmounted the central apse and the cross vaults were positioned on the side rooms. Various Islamic and Byzantine cultural references can be recognized, especially in the dome, in the pointed arches of the naves and in the decorative elements. Four pillars supported the roof trusses. These are supported by semi-columns with discs, which are even found in the corners of the central apse. The columns are surmounted by Ionic bare capitals. Artistic and architectural analogies can be found in the church of St.Maria del Patir in Rossano and in the Church of St.Giovanni the Old in Bivongi.


Fig.10 St. Maria de Tridetti Church (Ph.D.Mediati)

4. Tourist-cultural itineraries

The identity elements of the Grecanic area, the richness and variety of the landscapes of the Aspromonte southern front, the numerous architectural features and in particular those of ancient Greek roots, the unique villages scattered in an impervious area, represent elements of strong tourist appeal. It is affirming today the awareness that such a heritage should not be lost, rather it should be preserved and enhanced; the inland areas of Calabria are extraordinary resources that deserve attention and can contribute to an eco-sustainable development of the local economy. The Grecanic Area can be an important paradigm, provided that non-invasive and non-disruptive forms of restoration and recovery are activated of the historical and monumental value of the local assets. The charm of the places also lies in the production of native goods, of plant and animal origin, goods often given away by nature, from typical wild plants, which are being rediscovered thanks to the initiative of associations, cooperatives, small local businesses. More can be done, but political determination is also needed to support the territories. In this sense, it is also necessary to promote accessibility to places, but with a view to environmental sustainability [3, 4, 5]. There is no need to build relevant infrastructures, to resort to concrete, to facilitate the race, to upset the places. Instead, it is a question of providing for a careful maintenance of the existing road system, including in this system also the often forgotten network of trails, to favour slow, active mobility, useful for the enjoyment of the places through all the human senses. A mobility that helps to recreate harmony of the soul, to give peace, to live in close contact with nature and with ancient history. A mobility in which the usefulness is not saving time, but feeling alive and serene, stopping to admire a landscape, a tree, a butterfly, a prickly pear plant, a broom bush or a twig of wild oregano, perceiving odors, aromas, flavors unknown to most.

To this end, territorial accessibility, the enhancement of cultural heritage and tourist usability can be favoured by two types of visits to the Grecanic Area, one slow, focused on walking along ancient trails, the other easier with motorized vehicles on sea-mountain routes, but with a "last mile" on foot.

4.1 Accessibility through sea-mountain routes

Access to the Grecanic area can take place through a series of road routes leaving the SS 106 which runs along the Ionian coast (Fig.11). From Reggio Calabria the most distant coastal town is Brancaleone, located about 60 km away. Seven sea-mountain itineraries are proposed, in sequence; the viability is generally modest and sometimes even bumpy; the winding course and the slopes do not allow high speeds and in some cases require a certain driving skill. There are also transversal mountain connections, but they are not advisable, due to the poor quality of the infrastructures and

safety limits; on the other hand, these are very demanding, long and uncompetitive connections with sea-mountain roads.
The first recommended itinerary is inside Motta St.Giovanni municipality; from the hamlet of Lazzaro you reach the Motta city (8.6 km); then continue to the village of St.Basilio (2.5 km) and take a branch to the Castle of St.Aniceto, achieving the base of the cliff after 3 km. A total travel time of 40 minutes is estimated. Of course, the last stretch must be covered on foot and uphill. The second route starts from the SS 106 at Annà, a hamlet of Melito P.S., and extends for about 10 km up to Montebello Ionico; continuing along the provincial road for another 2 km it can reach the hamlet of Fossato, where is located the Piromallo Castle. Overall, half an hour of travel is required. The third itinerary winds for about 5 km from Annà to Pentedattilo and takes 15 minutes by car; the village can be reached on foot in a few minutes. From Condofuri Marina (Fork St.Carlo) the fourth itinerary departs towards Amendolea; 8.1 km and 20 minutes on the edge of the suggestive and wide torrent of Amendolea which is crossed by a bridge just downstream of the hamlet of Rodì. To reach Gallicianò it is necessary to return to the provincial road, re-crossing the bridge and from Rodì continue in the direction of the mountain along the river for 3.7 km, crossing the stream at the height of the Carcara village, then travel another 7 km of winding road on the mountainside; this second stage takes about 40 minutes by car and the whole itinerary, net of stops, takes about an hour. The fifth itinerary branches off from the SS 106 to the west of Bova Marina and extends upstream to Bova for about 12 km and a 20-minutes ride. A path similar to the previous one connects Palizzi Marina to Palizzi, sixth itinerary; even if the distance appears shorter as the crow flies, the road follows a more troubled course from a plane-altimetric point of view and covering 10 km takes about half an hour. The last itinerary, the seventh, always departs from the Ionian SS 106, at Brancaleone Marina and extends for 12 km; only the final stretch, of about 2 km, appears more challenging, with accentuated curves and slopes; overall, it takes about 25 minutes to travel.
Overall, the comb network extends for about 170 km (considering round trip) and the travel time, excluding stops, is of the order of 5 hours. Obviously, the tour could not be completed in one day; it requires at least three days of travel, considering the times for site visits, refreshments and night rest. A week-long stay would certainly be preferable.

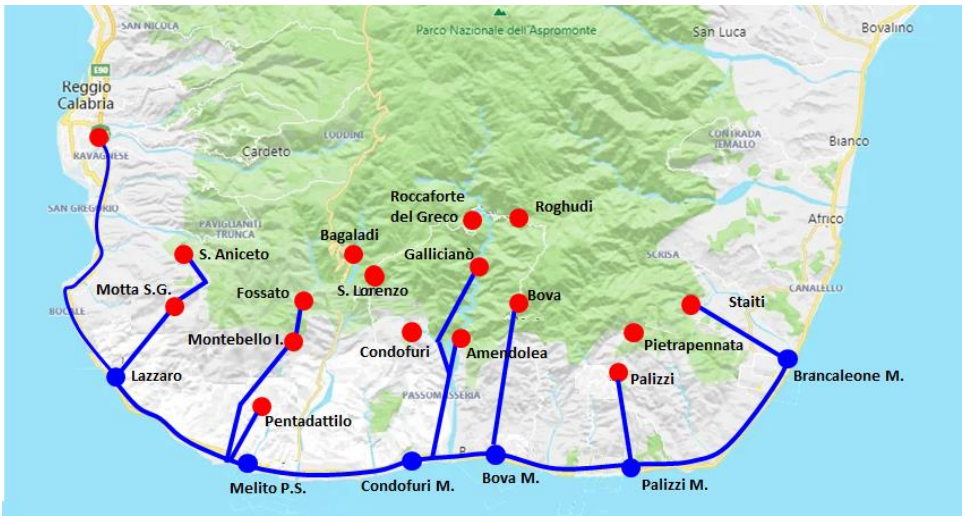

Fig.11 Itineraries sea-mountain access to the Grecanic Area

4.2 Accessibility through walking routes. The Trail of English

The Trail is so named in homage to the English writer and traveller Edward Lear, who walked it in the summer of 1847, leaving testimony of it in a writing accompanied by graphic illustrations published in London in 1852 [6]. It is proposed by some local associations as a week-long trekking route (Fig.12) immersed in wild landscapes in the Grecanic area. Walking among rivers, olive groves, bergamot plants and prickly pears, it is possible discover the most beautiful corners of the Aspromonte National Park, as well as numerous signs of the history and culture of Greek Calabria.
The itinerary is about 75 km long; it is divided into daily stages of variable length between 4 and 15 km and duration between 2 and 6 hours. It starts from Prastarà di Masella in the Municipality of Montebello Ionico, where a stele dedicated to E.Lear is placed, and crosses the villages of Pentedattilo (257 m), Bagaladi (475 m), St.Lorenzo (787m), St. Pantaleone (550 m), Amendolea (145 m) dominated by a hill on which lie the ruins of the Old Amendolea and the castle of the Ruffo family. Going upstream, on a 5.6 km branch, you can reach the ancient village of Gallicianò (613 m). From Amendolea continue towards Bova (820 m); from here it is possible to reach the characteristic and abandoned village of Roghudi Vecchio (607 m) through a path towards the high Aspromonte which is

about 12 km long. Back on Bova the trail continue, crossing the hamlet Licofossi towards Palizzi (272 m); and the last stage is Staiti (550 m), passing through Pietrapennata village (673 m).
With all due rigor historical, it is well to clarify that Lear's journey lasted 40 days and touched numerous villages in the inland of the current Reggio Calabria province of in the summer of 1847; in the Grecanic area, the journey took place on foot from Reggio Calabria to Staiti in a first phase, through Motta St.Giovanni, Bagaladi, St.Lorenzo, Condofuri, Amendolea, Bova, Palizzi, Pietrapennata and Staiti (29th July - August 8th); later (first 2 days of September) Lear reached Melito in a carriage, then continued on foot towards Pentedattilo, Montebello, Fossato, St.Aniceto, then returning to Reggio following an internal path upstream of Motta St.Giovanni.

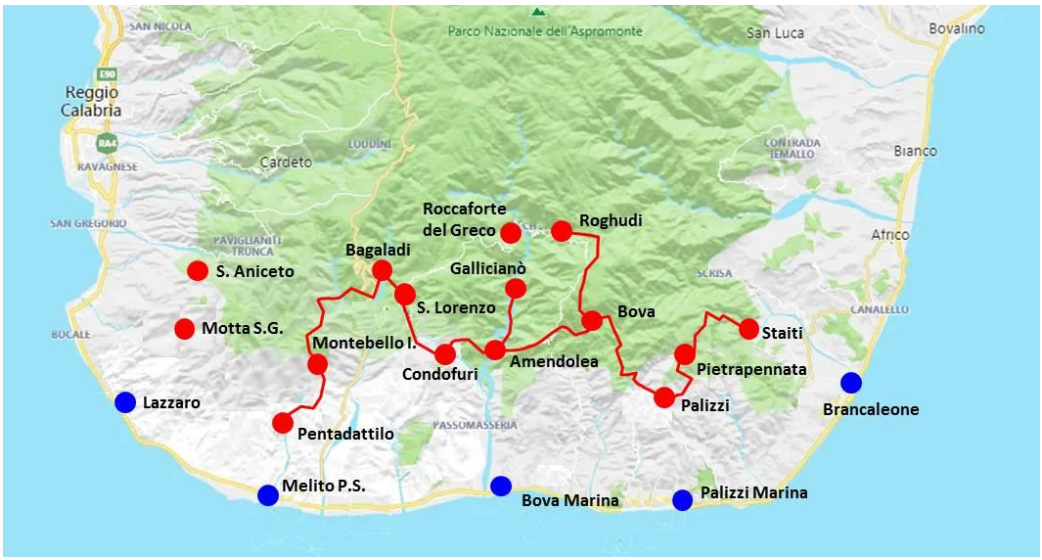

Fig.12 The trail of English

5. Conclusions

The Grecanic Area, in Calabria, is characterized by some unique identity elements. There are significant traces of a historical-cultural nature of Greek origin that substantially date back to two different historical periods, one relating to the colonization of the territory by communities from Greece (Magna Graecia period, first centuries b.C.), a second linked to the Byzantine presence, between the sixth and eleventh centuries. Attention is focused in particular on some buildings of historical-monumental value located in the old hilltop villages, highlighting their historical and architectural connotations. Identity elements, architectural emergencies, extraordinary natural environment, local culture can represent solid bases through which to fully express the potential of the sites in a tourist key; to this end, interesting itineraries are proposed for the use of these opportunities. In particular, a path for hikers, at a slow walking pace, along ancient trails, to live atmospheres and experiences that ancient travellers had already brought to light. Edward Lear in his "Diary of a journey on foot", dated 1847, thus describes one of the sites reached: "…*Pietrapennata has nothing remarkable, but, from above, immediately above it, one of the most stupendous panoramas. What isolated and extraordinary rifts! What breadth and depth of the densest wood! What soft and graceful lines on the horizon, with the blue expanse of the sea and the long plains on the eastern side of Italy! .. Oh, rare woods of Pietrapennata! I don't remember seeing a more beautiful place ... wherever you go, it will be very difficult to find another Pietrapennata…".*

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Virtual Enviroment for an Inclusive Heritage

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Abstract
The Virtual Reality systems are showing their potential for inclusive access to the heritage and, recently, they are playing a strategic role to keep the public attention alive on the cultural and historical places. The VR, therefore, allows anyone to overcome the barriers related to physical presence and, at the same time, has a positive impact on social equality and inclusion. Actually, the barriers to the knowledge fruition are more than commonly people believe, and concern not only physical aspects, but also sensorial, cognitive, social impairments and so on. Because of the Covid emergency, heritage accessibility is now a widely debated issue, influencing the huge growth of virtual tours. But, frequently, these applications don't take into account the specific needs of frailer users. Referring to autism, for example, the perceptual overstimulation given by the surrounding space, can be a barrier in the "real" world as well as in the "virtual" one. The visual overload, in fact, provides painful sensations, thus complicating the relationship with the architectural environment. If correctly designed and customized, the figurative configuration of VR can represent a useful medium conveying the right visual codes and the essential information for communicating the heritage's cultural contents. My study analyzes the visual patterns of virtual spaces, to show the way a VR environment can turn into an inclusive and communicative "autism-friendly" space.

Keywords: Heritage, Autism (ASD), Inclusion, Virtual Reality (VR), Representation.

1. Introduction
Recently the Health emergency and the quarantine have increased the development of virtual experiences expanding the scope of the involved disciplines. The potential of VR to overcome physical barriers makes it, today, a useful tool to prevent the withdrawal of the heritage in a so complicated period. Anyway, the use of VR is not enough to widely convey the cultural contents of the heritage with inclusive effectiveness; it is necessary to take into account the whole rich system of tools that builds the relation between man and machine. VR is an incredible complex "world" where technological and human aspects interplay so offering incredible mediating potential but, if badly designed, it fails its communicative target with the opposite result of providing sickness and frustration. Sometimes sensationalism and technologies become priorities at the expense of the human factors, affecting the VR design and the narrative value of the communication. We need to consider that each virtual environment is, first of all, a drawn space, therefore what we see during an immersive experience results from a graphic process, turning the information coming from the physical space into figurative codes. Therefore, the effectiveness of the VR depends, primarily, on the right management of the drawing language because it has the potential to empower each visual input, providing targeted and customized communication. For this reason, the drawing disciplines can build the essential bridge to manage the VR design in a "multidisciplinary" and "systemic" logic, providing useful guidelines for setting spatial layouts and visual inputs. This issue is a crucial aspect when our aim is providing an inclusive experience accessible to everyone also to fragile people as one with perceptual impairments; for example the autistics (ASD). Since the difficulties involving the autistic clinical frame are connected especially to perception deficiency, the VR can become a valid support and a safe space where learning experiences can be approached without the in vivo situation limits. Cultural heritage, for example, museums or archeological sites, often are uncomfortable spaces for autistic people,

because they can provide overstimulation of senses, becoming a painful and stressful experience for people with hypersensitivity. Most researches investigate the relation between autism and VR aiming at improving life skills, but rarely the academic studies focus on human aspects, particularly on visual perception involved in a VR experience, in order to understand how to enhance communication and knowledge of the space. Even if several disciplines are involved in this field of study, the lack of the drawing disciplines influences the experiments set up, where frequently the virtual environment is derived by the gaming world, therefore, without customization options. The present analysis aims to explore the drawing of virtual environments as a source of figurative codes helping the interpretation of the architectural space. Understanding which graphic actions help the reading of the space in the atypical development, will support the evolution of operative tools useful in designing inclusive virtual spaces for the Heritage communication.

2. VR and Autism

2.2 ASD perceptual aspects

The complex characteristics of autistic people's perception are difficult to summarize in a short description. Frequently, experimentations on ASD perceptual responses reveal contradictory results, leading to opposite assumptions. According to Delacato (1974), we refer ASD to Hyper and Hypo sensitivity [10]. The first condition is associated with the need to process too much information, due to the extreme sensibility of sensorial channels; the second concerns, at the opposite, a low sensorial sensibility, that seems to inhibit the reception of the environmental input. Both are strongly influenced by the environment which can become supportive in transmitting the right spatial information or, at the same time, providing dysfunctional sensations in the case of over or ipo stimulation. In fact, many subjects with ASD, are not always able to effectively and consciously adapt themselves to the context in which they are, probably due to an altered sensory integration. Despite the visual system is not impaired in autism, the perceptual incoherence leads to sensorial agnosia that may hinder the ability to fully understand figurative signs of the environment in semantic terms [5]. This results in the perceptual impairment of the main senses and deficits in executive functions, with alteration of cognitive processes (such as concentration, planning, attention) and general difficulty of interaction and control of the environment. Generally, people use to sum up the information coming from the space relying on previous experiences, but not the ASD people, who may lean to a literal perception, without filters or influences by the acquired knowledge [5]. Therefore the autism often implies a preference for perceptual details «and relative failure to extract meaning or “see the big picture”» [9] The failure to extract global form is influenced by the lacking integration of the local stimuli and by the low influence of visual experience [5], as usual. These problems can influence the relationship with the architectural space that can be misunderstood at the point to provide hyper-hypo stimulation with sickness and painful sensation.

2.3 Virtual Reality (VR) for Heritage and Inclusion

The variables related to the idea of “ability” depend on the person, as well as on space’s features he interacts with. Therefore, the space can be a “support” or a “barrier”, not only in terms of “presence”, but also in terms of “deficiencies” [22]. The IFC document, (the OMS International Classification of Functioning) states that the disability is the result of a complex relationship between the health human condition, the individual characteristics on the one hand and the environmental factors (that means life conditions) on the other hand [22]. An environment with barriers or without facilities limits human performances, therefore society can take actions enabling the space in supporting human skills. Particularly in neurological impairments, the interaction with space can be relevant in enhancing social and cultural skills; conveying comfort and safe sensations it can ease the learning process and the self-awareness, frequently lacking in autism. Since people experience the world through their senses, the perceptual modalities strongly influence the interpretation of the surrounding environment. Therefore, when the aim is designing an inclusive “physical” or “virtual” experience we first should take into account the user needs and his personal answer to inputs provided by the space. However, customization is difficult to realize in physical space, particularly if we refer to the heritage often characterized by complex spatial layout and rich decorations that obviously can’t be removed. Referring to specific autistic clinical frames, with perceptual impairment, cultural heritage, for example museums or archeological sites, often are uncomfortable spaces, because they can provide overstimulation of senses, becoming a painful and stressful experience for people with hypersensitivity. Generally, historical and cultural sites provide a sensorial and cognitive overload, first of all for their generic setup and public dimensions that make them chaotic and noisy places. The in vivo tours, often, are too long, repetitive and set on different floors, at the same time, the exhibition rooms can be too large, poorly lit and full of different objects, housed with a low sensorial and cognitive usability [4]. The VR can’t replace the in vivo experience, but it can provide a useful support to enhance the relationship with the physical environment; it can become a medium between the individual perceptual modalities and the complexity of the external world. Its strengths are numerous:

the chance of customization, the answers monitoring, the potential of translating verbal or abstract concepts into graphics, the gradual integration of stimuli and so on. The incredible flexibility of VR makes it the most powerful tool able to mediate the physical space, so allowing everyone inclusive accessibility to the heritage. Through a selected and customized setting of visual input provided in VR is possible to support the user's translation of spatial codes helping his understanding of the surrounding environment and his comfort sense.
However, observing the physical architecture is not the same that watching its image; the visual message of an image is twice summed and translated, early by the designer, then by the user who needs to decode the graphic signs and read them as physical spatial elements. Such process is complicated by multiple individual aspects acting at the unconscious level depending on cultural influence or perceptual impairments. Even if the virtual environments involve a graphic process, they differ from the common images. The differences are fundamental: the VR turns the "observed" environment into a "lived" one where the "space is image" [17]. Here the narration can't develop without action by the viewer. When the perceptual experience involves the motion, even limited, integrated cognitive process interplay, involving not only the sight but also the motion receptors as aptic and vestibular apparatus (depending on the system complexity). Rotating the head, instead of moving the body, is enough for grasping a whole scene exceeding the human visual field and, therefore, for activating the perceptual process in multisensory mode [27]. An example is provided by 360 degrees images, frequently used in virtual reality (fig.1). This way, we turn from "sighting" to "navigating", where the visual frame has no contours and the space becomes a place to explore in the first person. Nevertheless, VR is a simulation and, therefore, as well as any other graphic representation, the designer has the main role in conveying, preventing or enhancing the cognitive process driving the understanding of the space and the translation of its figurative codes. In the majority of the cases, everything in a simulated environment has a specific role; when each detail, as shapes and aesthetic characteristics, is chosen for specific aims, the VR can become a communicative tool [26]. For this reason, the design must be "user-centered", deeply analyzing the perceptual answer to the system's inputs. Exploring the human perceptual answer to the VR, allows the selection of the information to convey, providing an immersive environment effectively communicating its contents. In fact, virtual reality involves the visual process in a new way, that differs from the observation of reality [13] as well as of any traditional picture or computer screen.

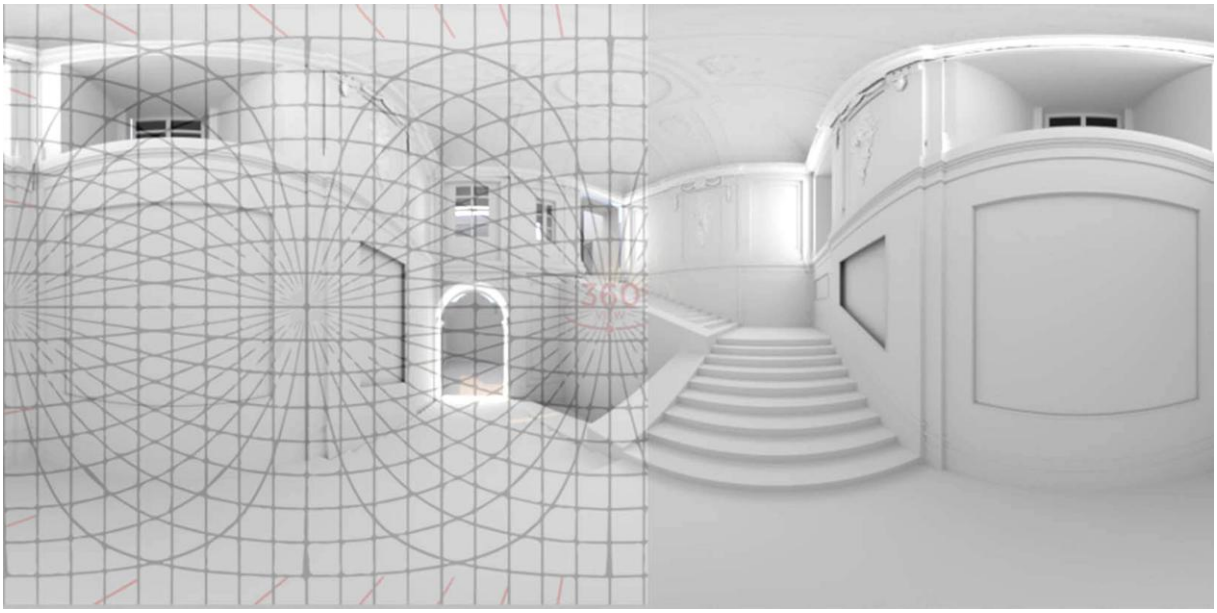

Fig. 1: Example of a 360 rendering. Frame from an autism-friendly VR tool prototype

3. The Human Centered VR design

3.1 Visual analysis of virtual space for autism

On the basis of a literature review, particularly focused on studies reporting ASD users' feedback to different types of images, some basic aspects of an autism-friendly virtual design have been deduced. The critical evaluation of the virtual applications employed for autism starts from the point of view of the drawing disciplines, analyzing the spatial clues that influence the perceptual interpretation of a virtual space. In the last twenty-five years, the rapid development of virtual reality technology has

improved the research about VR and Autism opening new disciplinary frontiers. The majority of the researches investigate four fields of applications:
Usability tests: valuating ASD users' answers.
Life Skills: learning of basic competencies useful in daily life.
Social skills: understanding of social situations.
Special education: VR application in schools environment, mainly for language learning.
Almost all of them use applications from the gaming world, without customizing perceptual inputs on autism needs. The majority of research, in fact, points out psychological and technical aspects without considering visual factors involved in the interaction between autistic people and VR. Some of the observed studies are visually overloaded and unfitted to the cognitive needs of ASD people.
In 2015 Nigel Newbutt, researcher in Digital Education, publishes an experiment testing the effectiveness of HMD helmets for ASD [23]. A color photo shows a frame of a virtual café from a subjective point of view while the avatar looks toward the user (fig.2.1). The chosen point of view aims to support the full subjectivity of the visual experience that, in autism, is highly important to enhance the sense of presence. In neurotypical development people, self-awareness, at the cognitive level, is based on integrated sensorial signs conveyed through various modalities and giving us the consciousness of being inside our body. Thanks to this awareness we live the world through a subjective perspective and we can manage our movements as well as the reaction to the stimulus [21]. In ASD people proprioception and vestibular impairments trigger low awareness about their body, therefore, giving the human height to the point of view, provides a familiar appearance to the framework improving the sense of presence and the willingness toward the virtual experience. Despite in Newbutt's experiment the sense of presence is well provided by the subjective point of view, some environmental features could affect the right interpretation of the space for ASD users. For example, the room is strongly characterized by colored and marked textures that can blur the spatial layout providing sensorial overstimulation. Considering the common autistic disposition to not filter the environmental inputs, each detail, even if irrelevant, can become an attraction diverting the attention from the main task. In the virtual café the gridded texture of the floor, with strong chromatic contrasts, produces a kinetic effect while, switching from light squares to dark ones, causes a fragmentation of the perceived image where the back elements appear like moving objects on the white background (fig.2.2-2.3). Particularly for people with perceptual impairments, visual dynamism can provide confusion and feelings of stress. However, if well managed, textures and colors can ease the wayfinding, giving information about relative distances and position in the space.

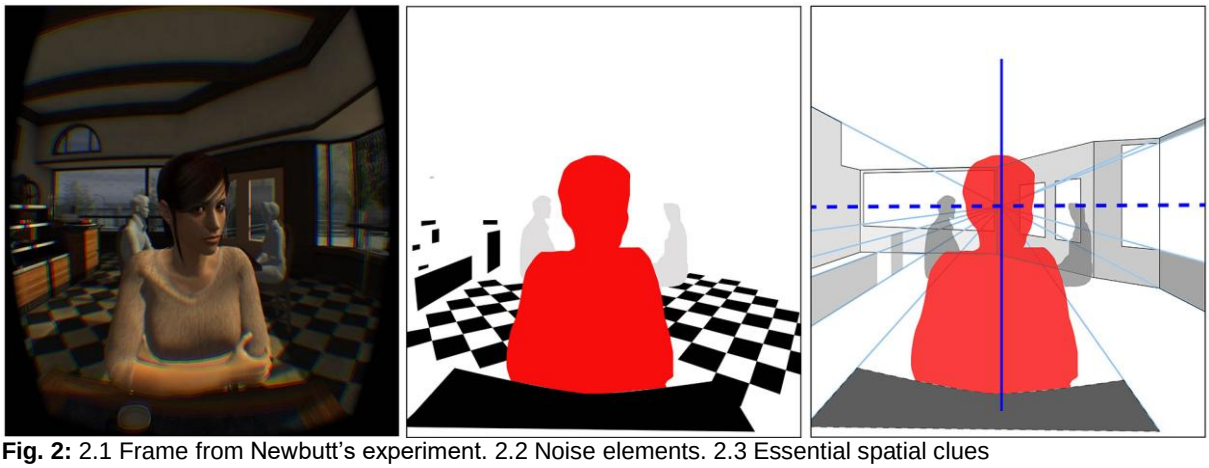

Fig. 2: 2.1 Frame from Newbutt's experiment. 2.2 Noise elements. 2.3 Essential spatial clues

Some published photos show the virtual layout set in 2002 by the VIRART team for an experiment with ASD people aimed to enhance social skills [8]. A grid pattern, with a unique neutral color, characterizes the floor, and the whole configuration is extremely schematic, without strong chromatic contrasts (fig.3). Here the floor pattern, lacking in superfluous inputs, works as a reference of space coordinates helping the orientation in the room. Moreover, the deformation of the squares contour lines provides a depth clue enhancing the tridimensional view, sometimes hard to perceive for autistics [5]. Arnheim explains that the deformation is the key factor for the perspective perception because it reduces the simplicity and increases the tension in the visual field, causing the need for simplification to reduce tensions; this need can be satisfied by transferring the shape in the third dimension [2]. In the VIRART's experiment, the researchers act on more than one factor to improve the user spatial relations, taking into account the autistics proprioception impairments and the difficulties in perceiving the physical size of their own body as well as their avatar dimensions [8]. First of all, they change the frame so that it's possible to see part of the avatar's arms, this way adding visual information about the

virtual body placement and the objects it grasps. Moreover, using a wide-angle lens of 28mm the visual frame appears larger than effective avoiding knocks with objects while moving the avatar. In spite of the effective perceptual solution in a virtual environment, we can suppose that, such deformation of spatial ratio, could provide discomfort if the VR aims to anticipate an in vivo experience because of the comparison between the virtual and the real space. Other perceptual aids for the understanding of the space are: the simple geometries, the use of few colors and objects and the subjective point of view that confers a familiar perspective to the sight (fig.4). Therefore the team VIRART points out the essentiality, providing few visual inputs in order to avoid distraction from the main task.

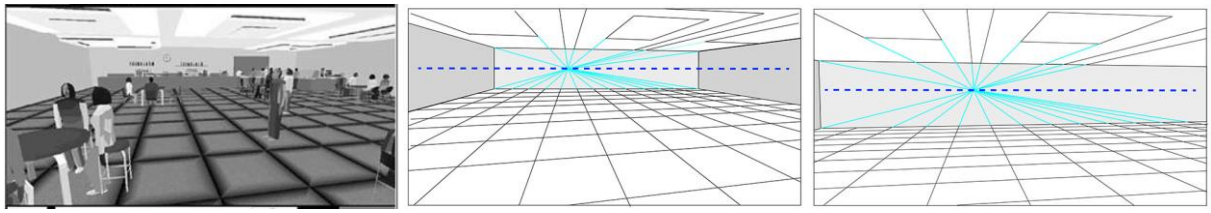

Fig. 3: 3.1 Frame from VIRART's experiment. 3.2 Spatial scheme with 28mm lens length. 3.3 Spatial scheme with 50mm lens length

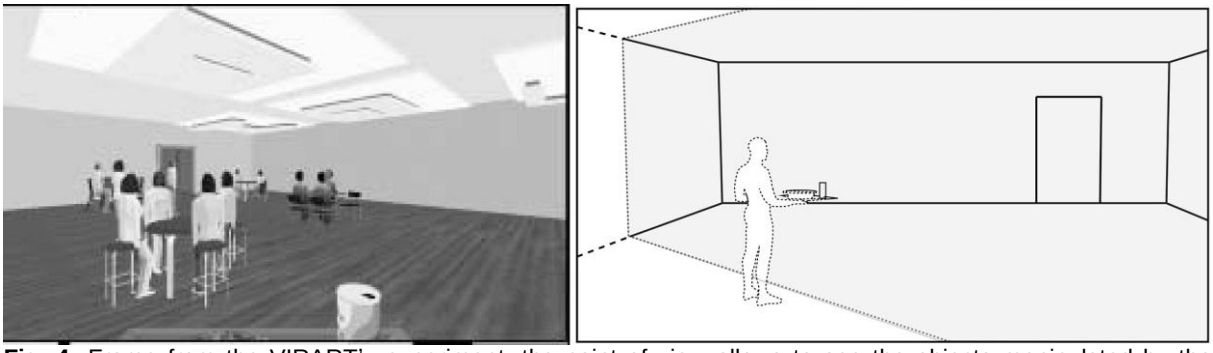

Fig. 4: Frame from the VIRART's experiment; the point of view allows to see the objects manipulated by the avatar

In 2010, a study from Illinois University, shows the importance of illumination in a pedagogic process for autistic people. The research observes that the learning abilities improve depending on the realism of virtual reality scenes. This occurs when the local illumination is added to the global illumination [12] creating shadows, reflection effects and, at the same time, smoothing the borders. The researchers relate the efficacy of this illumination setting to its ability in supporting the sense of presence and immersion; these aspects, in turn, solicit the attention on the educational targets. The global illumination, helps the familiarity of a scene, improving comfort and, at the same time, enhancing the user's willingness to his task [12]. In recent years, one of the applications more used for pedagogical and social integration aims is *Second Life*, because of its immersive and communicative potential. An example is the research lead by Alba Realpe in 2019 with therapeutic purposes for ASD people. Here the reading of the layouts is enhanced by luminous effects that shape the volumes through sharp contrasts between light and dark. However, this solution is not fitted for all users. Zimmons shows that, on the one hand, more sophisticated shadows improve the reading of spatial layout, on the other hand, it provides an increase of information that needs to be processed, sometimes growing the time spent for a task. The shadows confer naturality and familiarity to the scene, helping the conveying of the information about the space and the objects but, if too much marked, they can become a target for an autistic person. Strongly defined shadows could divert attention from the main topics. Moreover, observing some experiment's frames we can notice as, using a gaming tool, allows to take different points of view even if not subjective (as, for example, the top-down perspective) (fig.5). This option could be unfitted for autistic people who could be disoriented by an unreal visualization because of their frequent abstraction impairments.

3.1 Guidelines for application

The comparison between the spatial analysis of some photos published in scientific literature reporting ASD users' feedback to VR systems and the perceptual characteristics of autism, has been useful to deduct some basic aspects of an autism-friendly VR design in order to define guidelines for application.

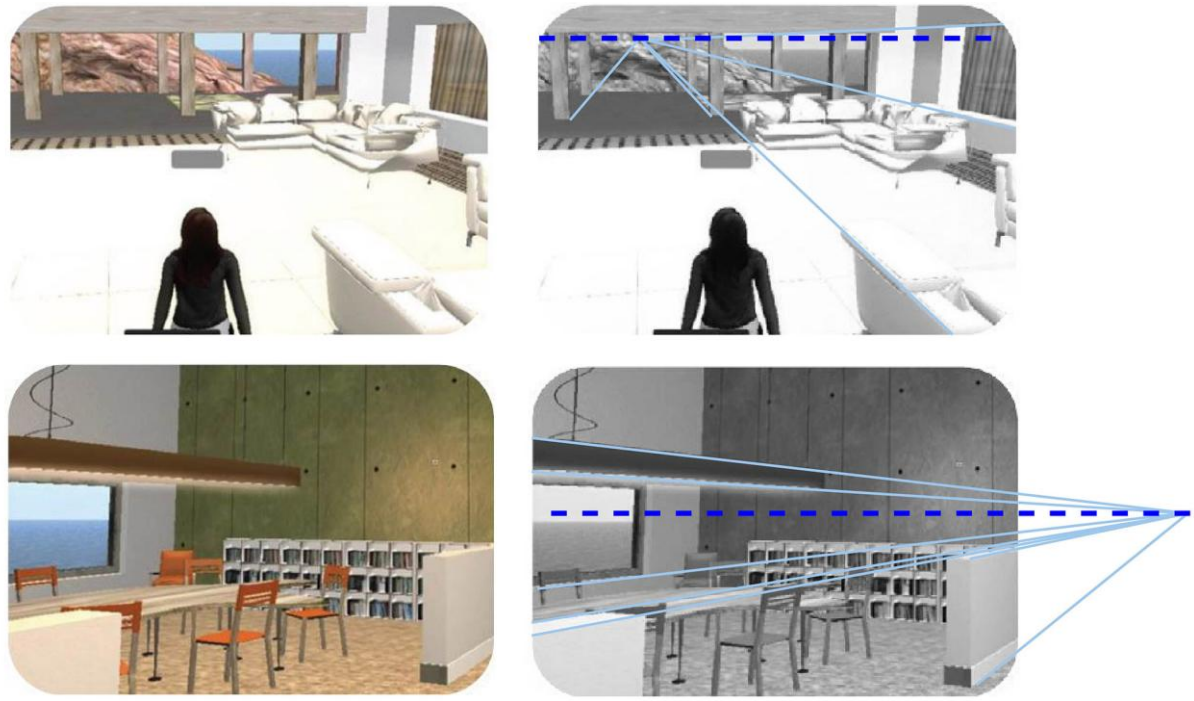

Fig. 5: Frame from Realpe's experiment showing different points of view.

Physical aspects: The navigation modality is a fundamental aspect in the understanding of space and for reduce motion sickness. Continuous navigation is more suitable for autistic people than point and teleport, because it helps the wayfinding, by creating relations between figurative elements of the spatial framework. A natural frame, with an egocentric point of view, is essential for improving comfort and immersion in ASD people. In fact, considering their abstraction impairment, autistics could be stressed and disoriented by an unreal visualization, like a top or bottom view. Objects in a virtual environment play the same role in creating awareness of being there, therefore they should behave in a realistic way, without floating in the space or showing unreal distances. Similarly, observing the arms and legs of the avatar's body helps their sense of presence and their difficulties with proprioception [27].

Perceptual and emotional aspects: Some spatial characteristics can provide overstimulation and stress, while others can enhance the comfort and the understanding of the environment. The configuration of clear spatial borders is important to provide a visual reference for displacement and orientation. Figurative guidelines for motion can also work as a tutor for navigation. Often, autistic people have difficulties evaluating dimensions, distances, shapes, deep sense [2], therefore, simple and clear spatial frameworks help users to create their own idea about the virtual world and its position inside it. For this reason, the spatial elements have to be designed in order to give information about depth and distances with specific shade aspects and textures. Breaking space continuity with sensorial rest and deleting the perceptual inputs during the transition between the different scenes, are also useful. Moreover, different functions have to be highlighted by different visual characterizations, like colors or textures, in order to strengthen their role. The comforting sense in ASD people generally increases in recognizable and familiar spaces, while new experiences can be a reason for stress [27].

Cognitive aspects: Simple frameworks with low sensorial stimulation (few colors and textures only to underlines visual targets) create a comfortable environment for learning reducing pain soliciting the perceptual system [5]. The stimuli can be introduced gradually giving time, to the user, to adapt and take confidence in the previous configuration. Instructions for navigation and training need to be few and clear, preferring images, while targets have to be highlighted by simple or bright colors [29]. Too much light can intensify the perceptual load providing overstimulation, whereas a soft illumination creates a neutral background with low contrast and soft colors communicating a sense of comfort. The main problems are related to abstract concepts since the most common impairment in ASD people is the lack of imagination and abstraction. Referring to these, the use of complex and unusual virtual objects is totally superfluous because they couldn't contribute to understanding the space, worsening the sensory weight.

4. Conclusions

The research focuses on the spatial representation of VR in order to provide a new reading of the virtual tools for the communication of the heritage in terms of inclusion and perceptual support for the ASD people. Even if today the focus on disability is growing, the difficulties involving the neurological impairments complicate the realization of specific and customizable interventions. Particularly the historical sites are not flexible spaces where the exhibitions don't take into account the individual perceptual-cognitive users' needs. The VR, without the physical constraints of the in vivo experience, has no limits to the free setting of its expressive apparatus. Since the reading of the architectural space depends on the right conveying of its spatial features, as depth, perspective, sizes, distances, the drawing discipline can provide a useful guide to well manage the figurative language of a virtual environment. Especially when the perceptual system is impaired, selecting the essential information and visual inputs coming from the surrounding background, can support the understanding of the space, improving the self-awareness and the relationship with the "world". The present study aims to fill in the gap of literature about VR and ASD perceptual answers, but more future researches are needed to find the right mediation between technological and human factors. Thanks to observation of special behaviors, in terms of perception and cognition, we can identify and select the stimuli that a VR tool can gradually provide with regard to user needs and learning targets. The autism-friendly design guidelines described in the present analysis represent a starting point for an inclusive process where the heritage becomes the communicative medium, not only for the content housed in the building, but for the architecture itself as the subject of narration. This way, the relationship with space could enhance human abilities by improving knowledge for non-neurotypical people as well as for anybody else.

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THE PROMOTION OF ENERGY TRANSITION IN VIEW OF URBAN REGENERATION: TOWARDS A PERSPECTIVE OF SUSTAINABILITY[1]

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Abstract

The work examines some of the legal problems that may hinder the full development of the energy transition process in Italy by focusing on the discontinuity of the transposition of European policies and the lack of unified action. On the basis of these premises, this paper addresses the issue of energy regeneration in light of the more modern concept of urban regeneration, in terms of consolidating a link, which until now seems to have remained in the background, between regeneration (social, economic, environmental) of a territory and energy policies. In this context, local authorities could play a central role: on the one hand, as holders of the main planning powers in the field of urban regeneration and, on the other, by strengthening the direction outlined by the Covenant of Mayors, promoted by the European Commission, which provides for the accession of municipalities to a number of commitments, including the adoption of a Sustainable Energy Action Plan (SEAP).

Keywords: energy transition - urban regeneration - sustainable development - local government

1. The "energy transition" process: address lines

From an overall look at the international policies of the energy transition [2], it is possible to identify three main outlines: eliminate dependence on fossil fuels, through the promotion of renewable energy sources [3]; improve energy efficiency [4]; develop technologies for the provision of energy services [5].

The connection between these different approaches, consolidated within international climate policies [6], is further reinforced by international sustainable development policies. In this scenario, the holistic approach to the energy issue applied by UN's Agenda 2030, action programme for people, planet and prosperity, deserves particular attention [7]: *goal* 7 (Ensure access to affordable reliable sustainable and modern energy for all) sets the goal, by 2030, to significantly increase the share of renewable energy in the global energy mix (*target* 7.2.); in addition, it proposes to strengthen international cooperation to facilitate access to clean energy technology and research, (*target* 7.a); *goal* 11 (make cities and human

selltements inclusive, safe, resilient and sustainable cities and communities) specifies the aim of substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters (*target* 11. b). *Goal* 12 (Ensure sustainable consumption and production patterns), pays particular attention to the goal of ensuring sustainable production and consumption models (*target* 12.2.).

The European scenario is coherent with the international energy policies and is based on a complex reform program, aimed, on the one hand, at simplifying the procedures for building plants powered by renewable energy, so as to direct the public administration's action in an efficient way and, at the same time, encouraging any private initiatives; on the other, the adoption of appropriate incentive instruments aimed at facilitating the spread of renewable energies [8].

The development of the energy transition process, in light of the modern approach applied by international and european policies, requires the refounding of sectoral regulations of each individual State, also considering the particularity of legal tools of production and consumption of energy.

2.Changes in legislation and lack of a unified perspective for action. The ineffectiveness of the "Italian model"

The Italian legal system is intermittently complied with obligations under international and European law, which are strongly in favour of a significant acceleration of the energy transition process, through a number of unrelated rules and, on some occasions, exclusively limited to the restricted areas of tools for which they were designed [9].

The regulatory framework of the sector is still incomplete, even considering that the italian transposition of European directives on the promotion of renewable energy has been characterized by controversy and repeated changes of direction.

The basic state legislation is now constituted by Legislative Decree No 387/2003, concerning the "Implementation of Directive 2001/77/EC on the promotion of electricity produced from renewable energy sources in the internal electricity market" which has long been devoid of the essential additional element represented by the "guidelines", adopted only in 2010 (ministerial decree on 10 September 2010), as well as Legislative Decree No. 28/2011, transposing Directive 2009/28/EC, on the "Implementation of Directive 2001/77/EC on the promotion of electricity produced from renewable energy sources in the internal electricity market" [10].

Some recent innovations were also introduced by new measures taken on order to address pandemic concerns.

Part of the Decree Law No. 34/2020, the so called "decree relaunch", concerns the incentives for energy efficiency (article 119); part of the Decree Law No. 76/2020, c.d. "simplification decree" concerns simplified procedures of renewable energy sources and energy as well as some special measures for the application National Integrated Plan for Energy and Climate. Subsequently, the Guidelines for the definition of the "National Plan of Recovery and Resilience" (post-pandemic) of 15 Seprember 2020 outlines the objective concerning the processes of "green revolution and ecological transition" and plans for a "broad programme" of investments aimed to achieve the European-based objectives "starting from the lines outlined by the National Energy and Climate Plan" [11]

These measures have undoubtedly had the merit of demonstrating the legislator's significant attempt to address energy issues. From another point of view, however, there is no coordination, which is a necessary to achieve positive effects and avoid the opposite effect of negative mutual interference between actions.

Delays in the transposition of international and European energy policies, along with the lack of coordination between the various legislative interventions adopted inevitably contribute to increasing legal uncertainty [12], producing negative consequences on the stability of the subjective legal situations of the private individual and the public administration, with a possible multiplier effect of litigation.

A further consequence of these problems is the risk of a decrease in the level of effectiveness and efficiency of Italian energy policies in terms of the energy transition process, compared to the results

achieved by other countries. It may be interesting, for example, to give a brief account of the German and Danish experiences.

The German energy transition process is characterised by a strong sectoralisation of legislation. The general rules dealing with energy efficiency are accompanied by a substantial body of interventions dedicated to certain sectors that are considered strategic for the pursuit of the objectives of promoting renewable energies: the energy sector in buildings; transport; industry, trade and services. The results achieved in the energy transition process are overall considered to be positive, although some sectors, such as the energy efficiency of buildings, are considered more virtuous than others, such as transport [13]. The Danish energy transition process is seen as particularly virtuous in view of the positive effects of the sharing of long-term objectives by the different political groups and business realities operating in the energy sector. Implementation is guaranteed: by the use of the instrument of the "agreement on energy companies' energy savings effort" aimed at establishing certain general conditions that are not likely to be overturned on the basis of the change in political balances in parliament; the adoption of a package of measures seeking to promote the circulation of economic relations through the introduction of contractual instruments between public and private sectors with flexibility and the implementation of public incentives in support of electricity production [14].

3.Evolutionary perspectives: the energy transition process in light of the modern concept of urban regeneration. The framework of sustainability

Outlined, as a whole, the characteristics of the national energy transition process, the aims of this process and the factors that have not so far allowed for a full development of the same, will be interrogated the possibility of declining the topic under consideration in light of the most modern urban regeneration concept, with a view to consolidating the link between regeneration processes (social, economic, environmental) of a territory and energy policies.

It is known that "urban regeneration" is a phrase on the common meaning of which there is "broad generic sharing, although there is no single definition" [15]. In particular, the concept in question has now passed notions such as the urban and building "reuse" and "recovery" of the "built", that assume an eminently conservative connotation, being, instead, projected towards organic interventions of public relevance, through legal tools able to deal problems of physical degradation and socio-economic discomfort [16] of the territory and suitable to enhance local identities interacting with them [17]. Therefore, the theme of urban regeneration can be addressed not only as a notion related to land consumption and land safety, but also to the "quality" of the same as a "key" [18] for resolving the many problems, including economic problems, affecting urban agglomerations.

Firstly, it is necessary to examine whether the legal system contains "symptomatic spies" that also include energy regeneration strategies [fig. 1]; whether there can be a relationship between the two strategies or, on the contrary, whether these two strategies are not part of a single approach.

Some ideas in favour of the first hypothesis are offered, more than by state legislation, in the context of regional legislation, in which urban regeneration poses as a territorial government strategy, so as to become a general principle of territorial government, or as an alternative to land consumption [19].

In this scope, the Regional Law No. 24/2017 of the Emilia Romagna region (New Regional Urban Planning Law) is of interest because it is based on the "new values of the field": reuse; urban regeneration; sustainability understood not only as a changing definition of environmental constraints but as an expression of a harmonious combination of environmental resistance and quality of land use; the orderly relationship between the public and private sectors, in which the tasks, although distinct (and that of the former dominant), are complementary [20].

In a very similar way, the Regional Law No. 21/2008 of the Puglia region (Rules for urban regeneration) expressly concerns the promotion of the "regeneration of parts of cities and urban systems in line with municipal and intercommunal strategies aimed at improving the urban, housing, socio-economic, environmental and cultural conditions of human settlements and through intervention tools developed with the involvement of the inhabitants and public and private interested parties" [21].

Finally, regarding state legislation, it is interesting to recall the content of Legislative Decree No. 70/2011 ("European Semester - First urgent provisions for the economy"): article 5 (private building), although in

a generic way, remits the adoption of specific laws to the Regions, with the aims of “encouraging” the rationalization of the existing building stock and of promoting and facilitating the redevelopment of run-down urban areas with the presence of heterogeneous functions and disorganized or unfinished building fabrics as well as buildings for non-residential purposes decommissioned or in the process of being relocated, even considering “the need to promote the development of energy efficiency and renewable sources” (paragraph 9).

Even the Legislative Decree No. 32/2019, the so-called “unblock-construction decree”, would seem to apply this approach because, within the legal framework concerns urban regeneration subject, it also provides to take into account the need to promote the energy efficiency and renewable sources development (article 5).

It is worth noting that the draft law about “Measures for urban regeneration” (XVIII Legislature, Senate, n. 1131), submitted to the Italian Senate in 2019, aims to establish the general principles to identify the tasks of different institutional levels, the resources and incentives for interventions on urban areas characterized by a high urban housing degradation, environmental and socio-economic, specifies that urban regeneration pursues, among its objectives: reduce water and energy consumption through the efficiency of public networks and the redevelopment of the building heritage (article 1(2)(d)); promote high standards of water and energy efficiency of buildings in areas covered by urban rejection, the reduction of water and energy consumption and the widespread diffusion of the digital infrastructure (article 1(2)(l)). Furthermore, the draft law, with a view to adoption of the National Plan for urban regeneration, identifies, among the objectives of the Plan, the safety, maintenance and regeneration of the public and private building stock and the reduction of land consumption and energy and water waste of buildings.

The European scenario shows fundamental principles in favour of strengthening a link between urban regeneration and energy regeneration. Paying attention to the 1990 Green Paper on the urban environment and the Leipzig Charter of 2007 [22] and, above all, to the informal ministerial meeting on the declaration on urban development (Toledo, 2010) [23]. According to this document, Member State ministers recognised the importance of achieving the objectives set out in the Europe 2020 strategy.

Considering future challenges affecting cities, in their triple dimension of sustainability (economic, social, environmental), urban regeneration has been given “a truly strategic role to play in the future of urban development in Europe”. It states, in particular (point No 3) that urban regeneration is conceived as a "planned process" that must renew the traditional approach, in order to address serving the city as a whole and its parts as components of the entire urban organism, "with the aim of fully developing and balancing the complexity and diversity of urban, economic and urban structures, while stimulating greater environmental eco-efficiency".

It is also worth considering the “Territorial Agenda of the European Union 2020. Towards an Inclusive, Smart and Sustainable Europe of Diverse Regions” of 2011 [24], which in the paragraph dedicated to the theme of Climate change and environmental risks, states that climate change may also lead to new development opportunities in such as within agriculture, green economy and renewable energy production. The challenges of climate change draw attention to the territorial coordination of policies, especially climate, energy, water management, agriculture, housing, tourism and transport.

Finally, by shifting attention to international law, we cannot fail to recall the 2030 Agenda, whose “goals”, not by chance [25], also deal with urban regeneration, cities and land consumption. Specifically, particular attention deserves: *Goal* 9 (Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation), which aims to develop quality, reliable, sustainable and resilient infrastructure, including regional and cross-border infrastructure, to support economic development and human well-being, with a particular focus on the possibility of fair access for all (*target* 9.1.); *goal* 11 (Make cities and human ettlements inclusive, safe, resilient and sustainable), which includes, among others, the objectives of increasing inclusive and sustainable urbanisation and the capacity for participatory and integrated planning and management of human settlement in all countries (*target* 11.3), supporting the least developed countries, including through technical and financial assistance, in the construction of sustainable and resilient buildings using local materials (11.c); *goal* 12 (Ensure sustainable consumption and production patterns), which sets 2030 as the goal of achieving sustainable management and efficient use of natural resources (target 12.2); *goal* 15 (Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss) which includes the objective to integrate

ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounting accounts (*target* 15.9).

The result is that, according to the international and European key of reading, urban regeneration must aim to increase the level of quality of life and habitability of buildings, on the basis of a link between environmental balance and the recovery and transformation of urban areas that are being regenerated [26], which could find an interesting link in energy regeneration.

From a different point of view, very interesting development ideas could also arise in the scope of cognition of the urban regeneration concept still much debated today [27], in particular by relying on the need to enhance the teleological profile of the same through a perspective that highlights the ultimate goal of ontologically understood sustainability.

This reasoning, if developed organically by the legislator, could contribute, more clearly than in the past, to “put to the system” an increasing number of urban regeneration interventions, not limited to the reduction in land consumption, but extended to other areas of intervention related to the principle of sustainable development, in which energy regeneration clearly plays a major role.



[fig. 1]

4. The profile of competences: the central role of local authorities

Given the recognized centrality of the relaunch of the energy transition process, read in a sustainable regeneration key, it is therefore proposed to reflect on the governance profile.

Among the various public actors responsible for carrying out functions that have a direct and indirect impact on promoting the transition to clean energy, local authorities play a central role for at least two reasons.

Firstly, they have planning functions in both urban regeneration and energy matters.

From this point of view, reference is made to a "new dimension" of the concept of urban planning [28], which, according to a recent jurisprudential approaches, "is not limited only to the coordinated discipline of the construction of the territory (and, at most, to the types of buildings, distinguished by purposes thus defined), but which, through the regulation of land use, also achieves the economic and social objectives

of the local community (not opposing, but rather in a harmonious relationship, with similar interests of other territorial, regional and state communities), within the framework of respect for and positive implementation of constitutionally protected values" [29]. This approach reflects a new conception of planning as an expression of urban choices as a whole [30], through the accentuation of a cross-cutting approach to the complexity of the social objective of planning [31] [fig. 2].

This reading favours and presupposes the careful weighting between the various interests involved, animating the “dialectic” between the needs of implementation of the intervention aimed at regeneration and the interests (public and private) involved, that a possible deregulation for the purpose of simplification could alter [32].

Therefore, it is in this context that urban regeneration actions could be coordinated with renewed energy strategies, for example through the development of local energy systems capable of making an essential contribution to large urban areas, ensuring conditions of competitiveness for businesses in terms of energy supplies at a local level and, at the same time, ensuring benefits for residents [33].

Local authorities, on the other hand, could activate virtuous processes of energy development also through a careful update of the building regulations, an instrument of municipal building discipline, which supports the general master plan, and which contains the requirements relating to the construction methods for each municipal area [34].

It is also not secondary that local authorities are the main players in the “Covenant of Mayors”, promoted by the European Commission, which provides for the accession of municipalities to a number of commitments, including the adoption of a Sustainable Energy Action Plan (SEAP). From the point of view of energy regeneration, it can undoubtedly be said that the Covenant of Mayors is one of the most significant realities for urban government, which reinforces the centrality of local authorities [35] in the context in which it is concerned, and even shows that often “bottom-up” initiatives lead to more satisfactory results than those achieved through state regulatory requirements.

On closer examination, the process of “relaunching” actions in support of the energy transition, in the light of the key reading proposed here, aimed at achieving a “connection” between energy policies and urban regeneration policies, could result in the integration between the Sustainable Energy Action Plan and the various instruments for implementing urban policies. From this point of view, it is interesting to mention the perspective of those who identify urban regeneration plans or the promotion of integrated actions such as energy urban masterplans, suitable to involve the urban and entrepreneurial fabric [36], so that economic operators are also encouraged to contribute actively to the strengthening of the administrative strategy on energy transition.



[fig. 2]

4.1. (continued) the recent institution of the Ministry for Ecological Transition

From an organisational point of view, particular attention should be paid to the recent institution of the Ministry of Ecological Transition. In particular, Decree Law No. 22/2021 has ordered that the "*Ministry of the Environment and The Protection of the Land and the Sea*" be renamed the "Ministry of Ecological Transition". The change of name has a not only formal value, recalling the name already used in other Member States, such as France and Spain, where respectively the "Ministère de la Transizion Ecologique" [37] and the "*Ministry para la Transiciòn Ecològica y el Reto Demogràfico"* [38], operate, but also substantial, in view of the fact that the new Ministry has a number of functions and tasks relating to sustainable development, which are likely to affect the energy transition process, for example, the definition of national energy and mining policy objectives and lines and related measures, as well as the "authorisation of energy production plants from renewable sources of state competence also located at sea" (article 2). With this in mind, it is planned the transfert to the new structure of some powers of the Ministry of Economic Development, as well as the exercise of shareholder rights of th "Energy Services Operator", joint stock company which are assigned numerous public sector tasks in the energy sector, especially in the sector of public incentives for electricity produced from renewable sources.

The Ministry of Ecological Transition is one of the ministries members of the Interministerial Committee for Ecological Transition, responsible for adopting the "Ecological Transition Plan", in order to coordinate policies on: a) reduction of climate-changing gas emissions; b) sustainable mobility; c) combating hydrogeological failure and soil consumption; d) water resources and related infrastructure; e) air quality; f) circular economy.

Given the central importance of the energy issue in the reform of the ministerial offices responsible for the ecological transition process, given that changes in the distribution of competences between the different ministries are still in a transitional phase, it will be interesting to monitor the future developments to verify the impact of the new regulatory interventions in terms of the organisational dynamics currently connoting the energy transition process.

5. Endogenous and exogenous factors in the relaunch of the energy transition process in Italy

The progress of the energy transition process in Italy will depend on a multiplicity of endogenous and exogenous factors.

The first category includes the factor concerning the legal regulatory framework. The latter has shown some shortcomings mainly due to the lack of homogeneity and coherence in the regulatory interventions adopted. On the other hand, in view of the correct and effective application of the principles and rules of administrative action, with reference to the principle of legality, it would be appropriate to reflect, at an institutional level, on the implementation of a structural reform governing both the general aspects relating to the production of renewable energy sources and the aspects relating to each individual source of renewable energy.

On the second point, the progress of the energy transition process could also depend on the progress of the urban regeneration process under way in the context of public policies concerning the main Italian cities.

Looking to the future, the enhancement of the teleological profile of urban regeneration could facilitate overcoming the traditional approach, exclusively related to the prohibition of land consumption as well as cover other areas of intervention, including those aimed at meeting the strict need for decarbonization and energy transition.

This could be achieved by identifying local authorities as proactive actors through a new conception of planning as an expression of a transversal approach to urban choices as a whole, which, within the framework of sustainable urban regeneration, which allows for the application of an urban social logic of renewable energies.

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Institute of the Holy Heart in Palermo. Architectural and technological proposal of rehabilitation intervention for post-pandemic social housing

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Abstract
Close to the historical city centre, the prince Pignatelli built his villa-palace in the 18th century. Later it became the headquarter of the Order of the Holy Heart that instituted a school attended by the highest society. The 11430 m^2 historical building (ground floor, first and second floor), along with its monumental garden (about 9600 $m^{2)}$, was abandoned by the nuns in 2008. The novel ownership is aimed at restoring and re-functionalising the complex, a kaleidoscope of urban-architectural and technological stratifications, located in a crucial point of Palermo still waiting for a new season of requalification, being also close to the *Zisa* castle, included in the UNESCO Arab and Norman itinerary.
This paper summarises the building main historical-architectural and constructive features and the most recent events: modifications, additions, demolitions, etc. The proposal of architectural and technological recovery to convert the abandoned structure into a *social housing* complex (using the social *mixité* as a design parameter) is reported. A "social" use is strongly desired as many other historical buildings in the city have already been transformed into hotels, a clear differentiation is needed for the local market and functions. The most recent pandemic events need an indisputable reflection of the novel function, architectural distribution, technological improvement, relation with green and the city. In the "design for all" view, a big effort is being made to select the most advanced technologies, materials and devices from the international market (i.e. nanomaterials, automation, smart devices, etc.), to make the new building healthier and more functional, still maintaining the original characters as prescribed by the local urban plan and national laws on monuments preservation. An exquisitely professional and academic challenge that can result in a series of protocols useful for a new and conscious housing design capable of facing even global problems of rapid and totalising spreads of viruses, such as the COVID-19.

Keywords: traditional architecture, rehabilitation, social housing, pandemic construction techniques.

1. Social housing, social cohesion and housing quality improvement
We would like to initiate this paper remembering that, in the COVID-19 emergency we are experiencing, this year for the "World Habitat Day" the chosen theme is "Housing for All - A Better Urban Future" [1]. Considering the incredible high percentage of COVID-19 cases in the urban areas and the evident relation between the number among the people living in poor housing conditions and the infection rates, it is extremely urgent examine the real criticalities of our cities and communities.
As pointed out by the United Nations, providing an adequate house is nowadays, more than ever, a fundamental issue. An adequate salubrious home is one of the key factors influencing living healthy conversely the level of vulnerability for a person to be severely affected by epidemics, in the present case by COVID-19. Consequently, it looks impossible for people to protect themselves, and the others as well, from the virus in the absence of a stable and safe place to live in. About 1.8 billion people around the world live in homeless situations or in "seriously inadequate" housing conditions and for those who live in unsuitable housing, with a high risk of promiscuity and difficulties in isolation, the risk of contracting the infection increases significantly. In reality, many have no choice but living or working in close proximity, sharing crowded spaces, including water and sanitation facilities. Such an emergency condition also distinguishes the Sacred Heart Institute in Palermo, object of this study, that - once a noble patrician residence, then a residence and religious school - in recent years has been uninhabited

and consequently vandalized and illegally occupied by homeless. The monumental building was parceled to obtain many emergency housing units, marked by the need for an immediate shelter, increasing the social decay of the neighborhood and depriving of one of the most significant examples of historic building in the city. Moreover, the situation sounds quite grotesque and paradoxical considering that this building, and its luxuriant garden, is located close to one of the most important Arab and Norman buildings in Palermo, the “castle” of Zisa, a destination for tourists and visitors from all over the world, especially following the recognition of the UNESCO Arab and Norman itinerary along with the cathedrals of Monreale and Cefalù.

It is indisputable that government's inability to properly plan and provide affordable housing for fragile or disadvantaged social classes has considerably contributed to the proliferation of grossly inadequate housing, which has spawned a highly unequal and fragmented society. What is needed goes beyond forced evictions: through long-term housing programs and a great deal of political foresight, the necessary resources should be committed to increase the number of social housing and make housing generally affordable for all without discrimination. The post COVID-19 housing stock recovery plans must include, then, nationwide strategies developed with the involvement of the population, including the most marginalized sections of society, such as makeshift residents and homeless people. The European Commission, however, clarified that any social housing project must show the purpose of renting or selling housing at affordable prices to people in conditions of hardship or difficulty, even if temporary. Depending on the European countries’ choice, the methods of development of such projects, as well as the rules, change a lot. To better remark, it is not so evident to everybody that the social housing stock is not aimed at hosting the most marginalized social classes only, but it considers all the categories of people who, in addition to the traditional weak social classes (elderly, disabled, immigrants), also might involve young people, single-parent families, students, precarious or temporary workers, etc., and finally the population that has issues, for various reasons, in accessing the free market and, at the same time, does not have the economic and social conditions to access public housing.

It is well known that social housing is something halfway between public housing and private properties, sold or rented at market price, providing housing with good or excellent quality standards, at a controlled rent, which should not exceed 25-30% of the renter salary, fostering a sense of community and developing integration, through the use of common spaces and services among the inhabitants. The Italian Ministerial Decree 112/2008 defines "social housing" as “a system consisting of the set of housing services aimed at satisfying primary needs". In particular, the article 11, titled "Home Plan", is aimed at increasing the real estate assets for residential use through the offer of residential housing, to be built in compliance with the criteria of energy efficiency and polluting emissions reduction, with involvement of both public and private capital. Other regulatory cornerstones are the Decree of the Prime Minister (DPCM) 16/7/2009 and DPCM 10/7/2012, that - in regard to the National Housing Construction Plan - have better specified the contents and potentialities. In a time of economic crisis like the present one, social housing, in addition to guaranteeing a house for all the population, represents a real advantage for the entire community, proposing itself as a remedy for housing inequality, fighting social exclusion and supporting the social *mixité*, pursuing production efficiency. In this sense, the quality of new or renovated buildings results extremely high, having a quite flexible offer, able to respond quickly to an demand increase, contributing to the energy saving system through the choice of sustainable solutions both in the form of community (shared spaces, green areas, etc.) and energy efficiency (principles of bio-architecture, circular economy, innovative sustainable materials), finally representing an opportunity for the economy, in general, and the real estate sector, in particular.

Many are the virtuous examples that can be mentioned as a good practice. The QUID, Quintiliano District, designed by the Milanese studio Lombardini22, is i.e. an energy class A housing complex equipped with common areas expressly dedicated to socialization that encourage a real interaction between residents [2]. In Italy, many similar examples can be reported: in Bologna the Municipality has approved an investment of 61 million euros to provide one thousand renovated housing units; in Udine a massive rehabilitation program was started in the public housing districts; the Regional Agency for Housing in Calabria is working on the rehabilitation of vacant houses and fights against illegal occupation. The first “Social Housing Community” was created in Scandicci (Florence) in Tuscany, an urban regeneration project consisting of 50 dwellings, 40 of which are long-term leases and future sale agreements [3-4].

According to the Italian journal *Il Messaggero* [5], in Italy the social housing is a still an uncommon phenomenon. According to the Permanent Observatory on Local Public Administration (OPPAL) report, by the Politecnico di Milano, there are only 11 municipalities in Italy (out of the 110 interviewed) that have indicated the presence of at least one social residential structure, intended to accommodate particular categories of people and to respond to specific needs. The report highlighted that only 16 municipalities plan to build thematic residences, although 78% replied that they intend to develop projects in the future. In the so-called "Colao Report" (initiatives for the relaunch of Italy 2020-2022, former Conte government) the Italian government has undertaken to support an investment plan aimed at enhancing an economically accessible, socially functional and eco-sustainable housing offer, also by

making real estate available and unused public spaces to be restored with public-private funds and to be placed on the real estate market with controlled prices. This ratio, however, very generically indicates the specific actions to be pursued, indicated only by qualifications (which also includes investment in social housing, using the agreed building assets and funds for subsidized construction) and not with specific programs implementation.
In a recent letter to the European Commission of European Building Contractor Associations, it was expressly asked to allocate a large portion of the funding of the European Recovery Found to the activities of their sectors, giving priority to the construction of houses with an average surface area of 60-65 square meters, the interventions of recovery, demolition and reconstruction, transformation of use of existing buildings. According to the 2019 *Report the State of Housing* only the 4% of the Italian population has a house with an low rent [6]. But things are slowly changing, as reported by the Housing Europe Observatory [7-10]; moreover there is no lack of virtuous examples, relying above all on the potential provided by the tools offered by the EU, one of all the Renovation Wave, a strategy aimed at improving the energy performance of buildings, providing the tools to reduce energy poverty, counting on the fact that almost 34 million of Europeans cannot afford to heat their homes adequately.
The European Commission's initiative for the new *Green Deal* affects, in fact, the construction sector with the so-called *Renovation Wave*, which aims to rehabilitate millions of buildings in Europe over the next decade. Its objectives are clear: to boost our economy in a period of rehabilitation, improve the quality of life in citizens' homes and, collectively, move towards the goal of climate neutrality by the year 2050. The building sector is the largest consumer of energy in Europe. The use of building accounts for 36% of CO_2 emissions and 75% of the park built is highly inefficient, because it was built before the energy regulations, and most of them will continue in service in 2050. These data more than justify the commitment of the EU, but a rehabilitation intervention will also entail improvements in other aspects such as the structural safety of buildings, comfort, accessibility and the creation of jobs that are so necessary in the difficult times that we are experiencing. The recent Italian legislation on energy performance and building efficiency derives from EU Directives 2018/844; the transposition of the long-term community strategy in order to obtain a un-carbonized and energy efficient real estate park by the year 2050 is transposed into the Integrated National Plan for Energy and Climate (PNIEC), structured into five lines of intervention (un-carbonization, energy efficiency and security, development of the internal energy market, research, innovation and competitiveness). The range of incentive interventions also has been expanded; these incentives are possible using solar thermal systems, heat pumps, geothermal systems, biomass systems, new and replacing existing systems, the thermal insulation interventions of the vertical and horizontal opaque surfaces affecting the envelope with an incidence greater than 25% of the gross dispersing surface of the building. The main tools that promote the use of renewable sources are already operational. It is the so-called *Ecobonus*, a tax deduction applied to income tax, 50%, 65% according to the intervention and 110% if there is an improvement of at least two energy classes, paid in 10 years [11]. The recovery of building heritage through the containment of carbon emissions is one of the strategies also pursued in Palermo. This design approach becomes more paradigmatic when it’s referred to significant and historical buildings or urban areas, having an international interest or involved in participatory projects for the Mediterranean city, well beyond the attention that citizens attest to them.
Strengthening this market means renovating dilapidated or energy-poor buildings, creating the conditions for a profound building renovation. Social housing also means creating a smart city, making the suburbs places for real and active life, creating primary services and more.

2. Different flexible ways of thinking about living on Earth. The pandemic redesigns new hygienic-healthy projects for the residence, social *mixité* and design for all

The global health emergency caused by Covid-19, and its variants, is changing the way a private residence is perceived and should be designed. However, this rapid process was not completely unexpected, and is in line with the “novel” health conditions and new housing-working concepts. The long and exhausting quarantine has made it clear the disparity between families living in comfortable and large homes and the others forced into inadequate, undersized or inappropriate homes, obviously in respect to the pandemic issue. In fact, as emerges from some studies of the American Institute of Architects, and more particularly of the Harvard Joint Center for Housing Studies, not only the demand to transform the existing buildings into large multi-accommodation containers suitable for different social classes is rapidly growing, also in a social *mixité* regime, but also for designers and contractors to demonstrate the ability to design and build home according to the new lifestyles. These do not exclusively mean smart working, but also a renewed way of understanding the entire life in the interior of homes, condominium and neighborhoods in general, with strong hybridizations between residence and work spaces. In short, a "multifunctional" approach that could assign great flexibility of use to the same domestic environment, the possibility of guaranteeing and satisfying physical and mental well-being, with the introduction of more light and green spaces, optimal integration with the network of

services. Then, the concept of "home" is expanding the residential spaces beyond the immediate surroundings [12]. The principle of "responsible housing" should focus on innovation concerning, as the Housing Europe Observatory reports [13], "services targeted at local residents and communities, collaborative practices, ownership regimes and contracts used in the market and construction and restoration techniques". In May 2019, the EU leaders worked to support and encourage the real estate market and an adequate provision of social housing. The Housing Europe Observatory report, titled "The housing situation in the post-2020 Union", highlighted the main problems faced by young generations and Eurostat showed that up to 2017, over 47% of young adults between 18-34 years old, live at home with parents.

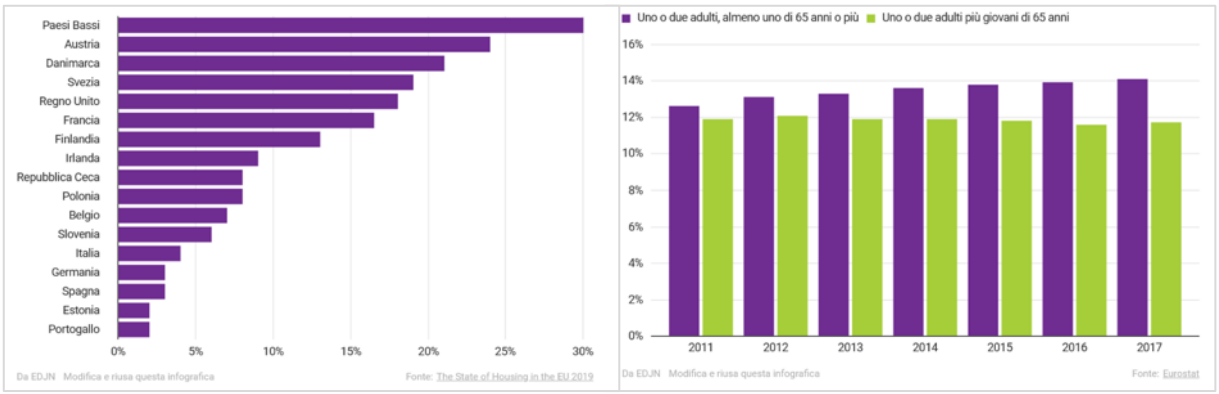

Fig. 1. Left: social housing in European Countries; Right: distribution of home owners, by group age.

To better understand the extent of the "housing issue", it is reported that the demand for larger housing has risen exponentially. Indeed, before the pandemic people used to stay in for a few hours a day and on weekends, while following repeated lockdowns, staying at home has become a necessity. Financial investments have, therefore, moved towards the apartments market and it was noticed how, during the pandemic, families' expenditure have changed: less for travel and holidays, concerts and shows, eating out and entertaining and more for accommodation, especially if more space to work from home is needed. It is not easy to establish how long this shift will last, but it is presumed that it will not fully reverse in the years immediately following the pandemic, especially as work from home is likely to play a larger and more permanent role than office life. Moreover, if on the one hand guaranteeing a comfortable accommodation for all is a priority, on the other architects and engineers must adopt more stringent criteria in interpreting the social needs of social distancing and sanitation of confined spaces. In addition, if in the first emergency the digital interface was implemented, with a technological and digital "leap" that implemented the apartment intelligence, monitoring and optimizing lighting, climate and security, it will be necessary to recover the sense of living linked not only to home automation and information technology (more powerful infrastructures, optical fiber, etc.) but also to recover the sense – and the spaces - of living on a human scale. Moreover, some standards considered as reference criteria for housing design will be eradicated: i.e. the recovery of the entrance as a filter-space between inside and outside, a space that was eliminated by the free-plan distribution. Automation and the household appliances sector will also play a fundamental role in domestic life (with a significant increase in energy consumption), just as the pandemic has brought hobby and sport into the walls of the houses. A study by the American Institute of Architects [14] reported that those who spent a long period in had desired a small home SPA, flexible spaces capable of hosting mini gyms for gymnastics and yoga. For example, the Ikea Life at Home report reported that 38% of respondents would have liked a space to cultivate their interests, not just to work in video-conferencing [15]. Therefore, the concept of home is radically changing from what has been usual for hundreds years: bedrooms, dining rooms, work rooms, etc.. Conversely an indisputable need for flexibility is, now than ever, evident. We live into too small spaces within cities that are too large. According to the American Environmental Protection Agency (EPA) [16] in the USA the citizen before the pandemic spent 90% inside closed spaces and the remaining time between trips and outdoor life. On the contrary, following the Covid-19, the public green spaces are re-evaluated.

For the Europeans living in the Mediterranean area, it is well consolidated the relation between the inner home spaces and the outside, with the city, or even the need to prefer a home with a terrace, a large balcony, a loggia or a private garden as an appurtenant space. Even such circumstance, considered "normal" before Covid-19, were strategic and fundamental in the isolation to alleviate the sense of confinement and isolation. That was confirmed by the studies of the European real estate agencies that investigated the meaning of "ideal home" for buyers: tautologically, the preference was an osmotic relationship between the exteriors and exteriors, with versatile furnishings, that can be for use in both indoor and outdoor spaces, the absolute preference for a private garden. In analogy, the latest survey

published by the Observatory on the house, launched by Leroy Merlin, highlighted a preference for modularity, sustainability, adaptation to the stringent regulations on energy efficiency, comfortability, and economy [17]. The health emergency has forced people to quickly reorganize the interior spaces, especially when a private or work space was needed; however, more design functional solutions for the new home life have to be designed. Studies carried out by the Smart Working Observatory of the Polytechnic of Milano attested that the so-called "agile workers" (people working remotely) will soon reach the quota of about 5.35 million. That shows the indisputable need for redesigning a "typical" apartment taking advantage of every space such as the basement, the resulting spaces, the so-called "lost" spaces [18]. The only question that designers should ask themselves will not be how the post-pandemic home will change, but how citizens and their priorities within cities have changed: will the design of the furniture changed into a more ergonomic and adaptive sense to optimize the use of spaces and, moreover, to guarantee sanitation (easy-to-clean touch displays, voice controls and other devices that reduce the contacts with handles, switches and various objects), lighting and ventilation, the need for vertical and horizontal partitions capable of acoustically isolating spaces will be implemented, etc.

3. Institute of the Holy Heart in Palermo: compatible recovery for a contemporary post-pandemic life quality

In 1904, the Prince Federico Aragona Pignatelli Cortès sold a large suburban villa along with the large garden with fountains and statues to the religious of the Sacred Heart. This event, and the novel use, determined a series of transformations and reconfigurations that, in less than 100 years, significantly changed the aspect of the patrician residence. For about 80 years, the complex housed a scholastic institution run by the nuns, one of the most fashionable schools in the city, that was attended by the upper classed of Palermo. The romantic and informal masonic-esoteric garden was commissioned by Duke Diego Pignatelli at the beginning of the XIX cent.; in 1929 the garden assumed a centric layout, with two main axes that divided the lot into four macro-areas. In 2008, the Italian Province of the Sacred Heart put on sale the entire complex requesting the maintenance of the social destination. In recent years, the complex has been the victim of vandalism and illegal occupation. To date, the complex is in an evident state of neglection and is still waiting for a new property to valorize and reuse it.



Fig. 2. Left: Institute of the Holy Heart; Right: the landmarks: the Institute with the private garden (red), the Arab and Norman Palace Zisa (yellow) and the public garden (green); the left picture point of view (light blue).

The analysis proposed in this study is divided into a series of phases which, starting from the historical-architectural evolution, led to the formulation of a proposal for compatible reuse, pursuing guidelines ranging from economic sustainability to typological appeal. The social housing use considers the building typology and the spaces distribution. The restoration project does not renounce to a contemporary reinterpretation that compatibly combines the ancient with the modern, also integrating distributive-functional choices based on “design for all”, which also considers the new pandemic emergencies. It is well known how the three innovative concepts of accessibility and adaptability, must be intended as three levels of quality of the physical space. A strong evolution of the "special" architectural project is requested as it is designed for fragile people, considering the global concept of “Inclusive Design” or “Universal Design” or, finally, “Design for All”. That is intended as a sustainable design that stimulates social inclusion: all the environments, public or private, should be designed bearing in mind the different needs of people. These parameters, which are a priority especially in the design of urban environments, can be applied with wide margins of effectiveness even in private domestic environments [19-21]. As reported in [22] "Design for All started from the analysis of disability, to manage the needs of all and seek the tools to promote interventions for the adaptation of the environment to all. The topicality lies above all in the fact that it not only involves the disciplines of architectural design, but also all the disciplines of the decision-making chain. It tries to address the

political decision, the economic-financial management, the social opportunity, the designer, the realization of the project and its management, according to the principle that, if an element of the supply chain is missing, above all politics, it will certainly not be only the designer, even if good, who will be able to carry out inclusive projects". The contents and processes of the Design for All are based on a systemic, holistic and necessarily multidisciplinary approach. The last phase was the "drafting of an executive project", with interventions aimed at sustainability and cutting-edge technologies.
The urban master plan of the Municipality of Palermo specifies the features of a historical-artistic building and the admissible interventions: restructuring interventions, excluding the demolition and total reconstruction of the building. The garden is instead classified as a space for public facilities of general interest. New works are therefore permitted, but subject to the maximum limit of 3 m^3/m^2, with a maximum coverage ratio of 20% and a tree planting index of no less than 60%. The new 2025 urban master plan outlines the new face of Palermo inspired by a green philosophy with sustainable mobility, recovery of the existing building heritage and improvement of the green areas. In particular, the neighborhood of the Institute of the Holy Heart is one of the nine identified areas of urban regeneration, assigning a new urban centrality. Then, the proposal is aimed at the reuse and redevelopment of the full area with the recovery of existing and no longer used buildings. Through these interventions the whole area will benefit from improvements in the quality of living and the social, economic and urban context. Another foundation of the outline scheme is the UNESCO Routes which not only identify the protection assets but also larger spaces whose perimeter is defined as First and Second Level Buffer Zones, subject only to actions aimed at increasing the level of urban decorum, limit the vehicular circulation, and create a pedestrian and light mobility systems.

4. The architectural proposal for a new post-pandemic social life

The proposed recovery and refurbishment masterplans involve the verification and maintenance of the structural characteristics of the original building, where the approximately 11400 square meters of interior spaces are divided into 10 "ordinary" (A2) and 6 "economic" (A3) housing units, along with common areas and university residences. In detail, the new distribution foresees: basement - entrance to the student residences, a restaurant, a bar, a co-working area, and a nursery, ground floor - the entrances to the residences and the elderly center; second floor - university residences, further accommodation and a gym; third floor - student residences and apartments; fourth floor - a rooftop.
All the spaces have been designed in accordance to the seven "principles" of the Center for Universal Design, North Carolina State University (Raleigh):

1. equitable use, allowing the same use to all users: identical when possible, otherwise equivalent;
2. flexibility in use, allowing the method of use choice and providing adaptability to the user's needs;
3. simple and intuitive, meaning that the use of the project and its spaces are easy to understand, regardless of the users' experience, knowledge, language skills or current level of concentration;
4. perceptible information, the project method of effectively communicating the information necessary to the user, regardless of the environmental conditions or the users' sensory abilities;
5. tolerance for error, minimization of risk and consequences of accidental or unintentional actions;
6. low physical effort, efficient and comfortable strategies to ensure minimal fatigue for the user;
7. size and space for approach and use, provide appropriate spaces for approaching, reaching, manipulating and using regardless of the size of the body, posture and mobility of the user.

The design choices derive from these 7 principles. For instance, in accordance with the principle of low physical effort (6) the use of stairs is limited with a preference to inclined planes and gentle slopes that can be easily connected to the floors; in compliance with the principle of perceptible information (4) within the building there is variety of techniques and devices that can be used by people with sensory limitations; furthermore, in compliance with the principle of Size and Space for Approach and Use (7), the use of furniture, lifts, services providing a clear view for any seated or standing user are favored, all the components are comfortably reachable for any user, allowing variations in handle size, providing adequate space for the use of personal assistive devices. Therefore, it is important considering the multiplicity of personal conditions that can deviate from the model of a "normal-gifted" person; for both ethical reasons and to devote attention to traditional technical project efficiency criteria, safety regulations, "ease of use" by the majority of users. In this sense, it can be talked about "universal architectural design" or "barrier-free design", intended as an approach to the design of products and living environments by extended users, regardless of age or ability.

4.1 The residences

- the 10 ordinary residences (A2) combine the use of traditional construction techniques and more advanced and contemporary solutions. They show a flexible internal distribution through careful details. Each apartment is designed as a "unique piece", satisfying the needs of the owner and is versatile with large rooms with excellent exposure and an enviable panorama (on the garden and on the Arab and Norman Zisa palace) from a covered terrace. All the apartments show modularity in order to be divided into smaller rooms or leaving large free-plan interior spaces;

- the 6 economic residences (A3) offer typological solutions with 2 or 3 rooms, guaranteeing maximum comfort with the smallest number of square meters possible, to contain rental or purchase costs. These apartments ensure the principle of housing mix and social integration;
- the university residences have different types of rooms: single and double rooms, comfortable environments, equipped with flexible, modern and functional furnishings. The student accommodations have been designed to give the opportunity to spend the time of study and relax in the room or in common spaces such as study rooms, relax areas, common kitchens, laundries, bike parking, and the large garden. The reception, opened 24 hours a day, guarantees access to the residences in complete safety and flexibility in entry and exit times.

4.2 The common spaces

- co-working spaces, integrated into homes as a new business opportunity, a home-work synergy and to ensure the smart-working; autonomous and collective workstations have been provided;
- nursery, designed for children up to 36 months can also take advantage of the historical garden;
- playroom, designed for intercultural exchange, between the children of the neighborhood, as well as an intergenerational swap where the elderly resident of the complex might be able to offer companionship to children and young people (3-14 years) and voluntary service;
- elderly center, plays a pivotal role in the general social housing project, both in the idea that the housing recovery is inspired by various "fragile" user groups, and in terms of design for all. It boosts socialization, integration within a single complex of various types of users and the psycho-physical well-being of the elderly, preventing situations of abandonment or isolation;
- gym, inside the building, is able to provide support for indoor gymnastic activities with the possibility of extending also outdoor and provides autonomous support in the event of a pandemic;
- restaurant, open to the public with 60 seats was designed with a bar and outdoor spaces in the garden, to ensure open air service even in pandemic situations, considering distancing;
- roof-top terrace, houses the roof garden and a restaurant-bar, with the view of the Zisa palace and the skyline of the city.

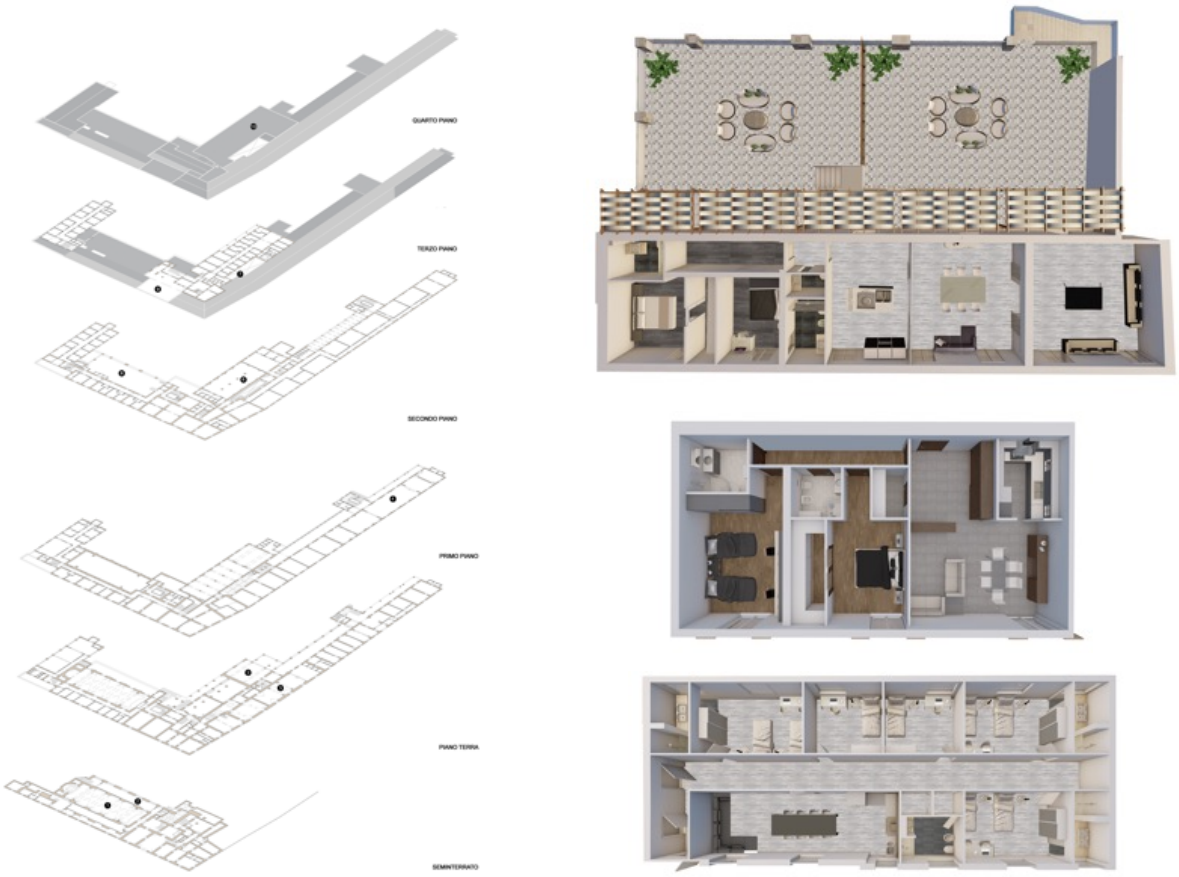

Fig. 3. Masterplan of the various floor of the Institute of the Holy Heart (left); renders of the designed apartments: ordinary_A2 (top right), economic_A3 (center right), students' (bottom right).

5. Materials and devices for a safe post-pandemic building

Our homes and workplaces have a huge impact on the physical and psychological health of the inhabitants. In addition, a number of certifications and standards such as the Well Building Standard and Fitwel have recently been developed to promote the construction of the so-called "healthy buildings". The WELL certification, i.e., proposes an evaluation system that defines the level of environmental sustainability as well as the overall well-being induced to the occupants. The standard is applicable in every design/construction phase, both for the new buildings and the renovations. The evaluation process can concern any artificial environment, regardless of whether it has a LEED certification on the energy efficiency and sustainability of a material, in a broad sense [23].

It is well known that Covid-19 is transmitted not only by direct contact, but also through the air droplets. Consequently, it is recommended to use easy-to-clean materials and non-porous surfaces. Surfaces made of granite and other natural stones, i.e., are porous and allow the accumulation of moisture, food residues, and microbial spores. On the contrary, hard and uniform surfaces such as steel, quartz or Corian are non-porous and easier to sanitize. Porous materials, such as carpets, fabrics, upholstery, some wallpapers, towels, and curtains, just to give some examples, require a very special attention in cleaning, especially from dust mites that may cause allergies. In addition, the human excessive exposure to sanitation chemicals can lead to epidermal hypersensitivity disorders or autoimmune diseases. Some materials are naturally antimicrobial. In example, copper and its alloys (brass, bronze, cupro-nickel, copper-nickel-zinc, etc.) show antimicrobial properties able to destroy a wide range of micro-organisms. Copper is one of the most used materials to produce bed rails, handrails, taps, door and window knobs, components for lifts, surfaces of kitchen, door plates, towel racks, coatings in the home. Among the materials that mostly, since ancient times, had always showed anti-bacterial activity is certainly silver. Despite its relatively high cost, it allows an extensive range of protection. The antimicrobial activity can be realized by means of thin films grown from silver nanoparticles, that can also be directly added to the matrices of mortars, alloys, plastic materials, but also sprayed on fabrics. The anti-bacterial action guarantees an excellent level of health [24, 25].

Another system that can be largely used in construction is the photocatalysis to produce clean and sanitizing surfaces. The action of TiO_2, i.e., is largely famous and widely used in thousands of products, including the construction ones, starting from Italcementi's TX Active Cement, to advanced experimental studies that see, ie, hydroxyapatite deriving from the bones of codfish, suitably treated and functionalized with titanium hydroxide, to manufacture photocatalytic mortars for interiors [26]. Moreover, TiO_2 can also be applied to glass, ceramic, steel, etc., and in theory on every typology of material and device. There are also self-cleaning, sanitizing, easy-to-clean products already sold on the international market - binders, paints, fabrics, materials for furniture and design, etc. - with different properties, effects, and applications. Worldwide, every company presently exploits nanoparticles and enhanced properties to better improve the building wealth [27].

The construction market is widely and rapidly moving to allow - both existing and new - buildings to efficiently respond to the pandemic emergency. Easy-to-install steel tunnel, such as the Spretch SanitiBox [28], that acts as a passage at the entrance of any building: supermarkets, schools, public offices, shops, museums that guarantees the sanitization of clothes before entering and, in the same way, exiting an additional sanitation (Fig. 4, left). The elevator is undoubtedly one of the most used devices in buildings and its surfaces represent an ideal vehicle for spreading viruses and infectious loads. Therefore, professional technological systems have been placed on the market for the sanitation of any lift cabin. Here a new concept product, the CARe [29], is presented as a device applicable to every kind of cabin. It consists of a mechanical ventilation device, with centrifugal motor and HEPA filter, that sanitizes the air continuously, ensuring its almost instant replacement. The air drawn from the cabin is then conveyed through some flexible ducts into the unit, inside which it is filtered and purified from viruses and bacteria, and finally released back into the environment. In addition, a UVC ultraviolet light beam is used, with germicidal technology (Ultraviolet Germicidal Irradiation), tested at health level and generally used for the sanitization of hospital spaces, guaranteeing a complete and instant sterilization of surfaces and objects in the cabin. The UV light eliminates almost all (99.9%) of the microorganisms present on the surfaces, activating automatically and in full safety only in the absence of passengers on board. To guarantee the correct operation of the LED spotlight, the system is additionally equipped with a dual technology volumetric motion detector (Fig. 4, right).

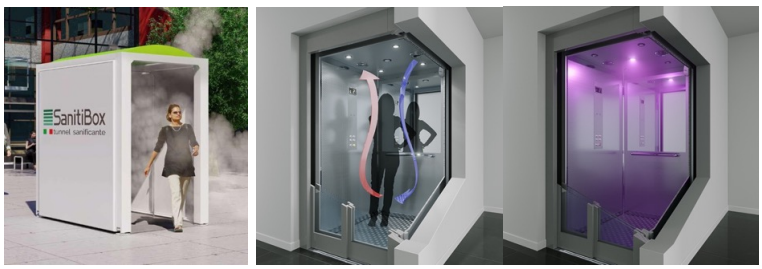

Fig. 4. Sanitizing devices: SanitiBox (left); CARe elevator cabin-system (right).

Research in aerobiology and biotechnology have developed surface purification systems that use advanced catalytic hydrated photo-oxidation. There are air sanitizers on the market, such as the Isanity by ICA Systems (fig. 5, left) [30], which looks like a designer lighting body when instead it is a sanitizer capable of using a new generation technology that is not based on filters crossing of the air through purifiers, but the production of a blanket of redundant oxidants that sanitize the surfaces and the air, eliminating pollutants. Other products are custom designed UVC lamps that are able to sanitize both the air and the surfaces according to need and time. When the lamps are turned towards the inside of the channel that contains them, they act by sanitizing the air, conversely as the lamps are turned towards the outside of the channel they irradiate the environment towards which they are turned, sanitizing it [31].

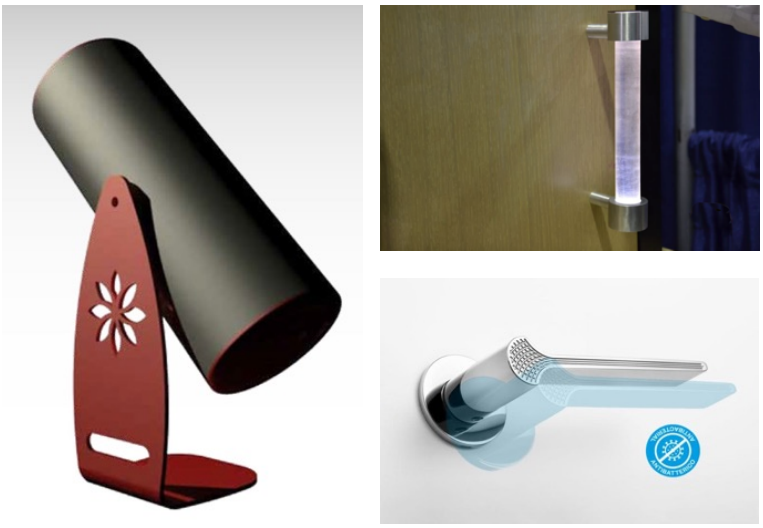

Fig. 5. Isanity (left); Chinese University product (top right), DND handle (bottom right).

However, as a general rule, the most important thing is aiding any cleaning process: avoid hard-to-reach areas, tight corners, or overly complicated solutions on high-contact surfaces such as knobs, handles, buttons, operating parts, railings - a flat and smooth surface is easier to clean. Often the rules in force for hospitals or medical and veterinary practices, represent an optimal solution that can be easily transposed into residential the buildings to implement the level of sanitation. Examples are smooth and curve connections between flooring and walls or easy-to-clean plastic materials as flooring. Self-sanitizing door handle, developed by Sum Ming Wong and Kin Pong Li from the Chinese University of Hong Kong, combines the advanced photocatalytic technology with the blacklight technology (fig. 5, top right). The light source activates the door handle coating to clean and sterilize the surface. Consequently, it can minimize the risk of infection by contact and enhance hygiene of the place. The working principle of the product is that a thin advanced photocatalytic coating could effectively decompose bacteria on the surface of a substrate. Since a consistent UV light source is required to activate TiO_2 film for disinfection, a custom-designed generator is used to provide stable electricity to light up a UV LED lamp by motion of opening and closing door. Reflections of light could occur inside a transparent glass door handle to activate coating on the outer surface. Then, the door handle can sterilize and clean by itself [32]. Italy has also made many significant strides in experimenting antibacterial finishes with particular applications. An interesting application is handle treated with special thin film that ensure durability and anti-scratch characteristics together with the exceptional bactericidal properties (fig. 5, bottom right) [33]. The Carlo Ratti Associates Architecture firm has created a pilot project for the Sella Group's Open Innovation Center in Turin (Italy) addressing many post-pandemic challenges. The new workplace design features automated desk sanitization, collaborative digital platforms and smart windows to ensure health, safety and sociability [34]. Insufficient air exchange may often cause Sick Building Syndrome. This has led to poor indoor air quality with consequent health problems for users, such as irritation of the eyes, nose or throat, but also nausea and headaches, allergies. Often, these issues arise from the generation of mold and mildew in the HVAC system which are, today, combated by UV filters. The European Center for Disease Prevention and Control has also analyzed the importance of the role of HVAC systems, and sanitation equipment, in weakening the transmission of the virus [35].

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WORLD HERITAGE and DESIGN for HEALTH
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Serra da Estrela: *Sanatoria* on the Portuguese Magic Mountain?

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Abstract
The plot of The Magic Mountain focuses on the lung tuberculosis epidemics, setting the narrative on a Swiss alpine locality. Therefore, coinciding with Mann's morphological locus, the mountain, the Serra da Estrela has been the protagonist site of the treatment of that illness on Portuguese territory. The highest *causa mortis* rate in Portugal in the 19th century was due to infective-contagious diseases, with considerable incidence on every stages of life, as well as on every economic and social classes.
Scientific studies about those pathologies, were led until the middle of the 19th century by the German scientists Schönlein and Koch, the French Villemin and Pasteur, as well the British Bodington, having concluded that tuberculosis, an environmental disease, should be treated in open-air environment. From 1850 on, the German researchers Brehmer and Detweiller determined that mountain climate would contribute to healing the disease. By the end of the 19th century, the *Sociedade de Geografia de Lisboa* sent an expedition to Serra da Estrela to conduct a study on its climate therapy potential, followed by another expedition promoted by the National Ministry of Public Works. Both expeditions signalised positively the region as appropriate for building establishments with those healing purposes. As a response to the proposed therapy, there was the architecture of health spaces denominated as *sanatoria* on the Portuguese Magic Mountain.

Keywords: Serra da Estrela; Sanatorium; Lung Tuberculosis.

1. From the Black Death to the White Plague
The Black Death, or Pestilence, has assailed all Europe all through the 14th century and in Portugal, in consequence of it, there was literally a witch hunting, as well as persecution of Jews. Besides that Plague, many other infirmities, considered contagious, such as anthrax, epilepsy, erysipelas, leprosy, scabies, bubonic plague, trachoma and tuberculosis, orbited around Europe during the middle ages. Only at the beginning of the 16th century in Portuguese continental territory did the concern with public health, contribute to the establishment of laws nominating Judge Pedro Vaz as health Chief Provider, besides other laws that predicted severe punishments for whom proceeded from epidemic locations. Also, the so called "cartas régias" recommended the building of health houses, along with their respective enlargements, thus assuring the legitimation of regulations. In the 17th century, there were published decrees that determined the extension of authority of the Chief Provider to the overseas territories, as well as regulations which established a sanitary cord at the national borders, and the quarantine over the Tagus River, having a maritime supervision on the Port of Belém, (at the Tagus bar). In 18th century there was also a regiment dedicated to the establishment of shops, warehouses of food kinds, or sanitary control of beverages. [1]

[1] LEMOS, M. *História da Medicina em Portugal: Instituições e Doutrinas*. Vol. II. Lisboa: Dom Quixote, Ordem dos Médicos. 1991 (1ª ed. 1989); FERREIRA, F. A. G. *História da Saúde e dos Serviços de Saúde em Portugal*. Lisboa: Fundação Calouste Gulbenkian. 1990; OLIVEIRA, M. A. A *Medicina em Portugal até os fins do Século XVIII*. Porto: Imprensa Comercial, 1881.

In the time of the Industrial Revolution, the city of Lisbon suffered the consequences of a rural exodus, which implied a dense demographic rate. Along with that population growth, some of the inhabitants had to live in deteriorated residential areas, where basic hygiene conditions were not possible. This fact, associated to malnutrition and the intense regime of working hours of workers, led to the outbreak and dissemination of illnesses, such as lung tuberculosis. The writings of Frank M. Snowden reveal that lung tuberculosis was historically one of the most ancient epidemics in human evolution. It was recorded that the disease affected animals, as well as humans, being considered a humankind disease, with clear evidences in *Homo Sapiens*, throughout Neolithic time, and going through civilizations of Antiquity (Egypt, Greece, Roman and Arab), Extreme Orient and Mediaeval Europe. It has attained the United Kingdom in the 16th century, reaching the highest rates of mortality in the 18th century. It has swept Eastern as well as Western Europe, in the beginning of the 19th century, evolving next to North and Latin America by the end of that same century, having attained then the highest level of incidence, thus being denominated as scrofula, Mal de Pott or phthisis - the White Plague. [2]

In Europe until the middle of the 19th century, tuberculosis was at first treated in accordance to the principles of prescriptions where there were discriminated expectorants and tonics, which contributed simply to relieve feverish symptoms, generally associated to diarrhea and perspiration. There had been some indications that maritime and flat land climates were recommendable for pathologies with those specificities. Eventually, those climate conditions were considered inefficient for that same purpose.

Sanatoria treatment, consubstantiated by the rest of patients, situated on low-pressure locations, accompanied by a hygiene and dietetic regime became legitimized and prescribed by specialists. That regime has become a common practice from the midst of 1854, on the Prussian mountain in Göbersdorf, idealised by Dr. Hermann Brehmer and, in consequence, the therapeutic technique spread throughout the whole continent. Before that new paradigm, the Sociedade de Geografia de Lisboa, from 1881 on, led by Dr. Sousa Martins, a Portuguese medical doctor which was a pioneer on the reflections about the relation between the mountainous climate and lung tuberculosis patients, planned and effectuated two expeditions to Serra da Estrela. The first one was dedicated to elaborate a study on its climate therapy potential and the second, two years later, together with the Ministry of Public Works, to implement the building of sanatoria, after the positive conclusions on mountainous settings.[3]

Preceding the building of the first sanatorium, there were conducted some experiences with patients occupying both wooden cabins and natural habitats such as houses adapted as rocky caverns. The Casa da Fraga, situated close to Penhas da Saúde Obsevatory was one of the architectural examples, consisting on several buildings, especially a cottage literally framed by the natural landscape and the granite blocks of the site. The main chalet was composed of dining room, which worked as an entrance hall and living room, a storage room, a pantry, a bedroom, a room with large dimensions contiguous to a balcony, a guest room with an independent access from the rest of the house, a dovecot, a henhouse, and a stable. Another similar structure was built later on, in order to provide shelter to more patients. Sousa Martins sent Alfredo César Henriques, one of his patients, who suffered from lung phthisis and stayed for two more years, showing evident signs of healing. This has stimulated other patients to look for this same location, having conferred to the Serra da Estrela a status like that of the Swiss station of Davos in the Alps, in two reports dating from 1840.[4]



Fig.1 "Casa da Fraga" Granite shelter, main chalet and main building. Source: the authors.

[2] SNOWDEN, F. M. *Epidemias e Sociedade: Da Peste Negra ao Presente*. Lisboa: Edições 70, 2019.

[3] LONGO, C., "Epidemias: Perspectiva de Portugal com Principal Enfoque em Lisboa e na Peste Branca Tuberculose" in *Medicina na Beira Interior da Pré-História ao Século XXI: Cadernos de Cultura*, nº 29, 2015, pp 109-120.

[4] NUNES, J. C. A. Os Berços da Arquitectura Branca em Portugal: O Surgimento dos Primeiros Sanatórios de Tuberculose. In FIOLHÃES, Carlos; SIMÕES, Carlota; MARTINS, Décio, *coord*. (2011) –*Congresso Luso-brasileiro de História das Ciências: Livro de Actas*. Coimbra: Imprensa da Universidade de Coimbra, p. 910-927.

Sousa Martins advocated the importance of the Swiss city for the cure of tuberculosis, an ode to life. It is relevant to note that differently from the Portuguese doctor, Thomas Mann, (at first) considered the author of an educational formation novel (exalting German deeds), initiated the writing of its work in Davos, inspired in his wife's the internment, when she arrived to that location to heal a tuberculosis in 1912. He conceives a narrative in The Magic Mountain *(Der Zauberberg)* [5], presenting an European *bourgeois* society with a sanatorium, he characterizes his protagonist as a naïf young man, capable of considering his disease with a fascination for death, presenting a spiritual crisis, in search for healing, through the alchemical "water for life", through the seven year period of sanatoria enclosure. He confers that the mountain ill world is capable of an extreme strength and cohesion, to the point of alienating active life, and being the last deed of a person, some form of existence, stressing the idea of a sanatorium though an aesthetical and sensual charm – an ode to death. Doctor Karl Turban, following Dettweiler's theories of therapeutic rest, founded in 1889 an anti-tuberculosis sanatorium, in Davos Schatzalp, known as the German therapeutic station, built by Davos' architect, Gaudenz Issler. "This building followed the usual models, only differing by the isolated situation, regarding the urban centre of Davos, in a high place, protected from predominant winds, and located inside a park."[6]
The building of the first sanatorium in Serra da Estrela did not take place in Penhas da Saúde, due not only to the absence of relevant data regarding the mountain, but also due to the lack of the government financial encouragement and the fact that it was quite retired in terms of location.
When the National Tuberculosis Congress, held in 1895 under the concept that a mountain was the ideal location for the treatment of that epidemic and anchored on the thought of the doctor Lopo de Carvalho, the possibility of implanting the sanatorium in the city of Guarda was still a faint idea. That location presented urban and residential infrastructures, capable of embracing the building with the desired expectations, besides possessing atmospheric conditions similar to those of the mountain. In 1907, the first sanatorium built as an initiative of the ANT was precisely Sousa Martins Sanatorium, in Guarda.

2. The Building of Guarda and Covilhã Sanatoria

Reflecting consolidated projects of European architecture of sanatoria, the Shatzalp Sanatorium, considered a reference in that context and planned isolated from the urban environment, thus limiting its visiting and restricting itself to the patients, situated in one of the mountain slopes, hereby allowing the action of the beneficial winds for the healing. Built between 1898 and 1900, under the plans of the architects Otto Pfleghard and Max Haefeli, its implantation consisted on a single building, protected from the winds that blew from North, being the spaces of the lodgings southwards oriented, with balconies, thus qualifying as bactericide spaces.



Fig. 2 Shatzalp Sanatorium, Davos. Source: https://cdn-cl01.epaper.guru/content/814.jpg [Consulted in February 2021]

In 1907, the Sousa Martins Sanatorium has opened in Guarda, following the above quoted parameters. Architect Raul Lino conceived the architectural composition choosing a pavilion party for three different financial classes and, detached from these, six chalets for the families. All healing pavilions followed a program with ground floor and first floor for the patients and a second floor for the personnel. In terms of volume, the façades were symmetrical and the main access in the middle of the building. There were arcades in the ground floor that allowed cross ventilation of the basements, along with metallic balconies in the lodgings, conferring a certain lightness and potentiating large spans, therefore annunciating

[5] MANN, T. *A Montanha Mágica (Der Zauberberg*). São Paulo: Companhia das Letras, 2016.
[6] TAVARES, André; *Arquitectura Antituberculose*. Porto: FAUP publicações, 2004, pp. 237-239.

innovative architectural lexicon and tectonics. Later on there were architectural rehabilitation interventions in this health equipment by the architect Vasco Regaleira, a specialist in sanatoria, throughout the 20th century.[7]



Fig. 3 Sousa Martins Sanatorium drawing (Pavilions: number 1 Lopo de Carvalho, number 2 Antonio de Lencastre and number 3 Rainha Dona Amélia).

Source: ALMEIDA, Ramalho de – *A tuberculose: doença do passado, do presente e do futuro*. Porto: Bial, 1995, p.45.

The Penhas da Saúde Sanatorium[8], built between 1928 and 1936 at a 1200 meter height location, was designed by architect Cottinelli Telmo, one of the most relevant architects of the Estado Novo regime architectural production.
Having finished his studies in 1920 with the highest classification, he entered very soon the Portuguese Railway Company (CP), as technician of the company, having as a result designed and accompanied many programs connected to the needs of the same company.[9]
The Regulation of Sanitary Services of Railway Companies, approved in 1929, included services of Clinical Assistance, of Emergency Room and Work Accidents, of Hygiene, of Profilaxy and Desinfection and of Sanitary Demographic Statistics. This Regulation, along with the implemented measures adopted by it, demonstrated the concern of the Company to guarantee the well-being of its employees, along with the access to basic health care and a proper education.
The "Sanatório dos Ferroviários" project was commissioned in 1927 by the railway company to Cottinelli Telmo as an external service contract. It completed in his own private studio, and one of his last buildings designed in accordance to an eclectic taste.
In order to study the program he had to develop, Cottinelly Telmo visited the Sanatorio de Fuenfria, in Spain, having realised that it would be possible to build one of such scale, fully integrating it in the landscape. Therefore, he invested in a somewhat romantic concept, conferring to it an aspect adequate to the region, that of a massive mountain hotel.
The land for the implantation of the sanatorium (which was part of the National Woods of Covilhã), was donated by the state, on the south slope of Serra da Estrela, which had already a road access. Being located near a natural water spring, the building would be easily supplied with potable water.
Designed in accordance to the model of a big mountain hotel, a romantic idea related to better dealing with the disease stigma, as the sanatorium procured a formal integration in the involving landscape scenery, taking into account adaptation to the land topography, refusing some too austere hygienist tendencies.
The sanatorium originally designed in conformity to regulations established by Turban in 1894, was south oriented, with an irregular polygonal "V" plan, offering an obtuse angle, favourable to capturing daily insolation and simultaneously protect from winds blowing from North. It worked as an articulation of two different blocks, the western one being of a lesser dimension and having a sort of space before the building, as an exterior courtyard.
The noble or entrance floor was occupied by functions of a more "public" nature, where one could find the administrative services, the various rooms for collective activities, namely the dining room, gathering and festivities rooms, recreation and conversation room, waiting room, library, and winter garden. There were also at this same level the medical services, including the areas of consultation rooms, radioscopy

[7] BORGES, D. H. Sanatório Sousa Martins: Uma Obra Única e Original do Arquitecto Raúl Lino In Guarda Viva – Boletim Municipal nº 2; Câmara Municipal da Guarda, p. 7.
[8] This sanatorium was initially known as "Sanatório dos Ferroviários"- literally Railway Workers Sanatorium - and later by Covilhã Sanatorium.
[9] In the year of 1910, after the implantation of the Republic, it changed name from "Companhia Real dos Caminhos de Ferro Portugueses" to "Companhia dos Caminhos de Ferro Portugueses", known as CP.

rooms, radiography rooms and operation rooms. In this level, in an annex in the rear part of the main building there were the kitchen, the pantry, the lavatories, connected to the main building by two closed passages. The last three floors corresponded to the areas of the rooms and healing galleries, each one of those for a different class (1st, 2nd and 3rd), distributed respectively from the inferior floor to the upper ones.



Fig 4 Fig 1 Penhas da Saúde Sanatorium (Covilhã), mid 20th century photo. Source: *TRANS – Casa de Passagem. Covilhã : Produções Impasse*, 1994, p. 13.

The employees of the Company could benefit from treatment for tuberculosis in this sanatorium that pertained to a network of about eleven sanatoria in national territory. Once built it remained closed for eight more years due to reasons that were strange to the company, opening to the public only in 1944. Later, the sanatorium would pass onto the responsibility of the Portuguese Society of Sanatoria, under the condition of receiving all the patients in need of mountain climate treatment, and keeping fifty beds at the disposal of the institute IANT (Instituto de Assistência Nacional aos Tuberculosos).[10] The mission of this institute was not only the orientation, coordination and supervision of prophylactic and therapeutic actions used in the fight against tuberculosis on national territory, but also implementation of private initiatives and the creation and maintenance of the establishments dedicated to the treatment of tuberculosis patients.



Fig 5 Ancient hall of the Sanatório dos Ferroviários. Source: *Gazeta dos Caminhos de Ferro*, nº 1398, 1946.

[10] In 1945, the ANT was nationalised and received a different name, that of IANT, standing for “Instituto de Assistência Nacional aos Tuberculosos”.

The Covilhã Sanatorium would receive thousands of patients coming from all over the country, for forty years. Even though it welcomed patients from all social classes, the less favoured did not accede to all the aisles, some of them, with more comfort, were dedicated only to the well to do classes.
The sanatorium infrastructure originally meant to offer around 170 beds, has later found the place for 284 beds, only when the sanatorium passed definitely into the guardianship of IANT.
When chemotherapy was a generalized anti-tuberculosis treatment, there was a tendency to close the most retired from the urban centres and less profitable sanatoria. In urban centres, there were by then many little units, known as the "dispensaries", used as a different form of fighting the illness.



Fig 6 Room with private gallery in the Sanatório dos Ferroviários. Source: *Gazeta dos Caminhos de Ferro*, nº 1398, 1946.

Finally, in June of 1969, after a dispatch from the Health and Assistance Ministry, publishing the order to shut permanently the sanatorium, the closed building continued kept in order and maintained in good habitable conditions by two civil servants employees. This situation lasted until de time when, in the mid of the seventies, it came to receive a group of around seven hundred individuals that came from the former Portuguese colonies, by the occasion of the decolonization and independence of the same, after the revolutionary process that followed the 25th April 1974. Only when it served as a temporary residence for these Portuguese citizens did the building suffer from considerable deterioration and enter a state of partial ruin. From the period these occupants entered the building, until 1980, the so-called Sanatório dos Ferroviários (or Covilhã Sanatorium) was in the guardianship of the Institute of Assistance to the Return of Portuguese Citizens (IARN).[11]
By the end of the decade of 1980, with evident signs of decay and abandonment, after having entered a noticeable state of decay, the building passed onto the responsibility of Turistrela, an official institution related to the region's tourism. Later on, in 1998, the building was sold to ENATUR (a national enterprise of tourism units) for the symbolical price of one Escudo, the contract having as a condition the compromise of that enterprise to convert the infrastructure into a "Pousada de Portugal". The project, commissioned to the architectural studio of Eduardo Souto Moura (Pritzker Price laureate of 2011), would represent an investment of two million Euro.

3. Souto Moura intervenes, rehabilitating the massive structure of the ruin

Still at the end of last century, in 1998, the Portuguese Prime Minister António Guterres announced the purpose of the Govern to encourage the initiative of the rehabilitation of the ancient and iconic building into a hotel program, in the sense of transforming it into a "Pousada". In 2001, the Municipality of Covilhã announced that the architect Eduardo Souto Moura would develop a project, according to a commission by ENATUR, using the former Penhas da Saúde Sanatorium (Covilhã Sanatorium, or Railway Workers Sanatorium) ruins from the eighties decade. Its budget for would be close to two million Euro, the highest investment done in the region in a touristic program.
The process of partial privatization of ENATUR, contributed to the adjournment of the concretization of the project for lack of financial viability. The Pestana Group which had acquired the passive of ENATUR, decided not to go through with the initiative. Having ceased the contract in 2004, the sanatorium's ownership passed once more to Turistrela.

[11] IARN stands for "Instituto de apoio ao Retorno de Nacionais".

Only in 2008, there was a new decision for the implementation of a hotel program in the ruins of the so-called Sanatório dos Ferroviários[12], according to a contract signed between the national secretary "Turismo de Portugal" and the hotel group Grupo Pestana. Both parties subscribed altogether the interest of applying to the funds of QREN[13], for the building of three new "Pousadas", on national territory, among which the former Sanatorium.



Fig 7 Pousada da Serra da Estrela. Eduardo Souto Moura (2001-2014). Grupo Pestana. Source. © Grupo Pestana..

The rehabilitation of the Sanatorium and its subsequent transformation into a "Pousada" would be evaluated under two different criteria: its functional level, because it was used to bring life to another building and aesthetical, for it implied a requalification of architectonic nature, through the preservation of the features of Portuguese architecture from the 20th century.
The main intention of Souto Moura would be that of maintaining the atmosphere and environment of the structure built in the Estado Novo regime period, through its restoration and using an approach different from the one that he had adopted earlier. That was the case of the intervention in the ruins of Santa Maria do Bouro Monastery, in the northern region of Gerês Natural Park. In this other case, the ruin allowed for a bigger degree of freedom in the design options.
The aim was to recreate the existing architecture, through the maintenance of what still had a story. "In terms of materials, they were keeping those which already existed, at least at the level of the public areas of the bigger halls", as Souto Moura explained. "We are going to choose a colour hydraulic floor tile because it existed here. They had access to all its material. Souto Moura chose the exterior colour, a salmon pink, according to the original colour of the Sanatorium



[12] The Sanatorium is nowadays classified in the category of IM standing for "municipal interest" by dispatch of the IGESPAR director on the 8th may 2009 and ulterior Edit by Covilhã Municipality published on the 28th July 2009.

[13] QREN: Quadro de Referência Estratégico Nacional. From 1986 on, year of the adhesion to the UE, Portugal was entitled to European funds for supporting regional politics.

Fig 8 Pousada da Serra da Estrela, Eduardo Souto Moura (2001-2014). Grupo Pestana. Source © Grupo Pestana.

As for the rooms, the features of the thirties interiors were kept. They had photos to help with the equipment design. Fr the bathrooms there were still some materials that were compatible to the original ones.
The budget of a restoration work is not inferior to that of a work done from origin, since what is available and integrates a heritage constrains the options and determines the use of certain artisan details and the use of non-conventional materials, with a type of specific workmanship, which makes the budget rise above current market prices.
The architect did not find any programmatic incompatibility between a new hotel and an ancient sanatorium. He proposed an integral restoration of the structure, having into consideration "All the lexicon of the materials, comprising the colours and the exterior mortars, the double window framing in Nordic pine, the Estremoz and Beja marble pavements, the polished hydraulic tiles, the *azulejo* tiles and their stereotomy, cork pavements and wainscotings."

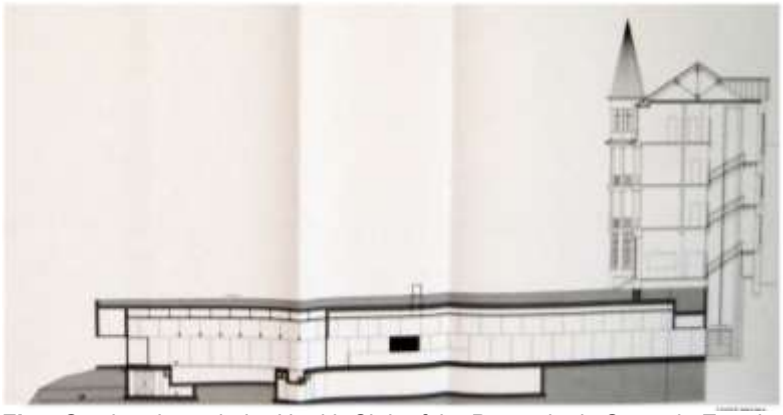

Fig 7 Section through the Health Club of the Pousada da Serra da Estrela, and the ancient building. Eduardo Souto Moura Studio, Oporto, 2001, 2009.

There was only one exception to the concept of integral restoration related to the roof. The idea was redesign the roof in order to build a wooden structure similar to the existing one, with the difference of previewing a under tile with thermic insulation, since the new tile to be installed would have a fixation with screws and the external tiles would have copper fixating elements.
In what regards the number of rooms, the client proposed to convert the initial number of 60 into 95. This alteration was managed though the reduction of the area of some of those rooms. Some of the foreseen suites transformed into rooms; the vertical accesses transferred into protruding volumes in the rear façade; the amplification by two floors of the volume in that same façade; as well as the employees' rooms passed onto a subterranean volume, under the entrance.
The rehabilitation was achieved in a consentaneous form with the existing natural and human elements, so that the infrastructures to introduce such as the parking space (subterranean and designed for 50 cars, with direct access to the Pousada"), along with the Health Club, cannot be seen and are morphologically integrated, not interfering with the landscape. The latter, set in a block made of concrete and glass, is equipped with swimming pool, gymnasium and jacuzzi is set along the slope. Finally, after some little alterations required by the client to the licensed project, the "Pousada da Serra da Estrela" inaugurated in the 1st April 2014.

4. Conclusions

The etymology of the words "hospital", "hotel" and "hospice" is very close from the latin "hospitalis", "hospitale", "hospitium". It means a place where someone "is taken care of". The typology of alpine *Sanatoria*, - very close to the image of a hotel,- was transferred to the examples of *Sanatoria* that were built in Serra da Estrela, our equivalent of the alpine mountains situated between German, Austrian and Swiss territories. The Alps were, during the Grand Tour avoided for the difficulty of access and rigorous climate conditions for many months all year round. The cases of climate therapy for lung tuberculosis in Portugal were several all over national territory, but in Serra da Estrela we can distinguish two cases projected by two relevant Portuguese architects: Raul Lino and Cottinelli Telmo: *Guarda Sanatorium* and *Covilhã Sanatorium*. Both of them suffered a different fate. Covilhã Sanatorium, which is the case we have studied, - after being shut for more than thirty years, - was rehabilitated and converted into a hotel, the "Pousada da Serra da Estrela", by a third remarkable architect, Eduardo Souto Moura. He chose to respect the original eclectic language of the Sanatorium that rose from start above the landscape, as if it were a huge "mountain hotel", with its main façade turned to South.

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The case albergo built in northern Italy in the 1950s-1960s: An example of resilient housing

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Abstract
Temporary housing solutions for common use highlight the renewed interest of users, designers and public authorities to the present day, as also shown by the many examples of cohousing. This type of resilient housing proves to be suitable both to face the users' accommodation demand, and the socio-economic and health vulnerability of traditional residential models in case of crisis situations, such as the effects of the Covid-19.
This paper investigates some examples of temporary houses realized in Italy in 1950s-1960s: *case albergo* designed by Luigi Moretti (1947-51) and the Fara Tower of Luigi Mattioni (1959-60) in Milan, the Cantore Tower (1964-66) in Genoa and *casa albergo* d'Azeglio (1967-69) in Turin built by the Società Generale Immobiliare (SGI). These cases of temporary housing, built to deal with the changing housing market demand in the post- World War II period, can also be considered as best-practices for contemporary design. The *casa albergo* building type was a flexible resilient housing solution, suitable for new lifestyles: the goal of clients, designers and construction companies was towards evolved practices for building production and management, based on the prediction of costs and time for construction.
This study analyses the *case albergo* highlighting the elements of typological innovation and construction experimentation and presenting the original aspects of the management of design and building process.

Keywords: Temporary houses, *Case albergo*, Italy, XX century

1. Introduction
The Italian building framework starting from the second post-war period was characterized by "three waves of building demand". The first corresponded with post-war reconstruction; the second (1970-90) was characterized by an increase in comfort standards; the third (2000-2015) coincided with the development of environmental sustainability issues [1]. Today's transformations of the social and economic framework, combined with the vulnerability of welfare and, finally, the inadequacy of current housing models in the face of the COVID 19 pandemic crisis, demand a further evolution of housing towards resilient and flexible architecture. In this context, collective residence is affected by new architectural research. Current studies have a cultural background that developed in the twentieth century, which we intend to investigate in this paper with reference to temporary collective residences built in Italy in the 1950s and 1960s. The relevance of the theme of temporary collective housing is attested by a state of the art that – despite the extensive theoretical debate and prototypes developed – delayed giving a widespread response to the demand for temporary spaces with a quality comparable to the standards of permanent residences [2].
In the last two decades, temporary residences in Italian urban contexts have consolidated recurring features that characterize the complexity of the phenomenon [3,4]. Temporary residences are divided into types related to the transience of the building, its conditions of use and users. This paper considers the third class (transience of the user), in which flexibility, adaptability and maintainability are the prevailing characteristics of the design and construction choices aimed today at creating resilient buildings [5].

The analysis of some 20th century Italian experiences realized in the economically and socially more dynamic areas can enrich knowledge of the topic, considering the evolution of technologies and the organization of building process connected to the development of this architectural typology. In this study, by examining the existing literature, some cases are analysed starting from the consideration of the elements of typological innovation and construction experimentation. The survey aims to present aspects which, to date, have been less studied and which concern organization of building design and construction process. The examples, studied on the basis of archival documents of designers and companies, are the *case albergo* by Luigi Moretti (1947-1951) and the Fara tower by Luigi Mattioni (1959-60) in Milan, the Cantore tower in Genoa (1964- 66) the *casa albergo* d'Azeglio in Turin (1967-69) by the Società Generale Immobiliare (SGI), an important holding in the building sector, that operated in Italy throughout the 1900s.

2. Temporary collective housing in Northern Italy (1950-1960). Aspects of typological innovation and construction experimentation

Housing - one of the crucial issues of post-war reconstruction - emblematically crossed the building scene of the major Italian cities, such as Milan, Turin, and Genoa. The typological and technological experimentation formed the characters of the most original episodes, defining tools and paths useful for codifying new living spaces, capable of responding to the housing demand deriving from the destruction caused by the war and the significant migratory flows from southern Italy towards the industrial areas of the country.

The national debate was animated around the reconstruction programs, considering the options of private intervention and public action [6]. The socio-economic needs of those years, which identified the construction sector as one of the agents of economic recovery, guided public interventions, of which the Ina Casa Plan represented strategies and implementation practices. Some key events marked the choices made in the construction sector. Referring to the Milanese area, which represented the most active and enterprising context, it should be remembered that in 1945 the 1st National Conference on Reconstruction was held in Milan, during which the themes of prefabrication and industrialization of construction techniques were discussed. The competition for prefabricated houses launched in the same year by the National Research Council (CNR) was related to this event; its results were exhibited in Milan. In 1947, after the pause imposed by the war, the Milan Triennale reopened with its VIII edition which was dedicated to the housing question. Despite the theoretical debate, the spread of innovative construction techniques was delayed. The socio-economic condition of the country and the government's planning guidelines suggested the substantial preservation of construction tradition and of the artisan organization of the construction sector. This policy also limited typological renewal. Social housing programs favoured apartment buildings as the prevailing scheme for the needs of the traditional family nucleus, although the evolution of the country's manufacturing sector and migratory flows promoted lifestyles alternative to this social model. The Milanese case was an example of this evolution and constituted an exception for the aspects of typological innovation [7,8], also witnessed by the experience of *case albergo* which, although limited, was decisive.

The *case albergo* were aimed at temporary users, such as single workers and young couples, living in the Lombard city for a short time, requiring modern homes and quality standards of spaces and services. The designers reserved original typological schemes for this user, which spread from Milan to Turin and Genoa. From a construction point of view, the characters of the modular layouts of *case albergo* favoured the typification of construction elements, placing these buildings among the cases of standardization that preluded the subsequent developments of the construction industrialization of the 1960s. The geometric standardization of the construction elements was, in fact, a widely debated topic in Italy after the Second World War and for many scholars and designers, in the phase of the reconstruction and in the 1950s, it represented a valid alternative to the industrialization of the building sector (difficult to implement), and to prefabrication, considered in many cases expensive for the national context [9,10].

2. *Case albergo* by Luigi Moretti in Milan (1947-1951)

The *case albergo* built in Milan by Lugi Moretti (1906-73) were part of the realizations that stood out as singular episodes due to typological innovation and construction experimentation. Moretti presented the project in the *Bollettino della Mostra Permanente della Costruzione* (Bulletin of the Permanent Construction Exhibition), which opened in Milan on 15 July 1946 promoted by the *Organizzazione Cantieri*, an agency that was part of the *Centro Industriale Lombardo per il Coordinamento dell'edilizia* (Lombardy Industrial Centre for Building Coordination).

Moretti presented the project of the *case albergo* to the Milanese city administration in November 1946, defining it as "the most technically and socially advanced housing". The project was approved on 27 February 1947, and the agreement was signed with the Municipality.

The program included the realization of 22 *case albergo* placed in a circle in the urban area, for a total of 2700 dwellings and 3000 bed units. *Case albergo* were destined for workers belonging to different

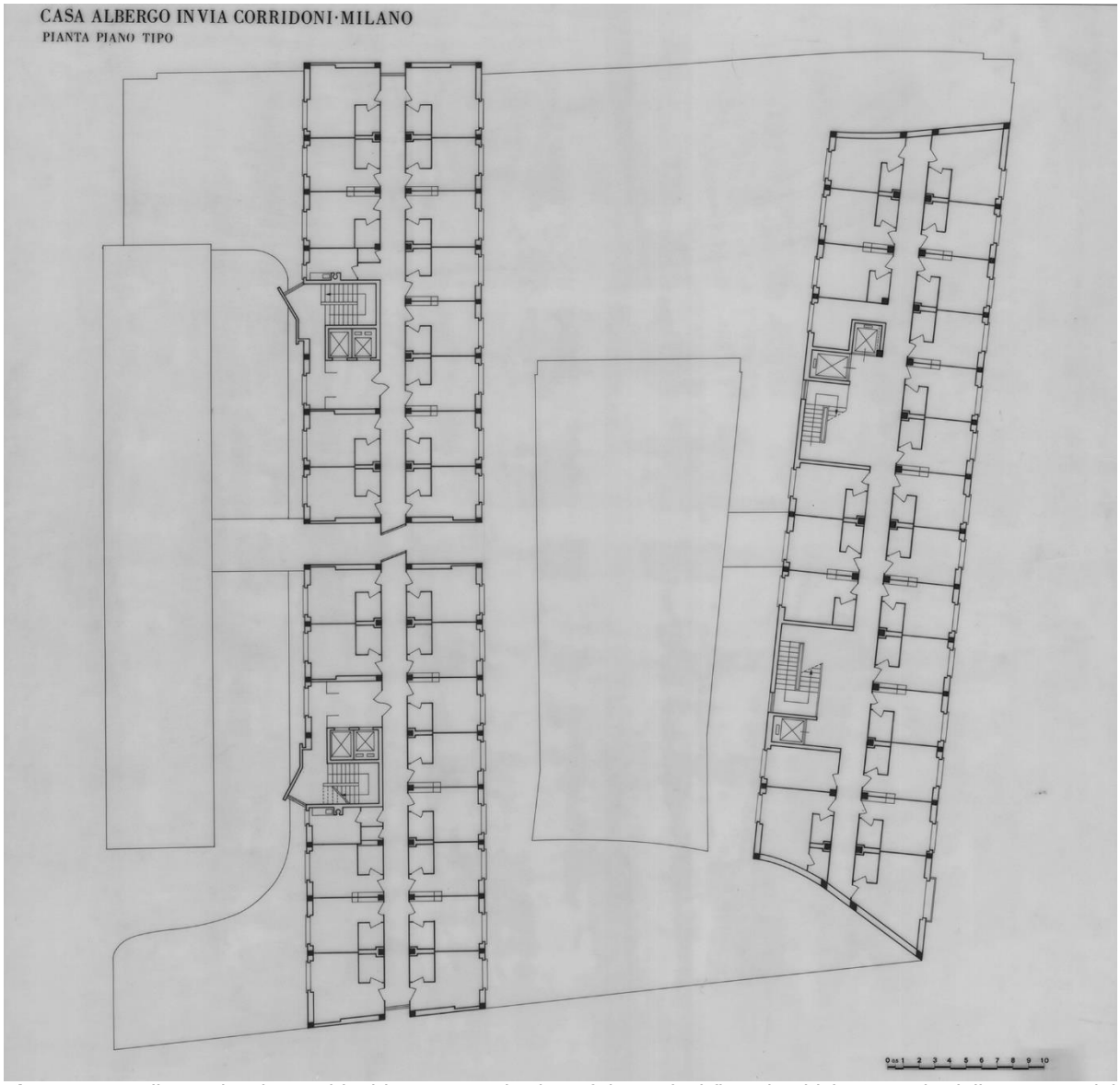

Fig. 1: Casa albergo in Via Corridoni by L. Moretti. Plan of the typical floor (Archivio Centrale dello Stato, Luigi Moretti Collection, Rome. Courtesy Ministero per i beni e le attività culturali, Rome. ACS-Moretti).

social classes, to provide accommodation with modern services at a contained cost. The program started with the construction of three houses, located in via Bassini, via Corridoni and via Lazzaretto.
The initial design of the *case albergo* was based on a scheme, that was repeatable and adaptable for different configurations, consisting of a group of multi-storey buildings (with two-three-four levels and 100-120 rooms for each building), arranged perpendicularly to a covered path that connected the blocks to the common services building. Rooms were served by a central corridor.
The three realized buildings depart from the project proposed by Moretti in 1946, while preserving its key points. The house in via Corridoni was distinguished by the majesty of the complex. In the buildings in via Bassini and in via Lazzaretto the height of the volumes was reduced and the distinction between residence and services was resolved with the introduction of a platform reserved for services [11,12].
The house in via Corridoni included two buildings (12x60 meters), arranged according to the north-south axis on an area of about 3600 square meters (Fig. 1). The lower block, six stories high (122 rooms), was for female graduates, while the second (twelve floors and 186 rooms) was reserved for men. A low building, that housed the entrance lobby, connected the two volumes (Fig. 2).
In Moretti's policy, the common facilities - library, restaurant, bar, post office, telephone, tailoring, sauna, and gym - characterized the *casa albergo* as an urban microcosm, highlighting the combination of the two elements of the complex: the private repeatable housing unit and the collective space system. The residential private unit had an area of 16 square meters and included an entrance, bathroom, living room, closet, and a small kitchen space.
The construction characters of the buildings were influenced by the Italian construction context, in which sector industrialization proceeded, as mentioned, slowly. In the building in via Corridoni, the reinforced

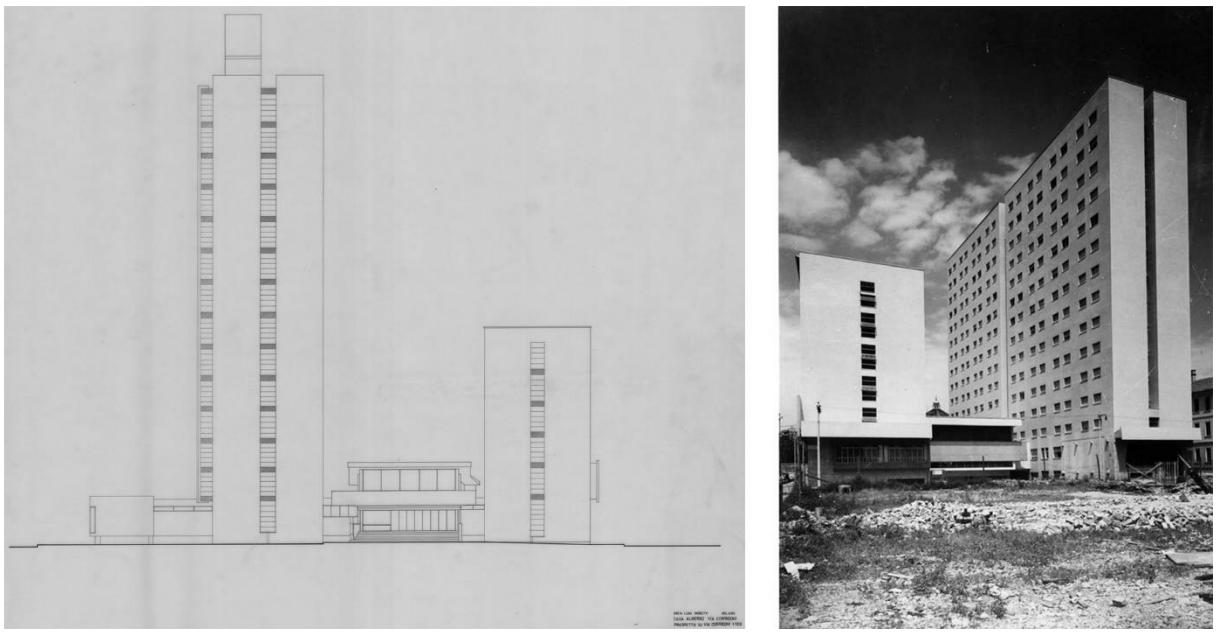

Fig. 2: Casa albergo in Via Corridoni: elevation (on the the left), under construction (on the right). (ACS-Moretti)

concrete frame structure was associated with masonry walls covered with a white glass mosaic (Fig. 2). What distinguished Moretti's buildings, and the house in Via Corridoni in particular, was the typification of the geometries of the spaces and therefore of the construction elements (beam spans, pillar sections, dimension and position of the windows). Innovation was, therefore, defined in the management of the process, in the method rather than in the means used to contain time and costs of construction [12].

The interest of Moretti's plan referred in particular to the planning and management phase of the intervention, aimed at reacting to the evolution of housing demand towards models that could not be solved with traditional building processes. Through the program of *case albergo*, Moretti considered a field of the real estate market not arranged in typological terms, indicating a socially evolved and effective building response. The architect, in fact, suggested a flexible and temporary use of houses, corresponding to the socio-economic changes that occurred in the Milanese context, completing "the chain of dwelling types in relation to family and social conditions" [13] and, whilst enhancing the collective dimension of the overall functional program of *case albergo* [14]. The plan of the Roman architect was innovative in relation to the extensive production of Milanese residential buildings and neighbourhoods of that period (referred to the traditional and permanent family structure) such as the Varesina neighbourhood designed by Diotallevi and Marescotti (1945), the Mangiagalli neighbourhood by Marescotti, Carbonara and Gandolfi (1946-50), or the first phase of the Ina-Casa program.

The program was promoted by Moretti through the *Compagnia Finanziaria per le Imprese di Costruzione e Ricostruzione* (Cofimprese), a company founded with Adolfo Fossataro in 1946 and addressed to the financing and execution of works in the building, road, and rail sectors [11]. Moretti and Fossataro supervised relations with public agencies and banks, while the architect developed the project with the collaboration of the three working groups included in the structure of the company (technicians specialized in financial and economic aspects, legal and administrative staff; engineers and architects; experts in the management of construction companies). The Cofimprese structure was aimed at managing the entire building process, from financial planning to building design and construction. Construction, economic feasibility and overall quality of the work merged with the architect's design skills, prefiguring a consequent organization of the design-construction process.

Moretti, confident that "reconstruction requires plans and capabilities to organize, coordinate and guide the various building-related interests" [13], introduced a technical and financial structure model that updated traditional architectural office organization, merging conventional design tools with the management of processes and resources. This method included the reorganization of the building process as a precondition for the implementation of an effective reconstruction. This circumstance revealed the architect's interest in "technical-industrial organization for the construction of building complexes", and which was confirmed in the definition of Cofimprese as a "technical-financial organization for reconstruction" [11].

The context in which Moretti and Fossataro worked was marked by the difficult reopening after World War II of public administration activities, which affected the time and cost of the program. Originally, Moretti’s plan included twelve months of construction and a cost of 900 million Italian Lire (ITL). Finally, it took approximately three years and three billion ITL to complete the three buildings, while the remaining part of the plan was not executed. The partial success of the program did not affect the

interest of the initiative, which was unique in terms of programmatic value in the Milanese framework. Effectively, the general organization and the definition of functions within Cofimprese were still being tested, while the plan started. Moretti guided all design decisions, the choice of materials, the definition of technological systems, pursuing a difficult balance between the innovative concept of "technical-financial organization for reconstruction" and the typical *modus operandi* of the traditional designer that characterized the Italian context of the time. This aspect affected the rational organization and the management initially proposed by Cofimprese, contributing to the delay in the implementation of the program. In any case, for the purposes of this analysis, the *case albergo* represent a significant experience for the innovation of the method, despite the partial application. The case demonstrates the compatibility of temporary residences with high architectural and construction quality standards comparable to those of permanent buildings and suggests the need for process innovation in the approach to the theme, requiring the updating of methods and project techniques, with an extension of the disciplines and technicians involved.

3. SGI's *case albergo*. Cases in Milan, Genoa, Turin.

The Milanese *case albergo* built by SGI in the 1950s were part of the high-building design and construction research developed in the city. Although the SGI was mostly busy in the construction of residential complexes in the 1950s and 1960s, it embarked upon the *case albergo*, responding to this market demand born in Milan in the 1950s, exported to Genoa and Turin in the 1960s. Unlike Moretti, SGI viewed the *casa albergo* theme as a prestigious housing solution, especially intended for the executive class in Milan for work. Therefore, the SGI set part of its tower building for the *casa albergo*.
As is well-known, Milan was probably the Italian city with the most innovative design and building approach after the Second World War [14]. Construction of tower buildings was the most important experience in the urban space, particularly in the urban voids as a result of the bombardments during the war. Tower buildings had no references in the history of Italian construction, however they were appreciated by the executive class as symbol of a new, hopeful, horizon in the Post-war period [15].
This type of construction had spread in Milan in the 1930s (e.g. Rasini Tower in Porta Venenzia in 1935 and Snia Viscosa Tower in San Babila square in 1937); it resumed after the World in the early 1950s (e.g. Breda Tower in Repubblica square in 1954). However, symbolic Milanese towers were built in the second half of 1950s: Velasca Tower (1955-57), Pirelli Skyscraper (1956-61), Galfa Tower (1956-59). Two of these (the Velasca and the Galfa) were built by SGI, through its subsidiary construction company Sogene; they were the first of other SGI enterprises in tall buildings, even if on a smaller scale.
Between 1959 and 1960, near via Fara and via Filzi, the SGI built a complex of two 18-storey towers (60 meters high). The location is strategic: in the heart of Milanese headquarter, near the Central railway station, close to the Pirelli Skyscraper. The east building (Filzi Tower) was designed by architect Alziro Bergonzo (1906-1997); it was intended for prestigious apartments (n.28) on the upper floors and offices (n.10) on the lower floors as well as shops (n.7) and garage (n.120 parking spaces). The west building (Fara Tower) was designed by architect Luigi Mattioni (1914-1961) entirely intended for *casa albergo* (Fig. 3); the interior design was architect Angelo Ostuni [16].

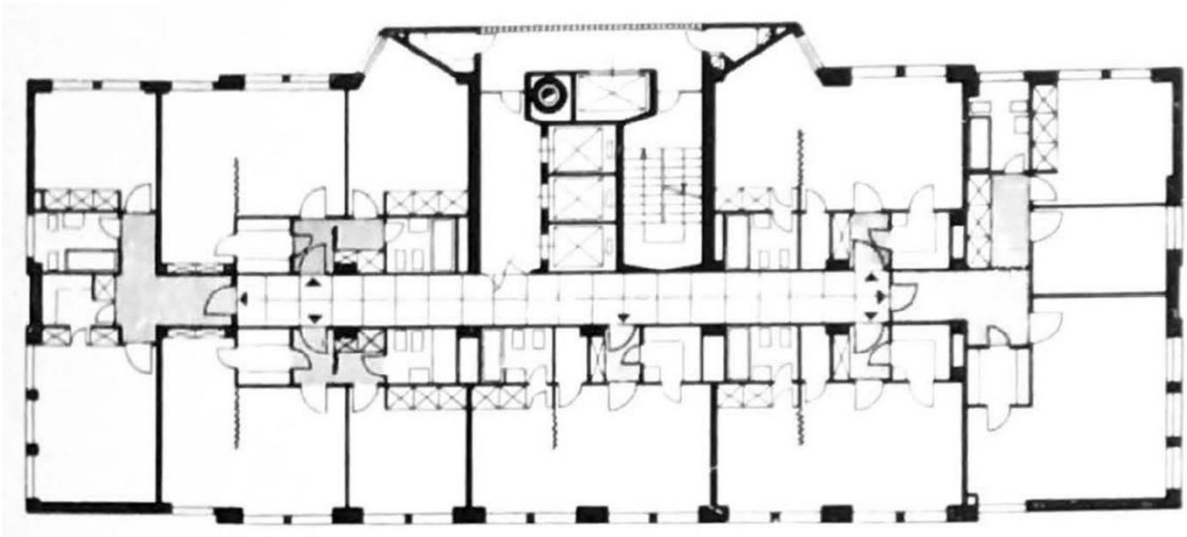

Fig. 3: The Fara Tower in Milan by L. Mattioni. Plan of the typical floor (Archivio Centrale dello Stato, SGI Collection, Rome. Courtesy Ministero per i beni e le attività culturali, Rome. ACS-SGI).

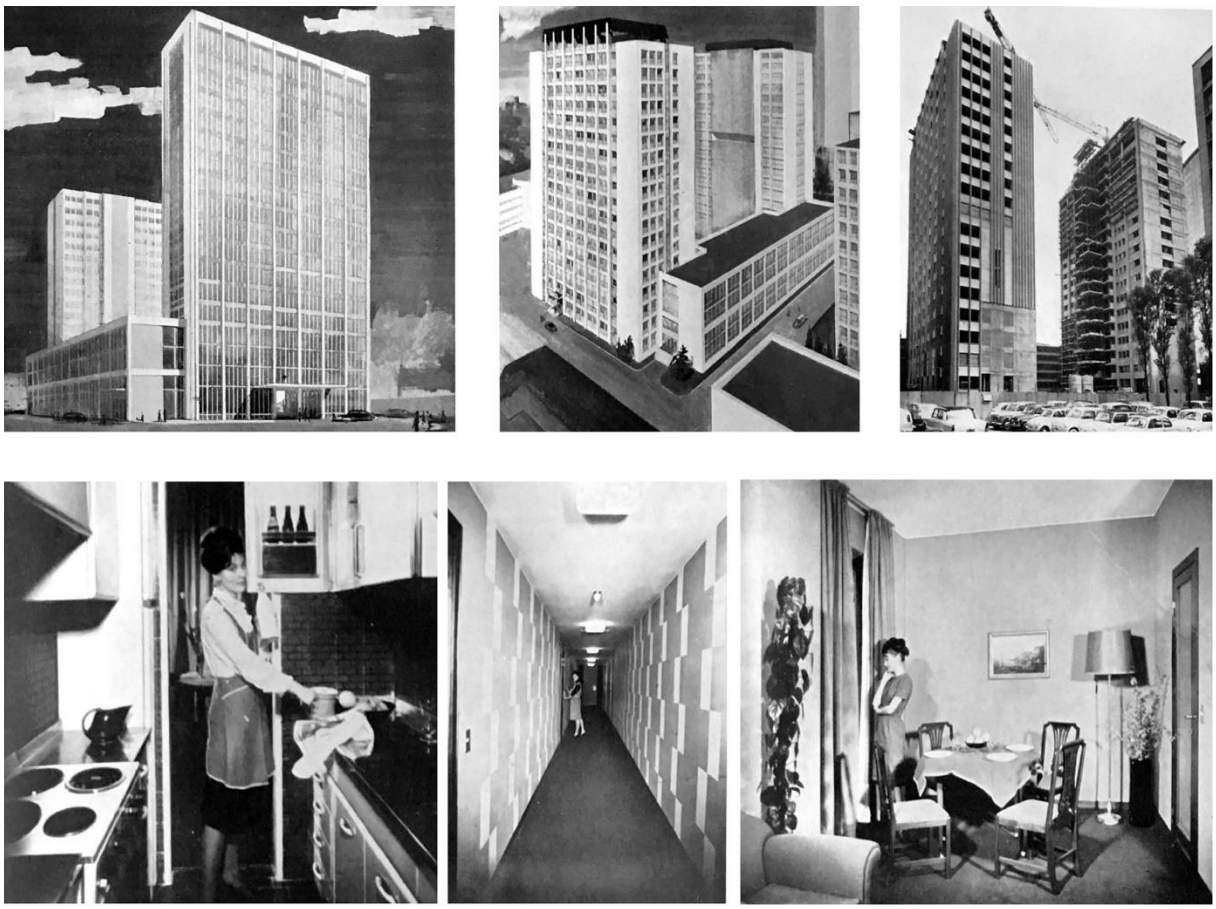

Fig. 4: The Fara Tower in Milan. On the top: design model and the building under construction. On the bottom: photos of the interiors. (ACS-SGI)

The Fara Tower was formed by small flats with a tiny kitchen (not for daily use, clearly), a bathroom, a spacious living room (useful also for small meetings) divided by a light partition from the sleeping area (in the smaller flats) or by a wall in the bigger ones (Fig. 4).
Curtain walls on primary façades gave the formal image of the towers; structural vertical lines characterize the volumes, in the midst of which the panels are fixed. They were entirely glazed in the Filzi Tower; in the Fara one they were traditional, made by glazed and matt parts. These design choices gave a valuable image, likewise to other buildings in the Milanese skyline of the same period.
Although not intended for *casa albergo*, SGI should have realized a complex in Loreto square partly for a hotel. The client was Alberghi Ambrosiani S.p.A., the project was traced since 1963 [17]; it was never realized due to events related to the land purchase [18]. Also in this case, a tower would have been the main volume of the complex; it should have had entirely glazed facades, designed by Melchiorre Bega (1898-1976) and Luigi Mattioni's office (1914-1961). The building is now listed in order to highlight SGI's care for prestigious accommodation solution in a Milanese headquarter, close to the Central station, linked to Fiera Campionaria district.
SGI pointed to different users compared to those to which Moretti's buildings were aimed: the Company was interested in people who stayed in the northern cities for work. For short or medium periods, SGI picked up this marked demand through a specific line of building production. The Milanese approach was similar in Genoa and Turin.
Cantore Tower in Genoa was another SGI's building, partly reserved for *casa albergo*. In the city, the SGI realized residential suburbs (like Valverde in via Piaggio), residential complexes (like Park Riviera in Quarto), multifunctional buildings (like in Rossetti square). Among the latter this is an achievement in the Sampierdarena district in via Cantore: it is the 22-storey Cantore Tower (in addition to an 8-storey building) for flats, offices, shops and *casa albergo* (Fig. 5). It was designed by architect Renzo del Debbio and built by Sogene between 1967 and 1970 [19]. As in Milanese cases, the building was located in harbour area, near highway exits, well connected to the city center; likewise, SGI realized a *casa albergo* in a tower building. It was a new landmark in the harbor, a strategic city access point. As in the Fara Tower, the plan of the building shows unique or separated living and sleeping areas and services (kitchen and toilet). Also in this case, the façade building shows vertical lines given by the structure in the foreground and the curtain wall in the background. This is an artifice used only for the tower: in fact

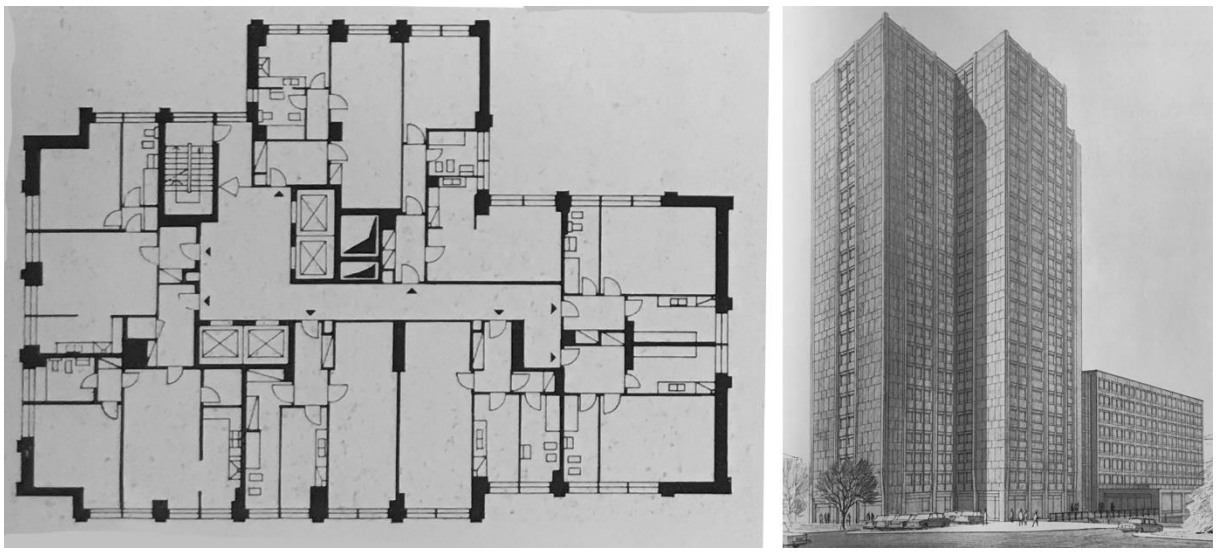

Fig. 5: The Cantore Tower in Genoa by R. del Debbio. On the left: plant of a *casa albergo* floor. On the right: drawing of the building (ACS-SGI)

the 8-storey building next to it has traditional façades characterized by a simple masonry wall interrupted by the window empty spaces.
In the 1960s, SGI also had a strong work presence in Turin. In this city SGI built wide economic residential buildings (e.g. the Sangono-Po complex in via Moncalieri and that one in via Taranto), elegant residential buildings (e.g. Turin Park complexes, in via Cosenza and via Oberdan). Furthermore, in via Massimo d'Azeglio the SGI built two prestigious constructions. Between 1965 and 1966 it realized a so called "*palazzina*", that is a very elegant residential building [20]. Later, between 1967 and 1969 SGI built a complex of two buildings for housing, offices, shops and *casa albergo* (Fig. 6); the client was SIAM (Società Italiana Alberghi Moderni) [21]. This construction is in front of Torino-Expo (Salone dell'automobile); the main building is as long as the site (75 meters long), 35 meters high, so it is characterized by a linear plant. The *casa albergo* apartments had one or two rooms and a bathroom without kitchen (Fig. 7). Also in this case, vertical lines marked the facades.
In the three cities mentioned in this study, there was a similar design approach: prestigious constructions in business districts of the cities, tower buildings in Milan and Genoa partly reserved for *casa albergo*, bigger sizes than Moretti's houses.



Fig. 6: Building in Via Massimo d'Azeglio in Turin, designed by SGI for SIAM. (ACS-SGI)

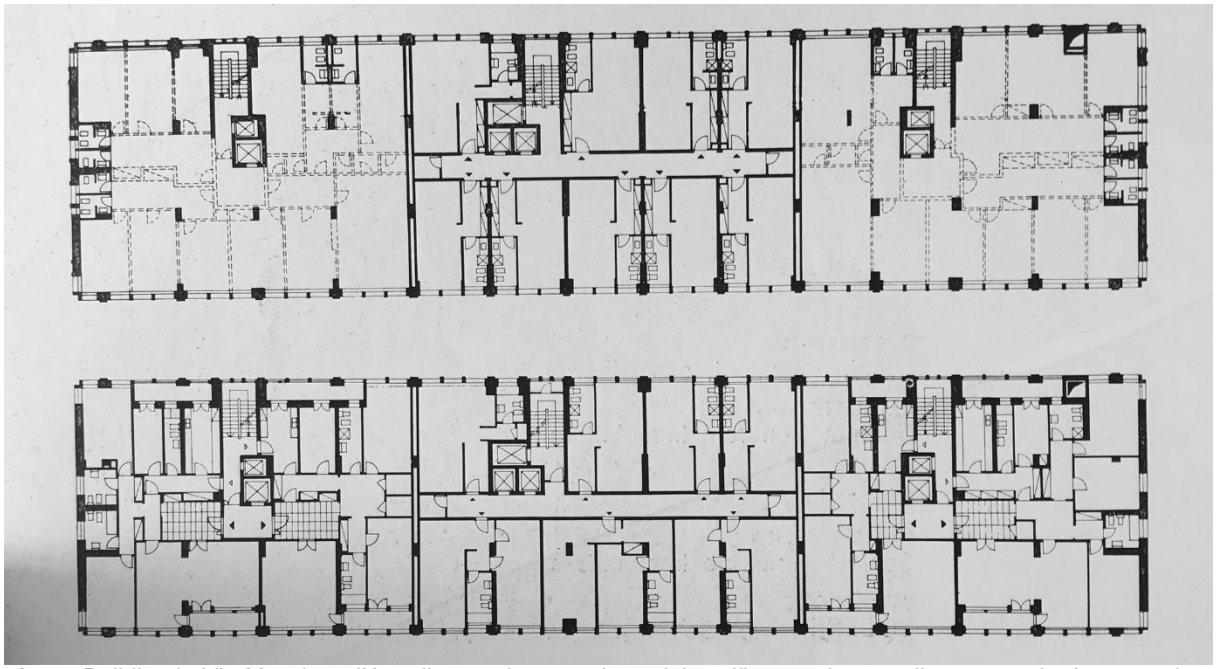

Fig. 7: Building in Via Massimo d'Azeglio. On the top: plant of the offices and *casa albergo*. On the bottom: plant of the apartments and *casa albergo*. (ACS-SGI)

The organization of the design and construction process was entirely managed by SGI through its organization chart. SGI's "in house" management offers positive results: the design process was supervised by the internal technical office, Sogene supervised the building phase, the SGI holding oversaw the building management. SGI had a strong organization chart, therefore it was more able than Cofimprese in the difficult Postwar period.

4. Conclusions

The analysis conducted allows us to highlight some aspects of innovation introduced by the experiences of *case albergo*. From a typological point of view, the buildings, considering the evolution of the socio-economic context, developed a temporary living space with comfort and construction quality, even if intended for different users. In fact, SGI aimed its realizations at businessmen who were looking for a temporary residence with high levels of comfort. Therefore, the layout of the SGI buildings was not constituted of housing units as in the case of Moretti, but of rooms with larger areas, in some cases even with a living zone. The Moretti *case albergo* updated the system of "landlords" for single people, while those of the SGI were an improvement on the classic "hotel room" required by businessmen. Moretti's vision, however, was more prophetic in evaluating social transformations and emerging housing needs. On the other hand, the typological evolution conducts, in both cases, to a concept of functional *mixité* that combined the temporary housing with a system of facilities and common services aimed at creating an urban microcosm within the residential complexes. However, unlike Moretti's *case albergo* which were organized in specific buildings, SGI integrated this typology of residences within multifunctional buildings, realized in the business areas of large cities. SGI's solutions were not standard typologies, but unique buildings, designed case by case, taking advantage of the typology of the tower. From an organizational point of view, in both cases the propensity to manage the entire design and building process of *case albergo* emerged, using internal technical departments. The SGI model was more experienced and close to the mission of a construction holding company. In the case of Cofimprese, the pioneering dimension of the organization, the still unstable balance between the traditional professional *atelier* and the multidisciplinary technical-professional division, established on the rationalizing of procedures and resources, were conditions that penalized Moretti's program. In any case, the social premises and the proposed typological model, the search for global quality of the temporary residence, equipped with comfort standards comparable to those of permanent buildings are aspects of the past experiences which are still current, suggesting original elements for the contemporary evolution of the design issue.

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The Roman road "per colles" between Puteoli and Neapolis. The drawing of some testimonies

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Abstract
The road connected Puteoli to Neapolis passing through the hill of Vomero, taking the name "per colles" road. Before reaching the hill, the road went to the port of Naples through the crypta neapolitana, a road branch directly connecting Puteoli to the coast of Naples. During 100 A.D., the name of the "per colles" road was Antiniana and it measured about 10 miles. There are some traces of the ancient basolato of the Roman road along via Vigna in Pozzuoli, inside the Mostra d'Oltremare, in Fuorigrotta, and along Via Terracina, near a thermal building whose ruins are preserved in an archaeological area. In via Vigna in Pozzuoli, there is a small portion of stone flooring, nowadays confused with the road surface and probably it's the initial stretch of the "per colles" road. Moreover, along the road's ancient path, there are some artifacts and ruins of a colombario in *opus reticulatum* in a state of neglect, while on the hill of the Vomero there are ruins of a wall structure with arches belonging to either an aqueduct or a viaduct. Through the tools of the representation and the digital detection, the contribution documents critically some stretches of the Roman road in order to testify the presence on the territory of goods that constitute the identity of a community and a place. Thus, they should also be properly preserved and protected as sustainable goods.

Keywords: road "per colles", stone paviments, struction from motion, digital detection

1. Introduction
The crisis generated by the Covid-19 pandemic threatens to strengthen the culture of emergency that makes territories and cities even more fragile. The investments planned for an economic recovery must also follow a multidisciplinary and systemic logic on which to base the governance of the territory, through an integration of skills. We can respond to the culture of the emergency also supporting local cultural diversity by optimizing maintenance processes to survive a cultural heritage that can still be the protagonist of new scenarios for the future of our planet. To maintain the patrimony should be a priority objective to reach not only with normative and procedural instruments but also and above all through the drawing and the survey that represent the base of plans of knowledge. These projects can improve the use of urban and architectural sites encourage conservation and restoration to project into the future the testimony of ancient civilizations. Road construction, for example, has played and still plays an important role in the development of a country. Therefore, ancient roads can be an important reference point in order to read the history of a territory on which to base new sustainable development projects.
This is the case of the Roman road "per colles" that connected in Roman times Pozzuoli with Naples passing through the hills of Vomero [1], of which still visible today, between neglect and abandonment, some stretches and ancient infrastructure along its route. The paper contains the first results of a research included in the National Research Project, Prin 2017, "Stone paviments. History, conservation, valorisation and design", and documents, based on the finding of documentary sources and through the tools of drawing and survey, some of the stretches of the Roman road, which still retain the original *summum dorsum*. The aim of this research is to carry out, through a comparison between digital models, the return of the original design of the paths and the respective stone consistency.

2. The road "per colles"

The literature on the roads of Roman times between Pozzuoli and Naples is wide and there are several news about the routes. Numerous archaeologists have studied the Roman road “per colles” which in the Rome-Naples route connected Pozzuoli with the city of Naples, passing through the hills of the city. We remember Charles Dubois, Domenico Mallardo and Johannowsky Werner [2] [3] [4]. The road was also called "via Antiniana" or "via Puteolana", while the official Latin name, also reported in historical cartography, is "via Puteolis Neapolim" that is "road from Pozzuoli to Naples". Along the 10-mile route, according to historical sources, some milestones have been found, and then lost; the only survivor is at the Archaeological Museum of Naples. Almost all archaeologists admit the existence after Agnano of two road trunks that both reached Naples, one of which crossed the hill of Vomero and the other, passing through the Neapolitan crypt, bordered the coast. Some, including Della Valle and Mallardo, also claim a split between Soccavo and Antignano. In this research, the author refers to a map published in 1952 by the Italian archaeologist Werner Johannowsky, in which there are "ancient, preserved, probable and hypothetical roads" and the location of some finds of Roman and pre-Roman necropolis. On the map, the author highlighted the route of the Roman road with the stretches of road still visible between Pozzuoli and Agnano, documented in this paper that is those relating to Via Vigna and near Via Terracina, in the park of the Mostra d’Oltremare. Moreover, in the map there are some important infrastructures built to overcome the roughness of the ground, some lost, and others in disuse (fig. 1). This is the case, for example, of the Monte Dolce Bridge and the Crypta Neapolitana documented below. The ancient Roman road “per colles” followed the following path: Via Vigna – Solfatara – Preventorio – Monte Dolce – Agnano – Terracina – Santo Stefano – Via Belvedere – Via Conte della Cerra – Via Salvator Rosa – Salita Tarsia – Spirito Santo – Piazza S. Domenico Maggiore.

In the stretch of road between Pozzuoli and Agnano the road followed a path that at the time, as reported by documentary sources, was quite difficult, crossing wooded areas and cliffs. Immediately after the Solfatara, the road crossed, in fact, a territory characterized by small hills of volcanic origin. Through a bridge of five arches, the road passed a cliff between Mount Olibano mt. 155 above sea level, covered with grey trachyte lava, and Mount Dolce. The structure, destroyed, was to rise near the present Cupa Marcone. To witness this particular infrastructure with inclined plane, which followed the slope of the ground, remain the survey drawing and a wide description, in which are also outlined the walls, made by Werner (fig. 2 A).

To overcome the tuffaceous ridge of the hill of Posillipo and continue towards the port of Naples, the architect Lucio Cocceio Aucto built in 37 B.C. a tunnel that connected in a faster and more direct way the Flegrea area and Naples. The route, called the road “per cryptam”, replaced the road “per colles”, which from Pozzuoli reached Naples for the hills [4].

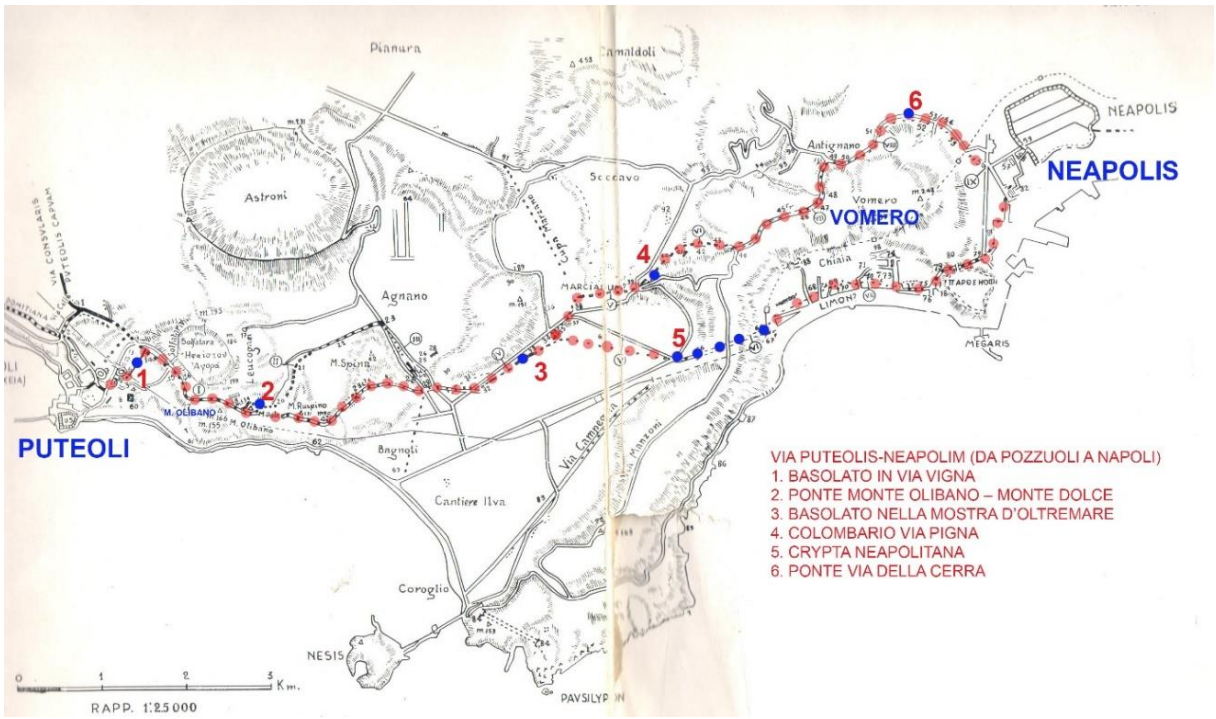

Fig. 1: Map of the archaeologist Werner [4]. Highlights the route of the Roman road with the location of some archaeological finds.

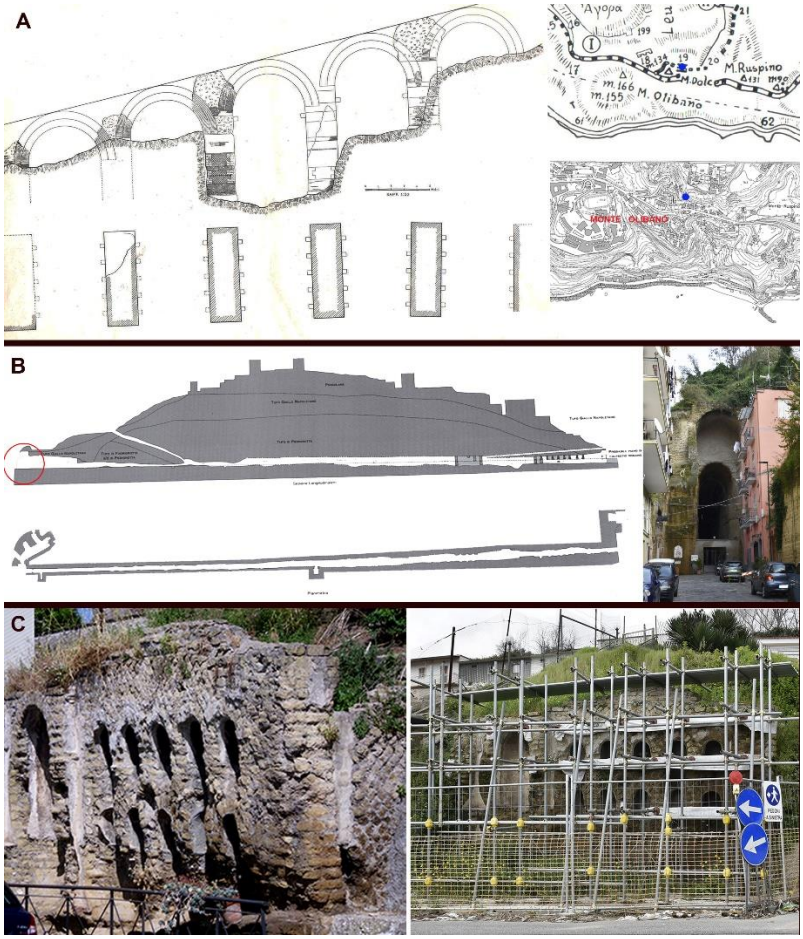

Fig. 2: A. bridge of Monte Dolce [4] Survey drawing in plan and in prospect. Position in the map of Figure 1 and on sheet 447142 NA CTR. B: Neapolitan crypt. Section and plan drawing (Mirabilia project - National communication plan of the cultural heritage of 1985) of the current photo of the author of the ancient entrance to the crypt, now in disuse. C. Colombario of the first century A.D. located in Via Pigna, from July 2020 completely supported by poles, because dangerous.

The tunnel, more than 700 meters long, had an elliptical section with a major horizontal axis, an average height of about 3 meters and a width of about 4.50 m. Two skylights made on an oblique plane and the two end sections of the crypt much higher than the gallery guaranteed the lighting and ventilation of the environment, as can be seen from the drawings taken from the project Mirabilia - 1985 National Cultural Heritage Communication Plan. In 1886 another gallery, called "Grotta Nuova", was built near the Neapolitan crypt. Today the gallery is called "Grotta delle 4 giornate", and in 1917 it definitively replaced the path of the Roman tunnel by now no longer safe for the continuous failures (fig. 2B).
Another fragment of Roman history dating back to the first century A. D. consists of a colombarium in *opus reticulatum* in which we distinguish small niches, intended to accommodate the Olle of the ashes of the deceased. Located at the beginning of Via Pigna, towards Soccavo, it is now in a state of severe neglect and since July 2020 is propped up because unsafe (fig. 2C).

3. The stone pavements still visible in via Vigna and near via Terracina

Many archaeologists, including the Werner, agree in identifying the beginning of the Puteolis Neapolim in the current Via Vigna, for the presence in its pavement of ancient trachyte lava basolati and for the discovery in the area of numerous finds of the Roman period. The road starts in North East of Pozzuoli, from Via Vecchia S. Gennaro, reaching Via Solfatara. Near the number 52 it is still visible inside the pavement of Sampietrini, a stretch of basolato of the ancient Roman road, about 13.50 meters long.
Instead, the funerary monuments, cisterns and structures linked to the nearby amphitheatre, described by scholars, are no longer visible, with the exception of some walls in *opus reticulatum* and tufelli visible in the facade of an old restored farmhouse, located after the railway bridge. The exception is also the Cardito Swimming Pool, unfortunately abandoned, whose entrance opens in the nearby Via Vecchia San Gennaro. The digital detection of the pavement of Roman times, described below, shows the signs

of a considerable degradation that risks continuing in time and leading to the disappearance of an asset of inestimable value. The ancient stone pavement, located inside the gardens of the Mostra d'Oltremare, is instead, less ruined, although abandoned. At the end of the thirties of the twentieth century, the works for the construction of large exhibition structures brought to light the remains of the Roman road. The road of about 220 meters runs almost parallel to the nearby Via Terracina. Along its path, there is a square temple, built between the first and second century A.D. with brick pilasters and terracotta frames and capitals. After World War II, Amedeo Maiuri [5] restored the structure, now abandoned and covered with writing (fig. 3).



Fig.3: On the left the pavement in Via Vigna and on the right the one located in the Mostra d'Oltremare. At the top, there are planimetric indications of the two sites, taken from the IGM 1:25.000 cartography (original graphic scale).

The area, belonging to an archaeological area, is however in a state of strong degradation and not integrated into the largest archaeological area of the basin of Agnano and Campi Flegrei. The grass that grew between a base and another has prevented, in fact, the digital modeling of the stones, in some sections also divelte for the presence of trees. Another trace of the ancient Puteolan road is in the nearby area of the zoo, while near the spa area of Via Terracina there is a branch of the Roman road.
For the detection of pavements in Via Vigna and at the Mostra d'Oltremare, the author uses a methodology integrated with direct and digital techniques to acquire and then represent, at an appropriate scale, the metric information of the road surface. Through digital photogrammetry and the use of struction from motion software, the author has created numerical models that have led to the processing of orthophotos to perform geometric models of the two pavements then compared in their stone consistency.

3.1 The digital detection of the stone pavement in via Vigna

A first inspection in Via Vigna showed a much worn stone pavement due to the continuous pressures of cars and an uninterrupted walkway of pedestrians.
In addition, the presence of the cars hindered the photography that the author had therefore to perform on only one side of the strip of ancient basolato that develops at the center of the road surface.
The basoli, made of hard stone of trachyte lava of the nearby Mount Olibano, have different dimensions: some reach even about 79 cm, others are of lesser size and still others show evident signs of deterioration. In fact, the orthophotos of the digital detection, described below, and the graphic rendering of the basolato demonstrate some much-damaged areas. The author to perform the photogrammetric survey used a Nikon D7200 SLR, CMOS 23.5x15.6 mm sensor, 18-105 mm lens, while to process the photographs used the software of structure from motion 3D Zephyr Aerial - 3D Flow, with the aim of obtaining an orthophoto, from which to redraw the basolato (fig. 4). She took 35 shots in manual mode with 18 mm focal length, without the use of the tripod, maintaining a constant distance between the shot and the object. After the alignment of the photos and the creation of the scattered cloud, the software generated the dense cloud of points from which the author eliminated the disturbing elements that is the cars parked on one side of the road. The software has scaled the dense cloud based on known points derived from direct detection and processed the mesh surface.

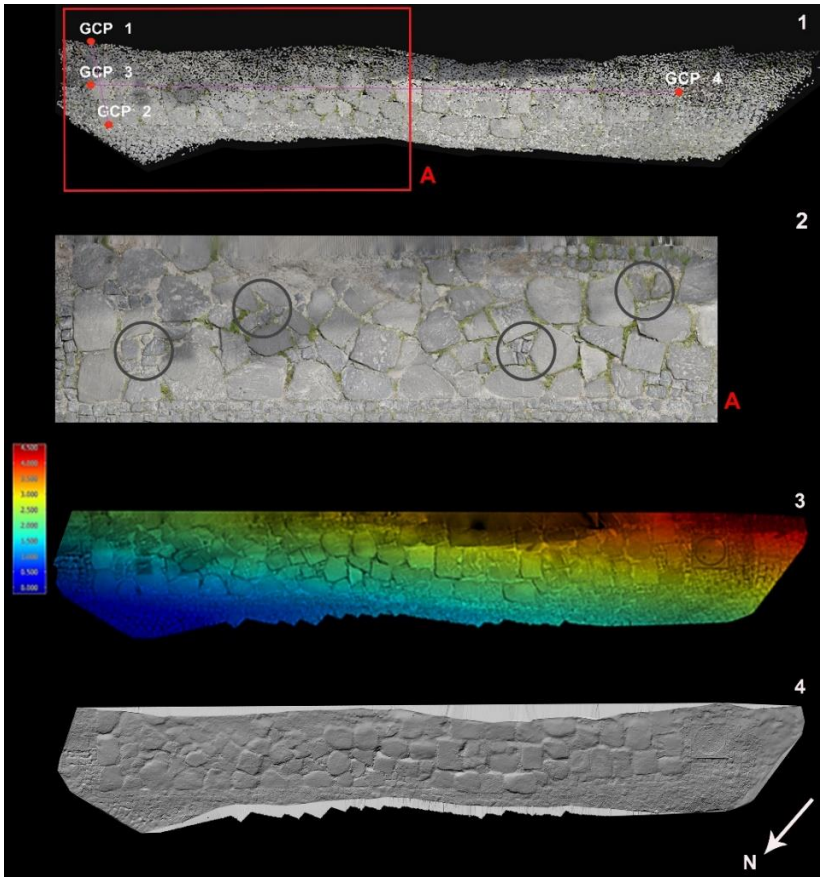

Fig.4: Stretch of Roman road in via Vigna. 1. Cloud of dense points with ground points control. 2. Orthophoto from textured mesh, detail with highlighted areas most deteriorated. 3. DEM chromatic display. 4. DSM model with shading processed in Qgis.

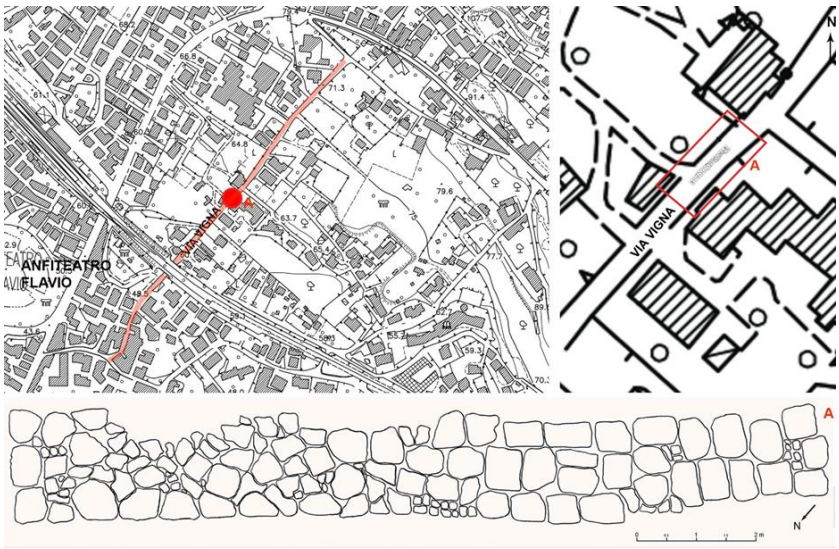

Fig.5: At the top: via Vigna (447141 CTRN Pozzuoli-Astroni on the original scale of 1:5000). It follows particular location of the Roman stone paviment in the road of via Vigna. Bottom: Drawing of the basolato in original scale 1:50, graphical restitution elaborated on the base of the ortofoto in CAD and with graphical tablet in Photoshop.

The photographic texture, applied to the mesh, allowed generating a high-resolution orthophoto, selecting the reference plane through the z-axis. Through the digital image, using the graphic tablet with the Photoshop software of Adobe, the author has redesigned the outline of the stone paviment in CAD to insert it in the urban plan (fig. 5). In addition, the software generated a DEM file, exported to DSM and DTM, uploaded the orthophoto and applied the color display for the representation of the altimetric densities of the object. Finally, the application of the shading algorithm on the model has determined a better visualization of the morphology of the basolato.

3.2 The digital detection of stone paviment in the Mostra d'Oltremare

Next to the large fountain of the Esedra of the Mostra d'Oltremare, there is an archaeological area that preserves a stretch of the ancient Roman road that joined Pozzuoli to Naples, about 220 meters long.
A first inspection made it possible to program the photo shoot for an optimization of time and equipment. The author has carried out two photo shooting campaigns on different days. For the first acquisition, she used the Nikon SLR in sunny and cloud-free conditions. For the second acquisition, however, followed a Sfm detection campaign of aerial photogrammetry, in which, given the characteristics of the object to be detected, chose to use a drone: DJI Mavic mini 2 Fly, 1/2,3" CMOS sensor, 35 mm lens, 4k video. During the photographic campaign with the reflex, in manual mode, the trees and the tall bushes have prevented to maintain constant the distance between the point of grip and the pavement of the road; moreover, their presence has not allowed to obtain a uniform exposure, causing difficulties in the alignment of photos. With the drone the author has realized in conditions of sky covered a video of 7'46" that has resumed the route of the road at an altitude of about 8 meters, not constant for the whole track always for the presence of trees. She then selected the frames to process for a stretch of road about 24 meters long, in which the parameters of the exposure and the distance taken remained constant. This has also made it easier to experiment with photogrammetric restitution with the purpose of considering in subsequent applications the entire length of the road.
At first the software has processed the intervals of frames coming from both reflex and drone in order to make comparisons based on which the author finally decided to use the drone video, as, starting from nadiral shots, the obtained model has turned out qualitatively better. Through the 3D program Zephyr Aerial, the portion of shooting, related to the section chosen for experimentation, was extracted from the video. The software processed the frames, and generated the orthophoto from the texturized mesh and a DSM model. In the Qgis, the application of the shading algorithm created another model (fig. 6).
The result was not, however, the desired one. In the DSM model with shading the bases are not there, but only the sidewalk, probably because in the interstices there are brushwork that have smoothed the unevenness. In the CAD, and later in Photoshop, the author has completed the restitution of the stretch of road, inserting it in the plan of the Mostra d'Oltremare with a detail of the basolato (fig. 7).

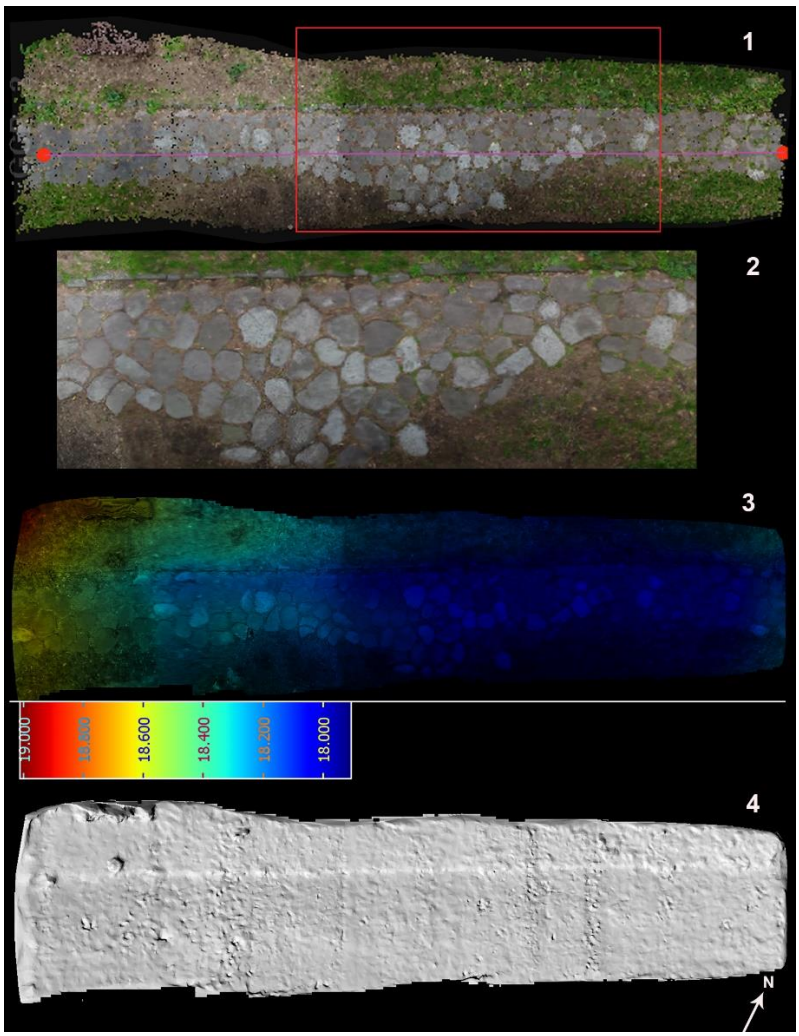

Fig.6: Stretch of Roman road to the Mostra d'Oltremare. 1. Cloud of dense points with control points. 2.Ortophoto from mesh texturizzata, detail. 3. DEM colour display. 4. DSM model with shading processed in Qgis.

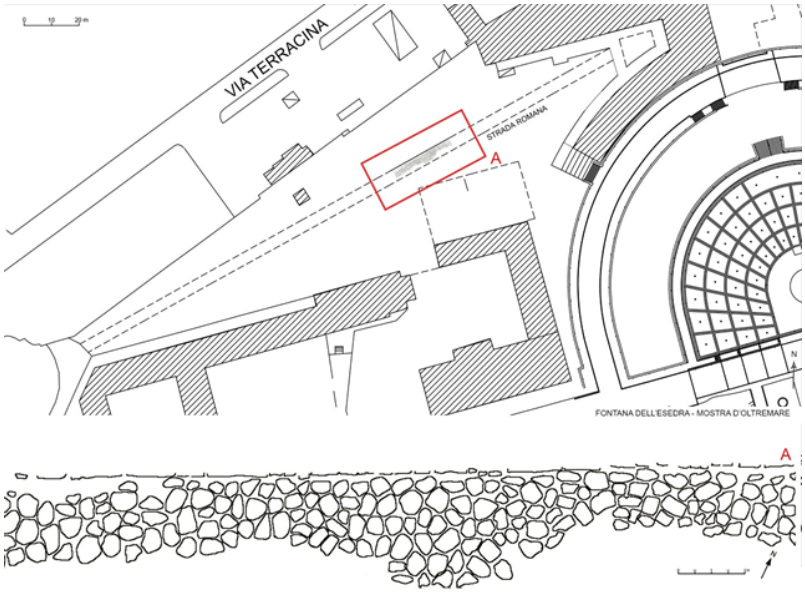

Fig.7: At the top: stretch of Roman road inserted in the plan of the Mostra d'Oltremare. At the bottom: design of the basolato (original 1:50 scale), graphic restitution elaborated on the base of the orthophoto in CAD and with tablet graphics in Photoshop.

4. Two models compared. Conclusions

Based on the acquisition of the metric data performed through the software of structure from motion, the author performed a survey model. Therefore, the study of the shape and measure of each individual stone element has helped the author to return information on the original relationship between the Roman road and the urban and suburban territory (figs.8, 9).

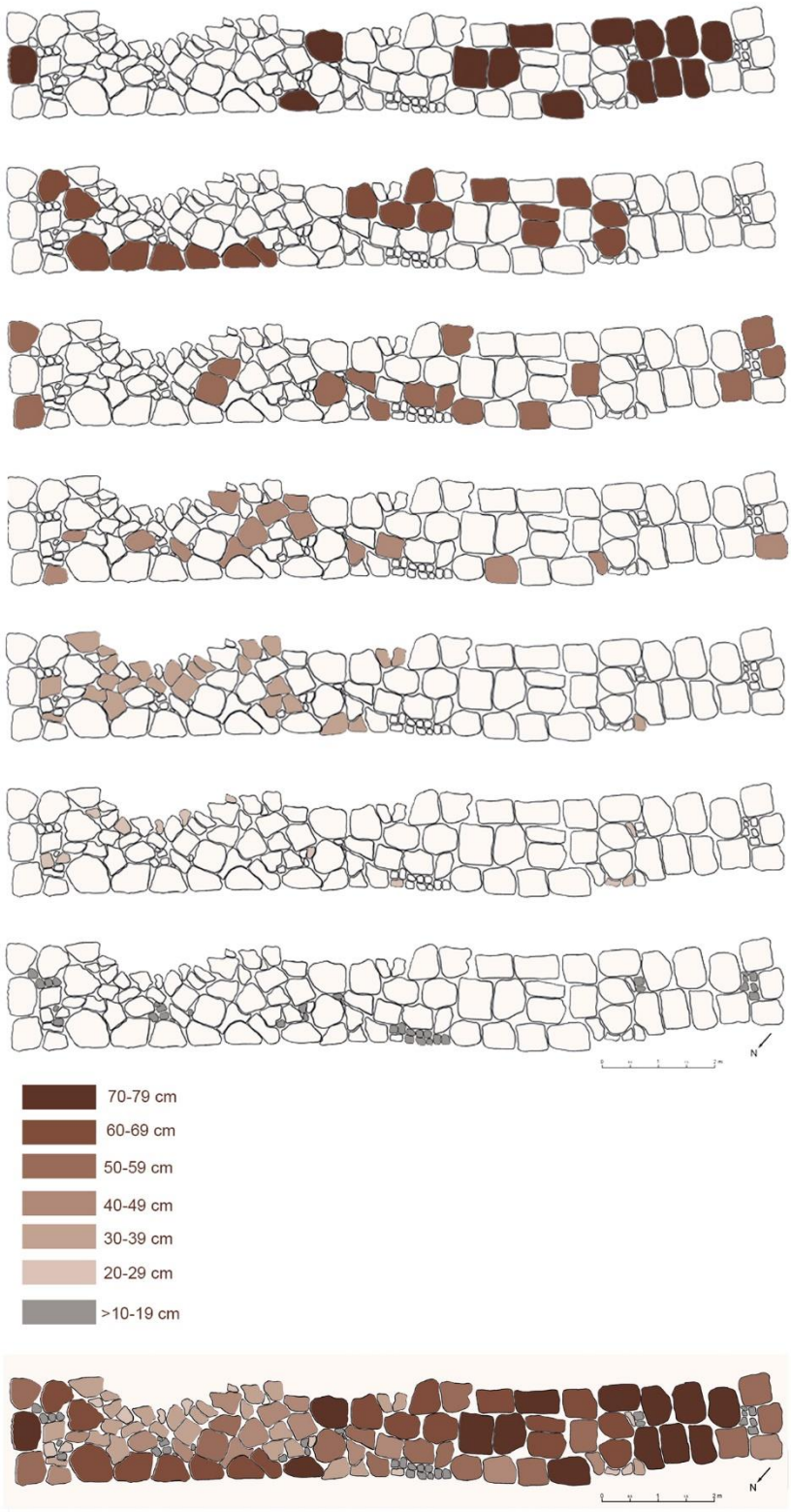

Fig.8: Via Vigna. Graphic restitution of the street paving with chromatic visualization of the lapidea consistency. Indicators for displaying the size of the stones.

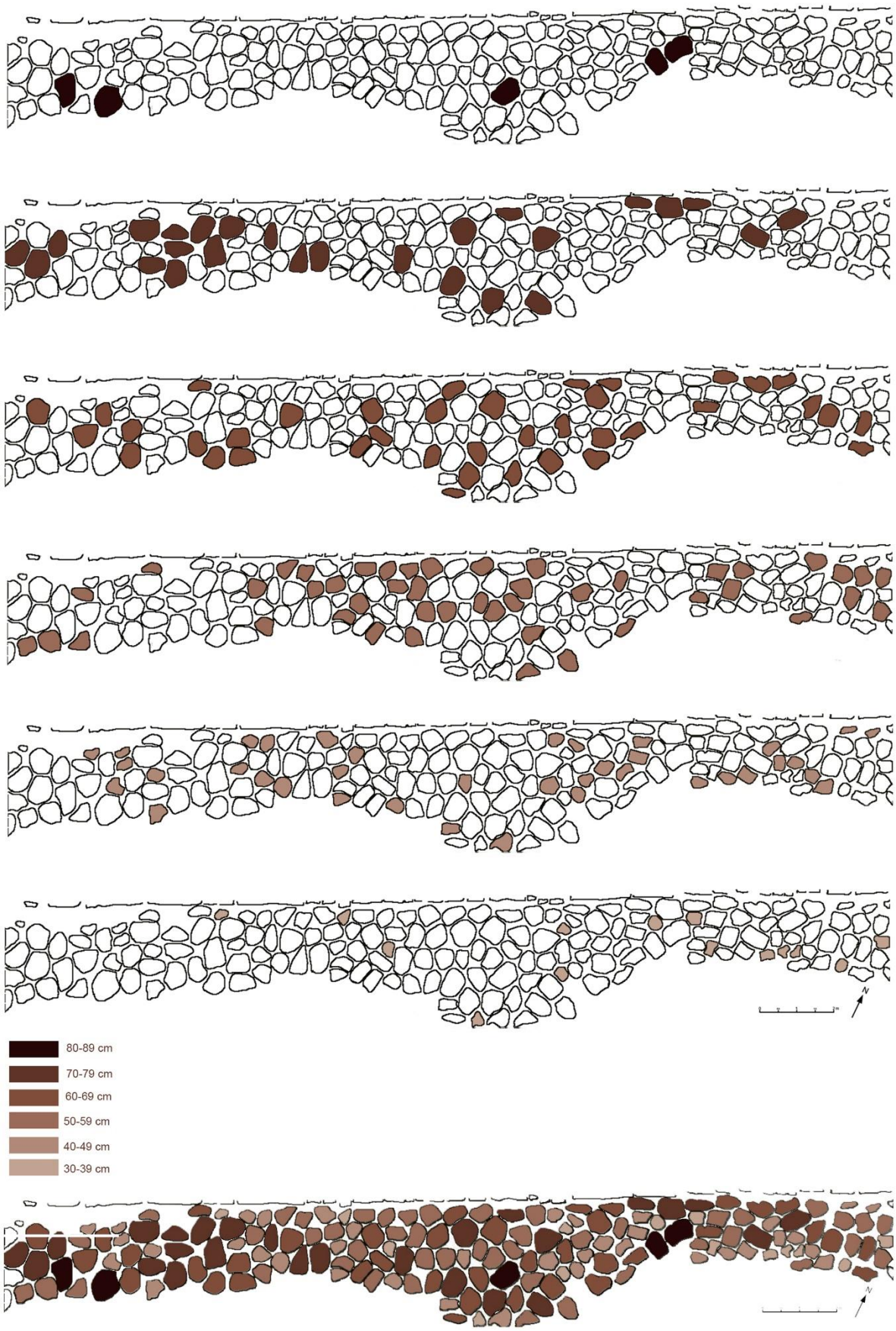

Fig.9: Stretch of Roman road in the Mostra d'Oltremare. Graphic restitution of the street paving with chromatic visualization of the lapidea consistency. Indicators for displaying the size of the stones.

In CAD, the orthophoto of both sections allowed the measurement of stone blocks, the data of which the author elaborated through a chromatic visualization. From the schemes carried out it is clear that the section in Via Vigna consists of mostly polygonal bases with dimensions that vary in the first three ranges of measures adopted, ie between 70-79; 60-69; 50-59 cm. The presence of irregular size and smaller fragmentary fragments indicates subsequent maintenance work. The section of road currently visible, although small, seems to have the characteristics of an urban road, in which the basoli of volcanic origin resistant to wear and compression and, therefore, ideal to support vehicular traffic, are arranged to form a continuous pavement [6]. The proximity to the center of Pozzuoli and the numerous cisterns and necropolis, found in the area, confirm this hypothesis.
The result of the data collected, for the stretch of road parallel to Via Terracina, shows, instead, a *summum dorsum* consisting of a paved layer in cobblestone, the so-called *galeratum* that refers to a stretch of suburban road. The stone blocks of size ranging from 89 to 30 cm, have a flattened shape, and although arranged with a certain regularity, do not seem to form a continuous pavement.
Roman road construction techniques were different [7], in the case of urban or public roads. Therefore, the study of the background of the road plan of the two sections examined on the road “per colles” would allow greater recognition of both the technique and the types of construction used.
For this reason, we hope to be able to integrate this first detection with other non-invasive techniques such as thermal infrared detection to complete the knowledge of non-visual structural data.
In conclusion, the potential of modern digital detection and imaging techniques is underlined, which, when applied to a road structure, allow you to have a formal and dimensional knowledge that you hope will be useful for the planning of strategies for protection and conservation [8].

Acknowledgments
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Virtual fruition models of the geometric and chromatic space of Villa Farnesina

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Abstract
When Villa Farnesina alla Lungara is named, one immediately imagines the frescoes by Raphael which for centuries have represented its greatest reason for fame. It is to see these frescoes that the visitor arrives at the Villa, discovering that the present decorative apparatus is much richer and is due to some of the main artists of the Italian Renaissance, such as Sebastiano del Piombo, Giovanni Antonio Bazzi and Baldassarre Peruzzi, who was a designer of the Villa. To communicate the unity of the work, in which it contains and contents (the building and the frescoes) are of equal importance, and to re-read the history of the artistic transformations that took place on the building, digital technologies for the dissemination and learning of culture, supported by an accurate survey and virtual modeling activity, offer the possibility to rethink the communication and fruition strategies of the architectural object. The contribution presents the results of an exemplary experimentation for the two Lodges, which implements various descriptive and communicative methods to contribute to the acquisition and dissemination of unpublished information. Through the provision of devices, multimedia technologies and visit paths that combine real and virtual elements, the use of a monument can be transformed from a passive event to an active and engaging experience, allowing the visitor to know the original geometric and chromatic configurations, proposing the "immersive" observation in models that represent situations that no longer exist or of a project that have affected and modified the work that has come down to us today.

Keywords: Survey, Documentation, Geometry, Three-dimensional Modeling, Augmented Reality.

1. Introduction

When Villa Farnesina alla Lungara is named, the first thing that comes to mind is the presence of Raphael's frescoes which over the centuries have represented its greatest reason for fame [3]. It is, therefore, to see these frescoes that the visitor arrives at the Villa, discovering - and it is only the first of the surprises - that the decorative apparatus, present in the various rooms, is much richer and is also due to other of the main artists of the Italian Renaissance, such as Sebastiano del Piombo, Giovanni Antonio Bazzi known as Sodoma and Baldassarre Peruzzi, the designer of the Villa [10]. Vasari already in the sixteenth century praised the mastery of the latter, achieved in the illusionism of the vault of the *Loggia di Galatea* as well as the Hall of Perspectives. The result is a weave of colors and textures that cannot overlook the architectural and construction work, the result of a program that lasted over time until the twentieth century - both in relation to the personal events of the client and his heirs, and to due to subsequent changes of ownership -, which allowed / motivated its realization, sometimes also contributing to its "invention" [1]. Communicating the unity of the work, allowing the visitor today to know the original geometric and chromatic configurations, as well as the transformations that have taken place over time, is a current goal of communication relating to cultural heritage; In this sense, an experimentation of virtual use was conducted, exemplifying the *Loggia di Galatea* and *Amore e Psiche*,

which, using information technology, devices and multimedia technologies, proposes "immersive" observation in models that represent situations no longer existing or of projects that have affected and modified the work that has come down to us today.

2. The Villa Farnesina today

Imagining to accompany the "modern" visitor to Villa Farnesina alla Lungara, it can be observed that his attention will be immediately captured by the rich pictorial apparatus and that he will hardly dwell on the architectural conformation of the environments to which these apparatuses belong, described in the studies conducted over the years. 2013-2016 and concluded in 2017, years in which the Villa was the subject of a research - conducted by making extensive use, among the various monthly techniques, of the integral survey of the building - aimed at reconstructing the various construction phases as well as understanding the reasons morphological and construction anomalies observed in the building [8].
Probably the user will not be informed that the ancient entrance, the one designed by Peruzzi, was located exactly on the opposite side, where currently it is the closing glass window of the *Loggia di Amore e Psiche* (Fig. 1), allowing Agostino Chigi to have a grandiloquent entrance, representative and immediately in contact with the area of your apartment [2]; and in the same way may not be aware of the changes undergone by the southern elevation and of the planimetric overturning of the entrance, which occurred following the restructuring measures promoted at the end of the nineteenth century by the Duke of Ripalta on a project by the architect Antonio Sarti, and of the fact that this modification involved structural, planimetric and / or formal changes to the sixteenth-century facies of the Villa. And again, along the current access staircase to the Villa it is difficult to believe that originally there was a similar staircase there, with a double ramp and with the function not of entrance but of exit in the *Giardino* Segreto at the end of a rich path of emotions that took place inside the building.
After crossing the nineteenth-century portal, the modern visitor finds himself in a hallway, also born with the interventions of the late nineteenth century - in which there was a decorative unit created by Ludovico Seitz -, lived today as a place of rapid transit in the modern museum itinerary and losing the characteristics of the ancient Peruzzian living room (Fig. 2), endowed with a centrality necessary for the internal distribution of the building; going beyond the space used today for the ticket office, the visitor is enchanted by the colors and geometric textures of the *Loggia di Galatea* (Fig. 3), very different from the original configuration [13].



Fig. 1: External view of the ancient entrance of Villa Farnesina.

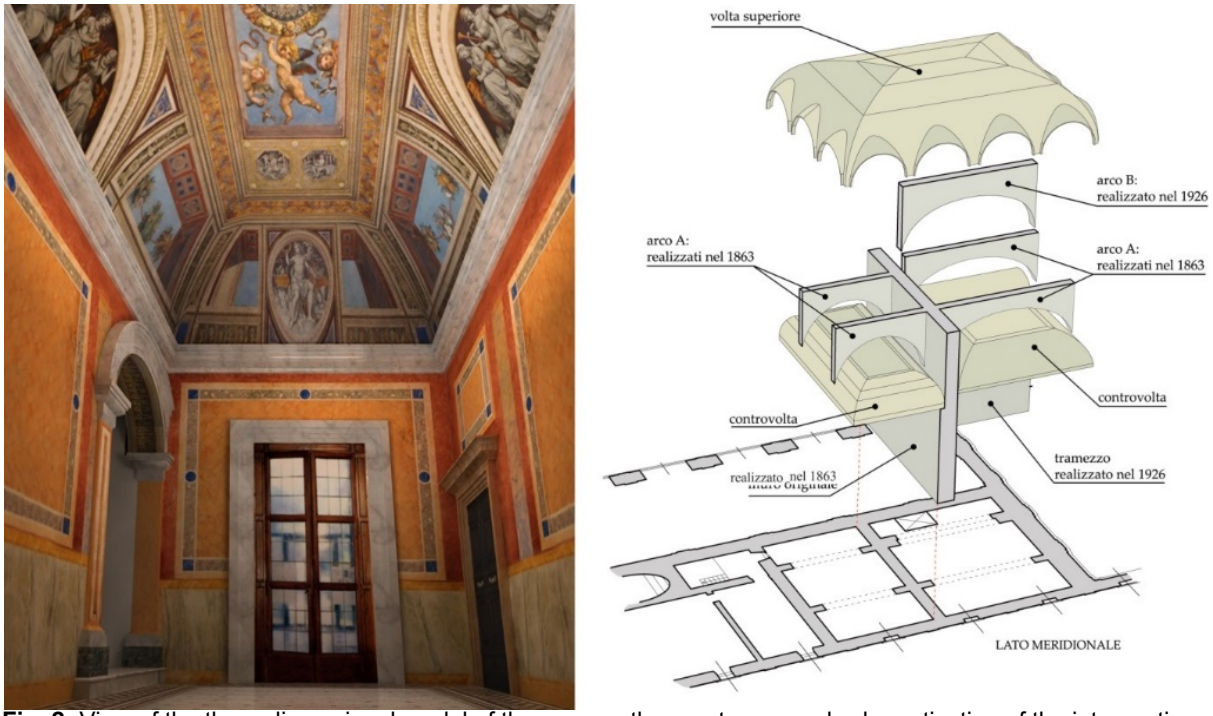

Fig. 2: View of the three-dimensional model of the new southern entrance and schematization of the interventions of the ancient living room with the transformations undergone in the second half of the nineteenth century (on the recommendation of the architect A. Sarti) and in the first half of the twentieth century (by G. Massari).

The term *Loggia* is a further clue to understand that it too was open with five arches towards the gardens and the Tiber [5]; the vault, perhaps supported by corbels (considering the correspondence of a walled door in the corridor adjacent to the ticket office, in the original living room), was characterized by the valuable decoration by Peruzzi with the representation of the Christmas horoscope of Agostino Chigi inserted in a "false" architecture. The room, which was an extension of the living room, was closed to the outside in 1650 by Cardinal Girolamo Farnese, probably to protect the valuable sixteenth-century frescoes, and with rural scenes painted by Giovanni Francesco Grimaldi, with the pilasters decorated with grotesques by Modenese painter Giovanni Paolo Marescotti. Continuing the route, the visitor reaches the *Loggia di Amore e Psiche*, once the ancient entrance that served as a backdrop to the performance of the theatrical performances originally held on the terrace-stage located between the two wings of the building. A unique loci with an incredible scenographic aspect, if we consider the vault frescoed by Raphael, which with the closing of the five arches once opened with wooden frames to defend the pictorial apparatus (completed between 1693 and 1694 by Carlo Maratta and under the supervision of the archaeologist and writer Giovan Pietro Bellori), today seems to be losing its privileged position, usual for Renaissance residences. The path then continues, through the staircase, towards the noble floor, also the result of transformations, which took place starting from 1518, for the construction of a room that hosted the wedding - with the task for Peruzzi of creating a new environment, the splendid “Hall of perspectives”, which should have held up the comparison with the two large Loggias below, open onto the gardens and therefore very bright - by Agostino Chigi with Francesca Ordeaschi [12]. There are four vertical picture perspectives painted on the perimeter walls of the room that accompany the tour and that seem to "play" with the eye of the visitor who, pausing in space, is looking for the position of the vanishing points of the scenes represented. It is an illusory architecture of an open Loggia overlooking the city. Of the sumptuous Villa built by Agostino Chigi in the first two decades of the 16th century there remains today, surrounded by a greatly resized garden, a building revisited for the new needs of the various properties that have followed one another, starting from 1511 - the year of its first complete configuration, which saw it as the protagonist of profound structural and distributive modifications of its environments to solve the instability highlighted by Ferdinando Fuga questioned on the question, due to the alluvial nature of the land - close to the river and subject to the variation of the aquifer also due to of the water naturally descending from the Janiculum - on which the building was built The virtual fruition, through the relief and the geometric-chromatic analysis of the textures [7], can today allow to fully understand the "artistic breath" of the Peruzzian invention, or to associate in an admirable way the figurative invention to the architectural invention, making the former compatible with other forms of artistic expression.



Fig. 3: The *Loggia di Galatea* today.

3. The geometric and chromatic model

The laser scanner survey made it possible to faithfully record the geometric configurations that the building presents in the individual rooms and outside, also allowing to follow rigorous procedures both in the interpretation and modeling of composite and complex surfaces, and in the applications of textures relating to the equipment decorative, for the metric and chromatic restitution of vaults, coffered and floor textures.

The geometric construction of the virtual model made use, as reported, of a consolidated digital survey practice (laser scanner and photogrammetric) to record the roof vaults of the two Lodges which, below, we will illustrate in the main steps with particular reference to the vault of the *Loggia di Galatea*. It proved to be of particular utility and importance to have operated with digital surveying, thus constituting an archive for the registration of the forms of the building that made it possible to check the reconstructive hypotheses in advance and in *itinere*. The construction of three-dimensional models has also robustly supported the formulation of the reconstructive hypotheses of the facies no longer existing or modified, allowing to verify their congruence both with the surviving elements and with the survey.

It is necessary to underline that the figurative apparatuses, which decorate the vaults, almost always relate to their respective geometric conformations; this character, however, is also useful for replicating the figures on the corresponding surfaces of the virtual model. Looking at the main floor, at the vaults of the entrance and the ticket office (made in the reed room), the two most important pavilion vaults with lunette are those that cover the two Loggias famous for the figurative apparatus they house: the *Loggia di Galatea*, which it looked at the gardens towards the Tiber, and the *Loggia di Amore e Psiche*, to the north; both have lunettes on the four sides whose intersections with the main vault are not always evident because they are covered with figurations. It was considered appropriate to define a univocal procedure for the morphological analysis of these vaults which was applied in their survey and in the construction of the relative models. For example, with reference to the vault of the *Loggia di Galatea* (Fig. 4), the geometric analysis of its complex surface has seen: first of all, the constancy of the profile along the longitudinal axis has been verified; analyzed the relationship between it and the one orthogonal to the short side; obtained the curvature of each bezel as well as the extrusion line. The knowledge of all these elements made it possible to build a reliable model on the basis of the point cloud. In practice, first of all two typical profiles have been obtained transversal to the main axis of the vault; the first realized in correspondence with the center lines of the pilasters present on the side walls (replicated, for comparison, for each pair of pilasters), the second obtained in the key of each lunette. This second profile was assumed, in the planes of the external walls of the main vault, as a generator for the development of the surface of each lunette.

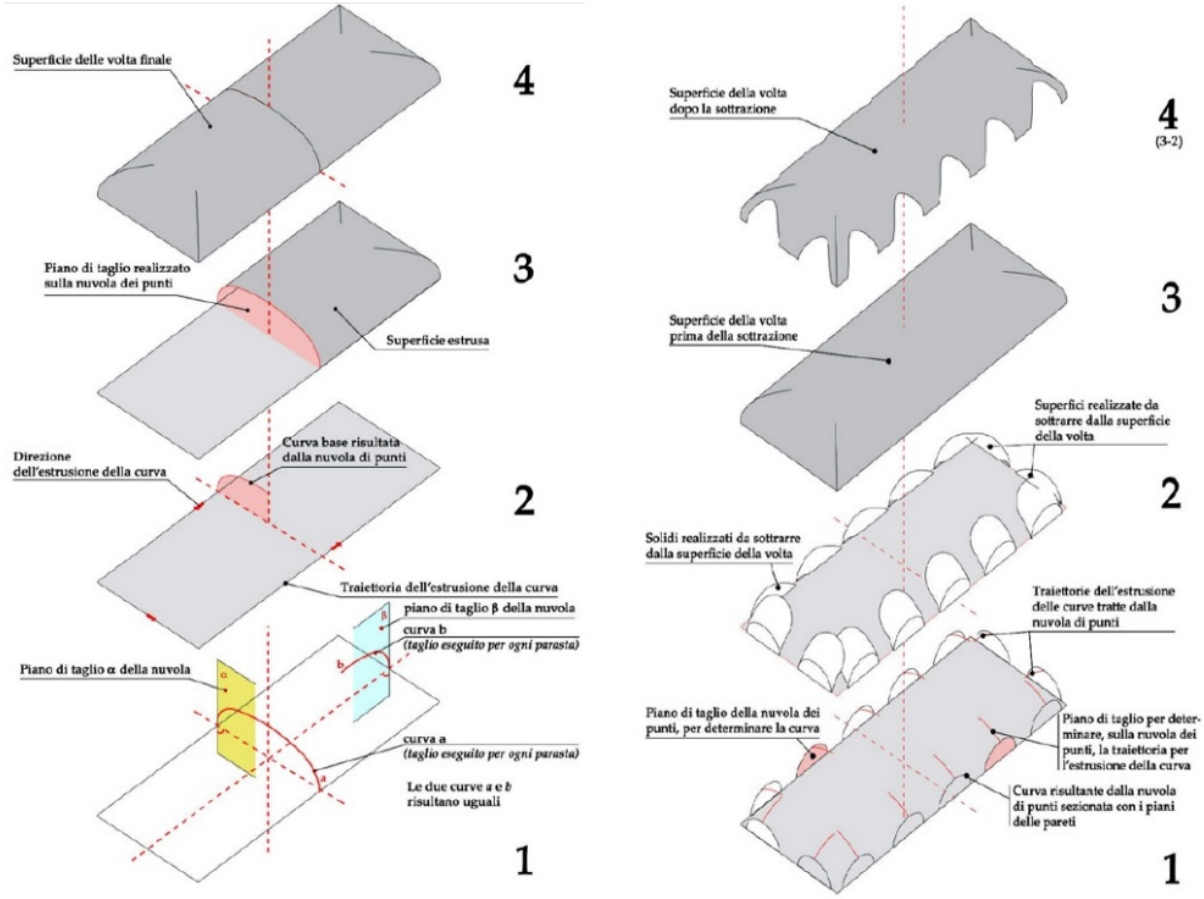

Fig. 4: On the left, determination of the basic generatrices for the construction of the model of the vault of the *Loggia di Galatea*; on the right construction scheme with the removal of the nails from the base surface of the vault of the *Loggia di Galatea*.

A similar procedure was followed for the construction of the surfaces and the consequent models of the other vaults, both pavilion and non-pavilion, as well as for the construction of the coffered models to document their singularities and create both the necessary hypographs and the relative profiles. In particular, attention was paid to the geometric and chromatic analysis of the ancient entrance to the Villa, the *Loggia di Amore e Psiche*, and to the geometric-constructive reconstruction of the new entrance, part of the ancient living room. The morphological and geometric analysis described was therefore accompanied by the rigorous application of the pictorial textures for individual parts. In fact, since the composite surface of the vault is divided into geometrically defined parts, the application of the relative texture to each of them was consequential, minimizing the level of approximation. Moreover, it should be emphasized that, despite the aspiration - however achievable to a large extent - of a likelihood between model and reality, a factor of "reduction" in scale always intervenes which in any case involves a synthesis of the real form as it occurs in the graphical representation.

4. The virtual fruition model

The results of the geometric-formal analyzes (Fig. 5) made it possible to virtually reconstruct the original configuration of the ground floor of the Villa, with a northern Loggia that from "the first lower room to the interior of the palace" [15] - whose decoration constituted a highly scenographic backdrop of the theatrical space in front -, becomes a simple passageway (Fig. 6). The model is not configured simply as an aseptic digital transposition of a cultural asset, but as an action that can follow analytical and / or synthesis processes, which it interprets to understand and know, which it defines to describe and communicate through its visualizations [4]. Virtual modeling makes it possible to verify complex information, analyze and interpret design hypotheses and carry out a detailed reflection on the design problems faced by Peruzzi in carrying out this delicate task and on the original solutions adopted. At the same time the model becomes a tool to reproduce the ancient suggestions, to re-read the different construction phases and appropriately describe the technical solutions adopted by the architect "on the geometric / spatial level" of the representation by means of the superimposition / dialogue / integration / connection of different analytical levels in a single multimedia support [9]. In particular, for each

construction phase, the related virtual model documents, based on the archival knowledge acquired, also the internal decorative elements (using the related textures).
Of particular interest was also the reconstruction of the existing situation when the Villa was first completed (1510) and the large living room led to the *Giardino Segreto* from which it was also possible to access the basement where the kitchens were located. It is useful to specify that, both in the realization of the general survey and in the construction of the reconstructive virtual models of the various construction phases, the principle of verifying the congruence with the Vitruvian principles of *firmitas*, *venustas* and *utilitas* was adopted. The experience made in the study of the Peruzzian building, on reflection, describes the events that occur daily; there is hardly a building that, over time, has not been transformed and modified in its functions; modifications and transformations are not normally subject to particular investigation unless they have an impact on the stability of the building organism.

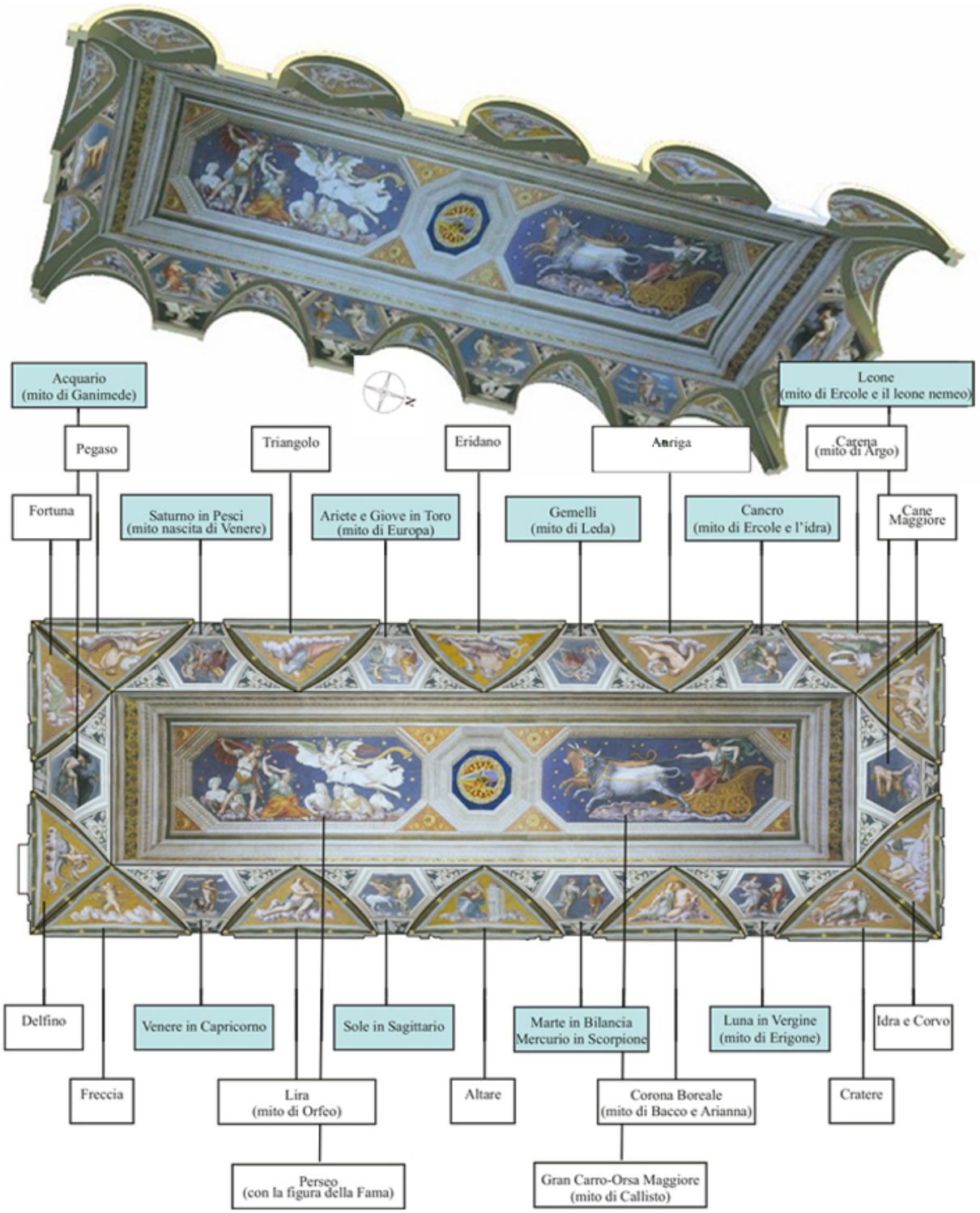

Fig. 5: Typography and axonometric view of the digital model, complete with textures end indication of the representations, of the vault of the *Loggia di Galatea*.

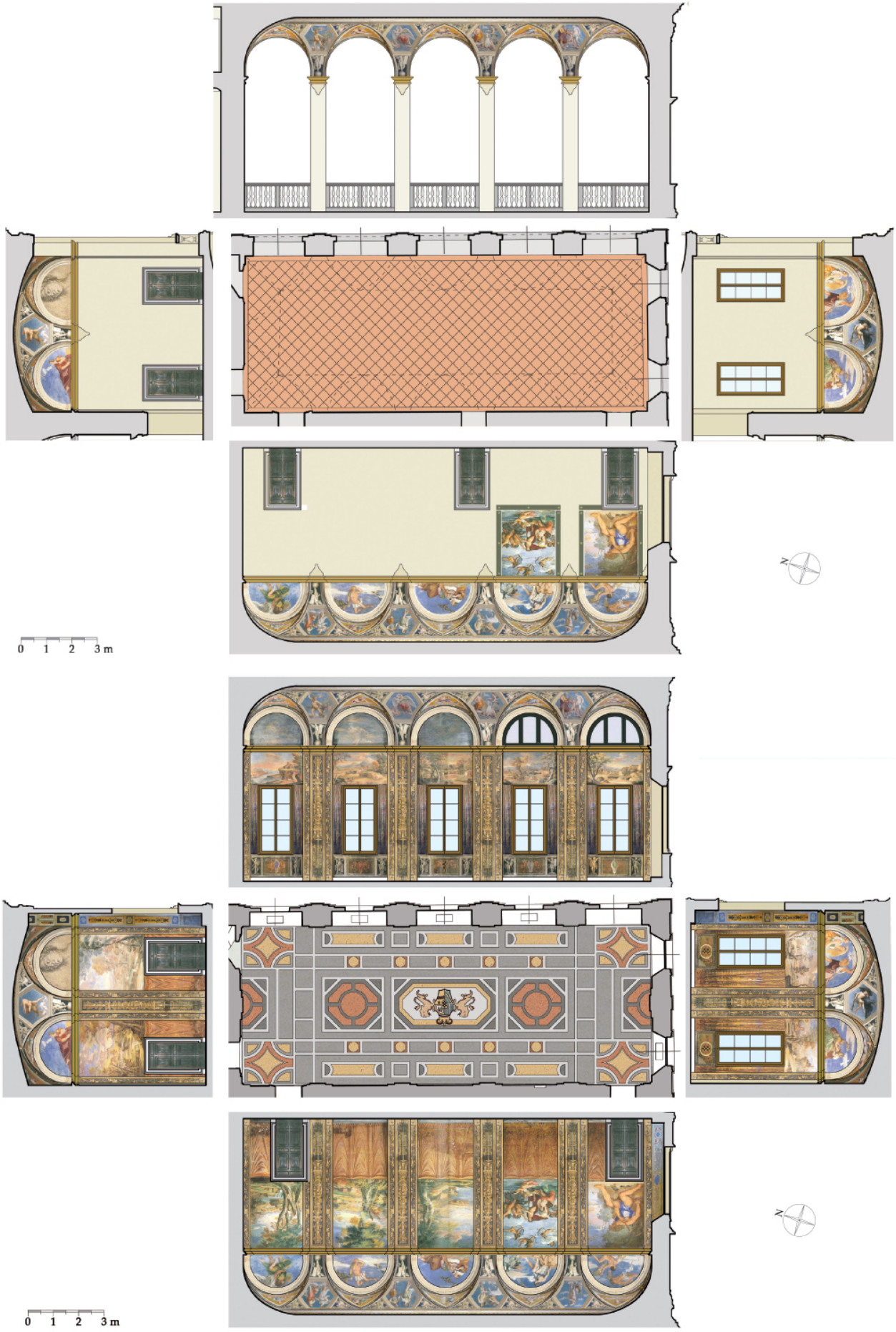

Fig. 6: Plan and internal elevations, in 1522 and in today's configuration, of the *Loggia di Galatea*.

Different is the case of a monumental building, such as the Villa Farnesina, in which the modifications and transformations, in addition to embellishing a building already of monumental value, have made it possible, over time, to create further "artistic inventions" [11].
In the case in question, the complex investigation carried out made it possible to reconstruct the principles and criteria followed by Baldassarre Peruzzi in the initial design of the building and in its subsequent transformations, defining its conditions at the end of the main construction phases. Allowing the visitor to know, in comparison with the current situation, the original events, constitutes a current goal of communication relating to cultural heritage which, using the most advanced information technology, today allows to propose the immersive observation of (three-dimensional) models of situations that no longer exist or of the project. Immersion and interactivity are the main features of the experimental prototype of virtual use (Fig. 7), an example for the *Loggia di Amore e Psiche* and for the Galatea, created to involve the user, even emotionally, in a virtual sensory space.
The model implements different descriptive methods to communicate the unity of the work, in which the content and the building - the building and the frescoes - are of equal importance, and to re-read the history of the transformations, including artistic ones, that took place on the building [14]. Thus the visitor can retrace the geometries, colors, textures in the different construction phases, edit, if necessary, the complex three-dimensional informative levels of the reproduced figurative apparatus, providing an experience characterized by a strong hybridization between virtual and real and enriched by immersion. typical of reality increases with the sharing of audio / video and insights via links or QRCodes applied along the route.
Digital technologies for dissemination and learning, if supported by accurate surveying and virtual modeling, therefore offer today the opportunity to rethink the communication and use strategies of the architectural object and contribute to the dissemination of unpublished information.
The preparation of VR and AR devices in the construction of a new visit path that combines real and virtual elements, allows to enrich the sensory perception and implement the use of a monument from a purely passive event to an active and engaging experience [6].

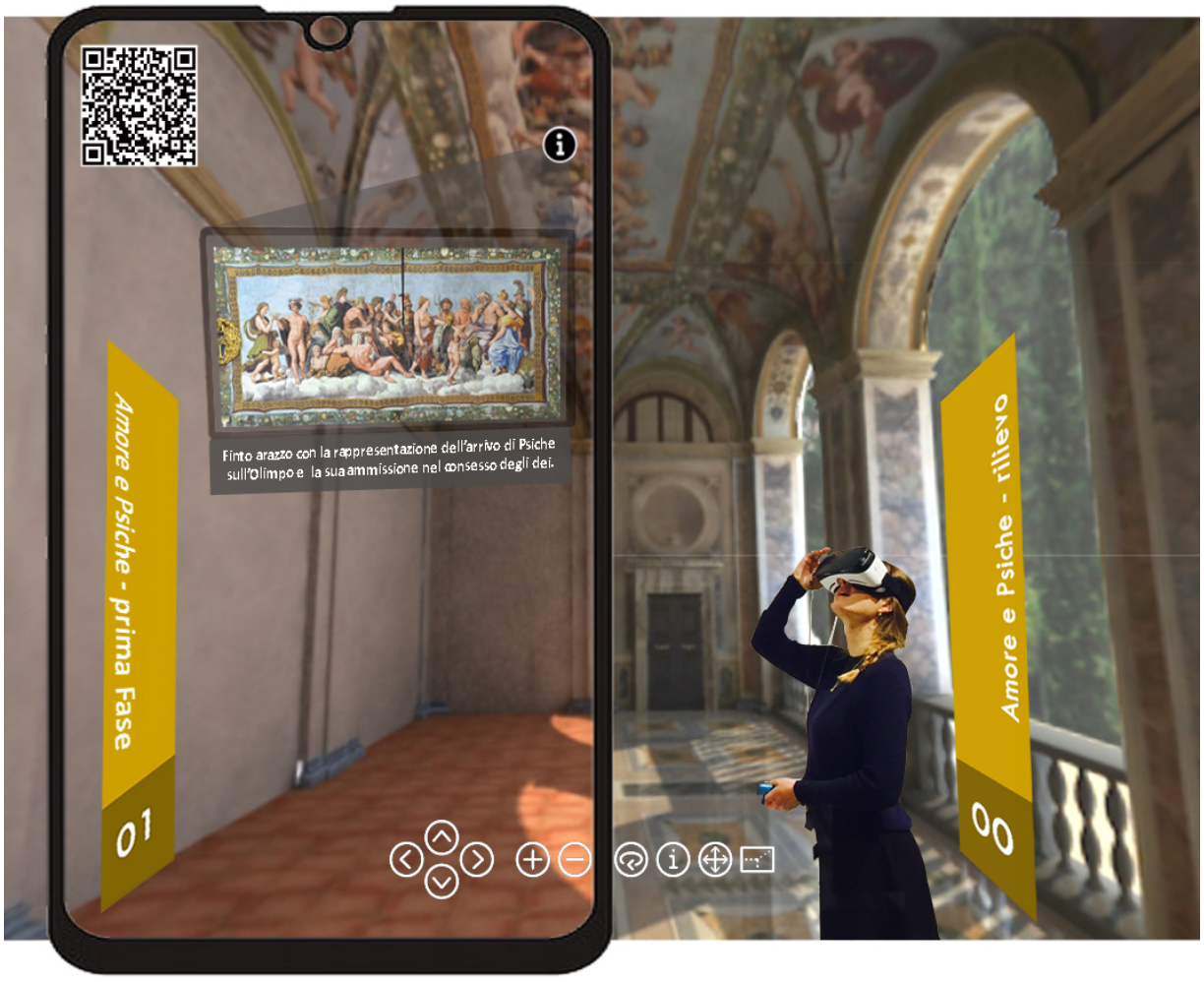

Fig. 7: Typography and axonometric view of the digital model, complete with texture, of the vault of the *Loggia di Amore e Psiche*.

5. Conclusions

Referring to a critical survey allows virtual modeling to become a tool for tracing back, as far as possible, the history of the transformations that took place on the building. The new communication tools allow you to retrace the images of the villa over the centuries. It constitutes not only an interesting activity for the documentation of the architectural artefact - integrating available bibliographic sources together with an accurate investigation of the fund relating to the existing building at the Archives of the Accademia Nazionale dei Lincei - but also very important for the dissemination of its history, so that the hypothetical modern visitor can understand the unity of this work in which it contains and contains, the building and its figurative and chromatic apparatuses complement each other. The research activity carried out thus contributes, in the different construction phases, to give more details also as regards the perceptive and geometric aspects, going beyond the "skin" of the building - to reach as far as possible a full knowledge of the history of 'building.

The research is the result of the joint work of the authors. For the sole purpose of evaluating this contribution, they agree in the following attribution of the paragraphs: Cesare Cundari (“Introduction”, “Conclusions”); Giuseppe Antuono (“The virtual fruition model”); Maria Rosaria Cundari (“The geometric and chromatic model”); Gian Carlo Cundari (“The Villa Farnesina today”).

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A new way of dwelling

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Sustainability has always been intrinsic to architecture even though it has become highly topical in the recent years, starting with the spread of the environmental alert which has only amplified and got worse. Sustainability should be read as a congruence between proposed solutions and ecological dimension, in a general view of harmony between nature and architecture. These last months, where we have shared vulnerability and isolation, have made us reconsider the value of creating a link between collective life and nature. Pandemic, economic recession, isolation, social disruption and climate change urgently impose a rethinking of architecture, in its broadest sense of building spaces to live in, as a discipline that can face these problems with a long-term vision.
The thesis that this essay wants to explore is that the crisis triggered by pandemic is an opportunity to restore the notion of sustainability in a more deep and useful way for the community, overcoming its strictly technical value to rediscover the humanistic dimension of sustainable living. The literary contribution will develop these themes through the presentation of residential architecture's project considered as case study.

Keywords: Architecture, Health, Dwelling, Porosity, Sustainability

1. Health and urban shape

The definition of space is the first and primordial element of protection from the external danger. The health crisis that have characterized human history have left an imprint on the construction of the anthropized and natural landscape, from time immemorial. Each disease, from cholera to tuberculosis, and the strategies associated with it, has left its mark on our way of living, profoundly influencing the way we shape the context, whether social and cultural or urban and architectural.
It was cholera that influenced the modern street grid of many cities, as the epidemics of the 19th century prompted the introduction of sewer systems that required wider, straighter streets, along with new zoning laws to prevent overcrowding.
The plague pandemic, disrupted many hitherto established building habits, from drain pipes to door thresholds and building foundations, in an effort to heal affected areas. The transformation of the form of the city and the form of living became radical and revolutionary during the Modern Movement, focused on principles that aimed at an open, safe, and healthy city. [1]
The IV CIAM of 1933 collects in the Athens Charter the new model of functional city, in which a design method confirms the construction of the block as the most correct model for the modern city. *Maniera di pensare l'urbanistica* the famous sketch, which compares the typical morphology of the block of the consolidated fabric of the historical European cities with the new open and free urban morphology proposed by the Modern Movement, condenses the results of researches on the city and architecture of the first decades of the twentieth century. The typical nineteenth-century fabric develops with an irregular pattern that adapts to the road network of the consolidated city, following its shape. It is attested along the streets with a compact curtain while the interior of the block is a chaotic saturation of extensions and small courtyards, defining an urban morphology that refers to the scheme of the *rue corridor*. This structure leads to inefficiency in the spatiality of housing, randomness in the relationship with the sunlight, unhealthy hygienic conditions and an absolute lack of green.
This structure of blocks, arranged on the ground in an open way and completely detached from the shape of the road, is indicated by Le Corbusier as the urban strategy that allows to obtain the

advantages of health, hygiene, efficiency that the standards of the new industrial society now imposed.
Thus, a substantial disconnection between building and street takes place, determining an indelible imprint on the configuration of the urban expansions of this period. Buildings and public space are detached from each other. Buildings, freed from the formal relationship with the street, become perfectly functional blocks in their size, exposed to light according to the most appropriate laws, studied in the details of distributive organization and design of individual housing cells. The space of the city, previously shaped by blocks through a succession of streets and squares, is now determined by the standard, by zoning, by the geometric and quantitative relationships between pure volumes. In the design of the new city, the form of physical and social urban space is put in second place to individual needs related to the domestic space. "The researches of the exponents of the Modern Movement are unitarily based on a linearly deductive design process, which begins with the study and design of housing and ends with the analysis of the city and the urban plan" [3].
The urban vision promoted by the Athens Charter has had an extraordinarily widespread echo in all European cities, leaving an indelible imprint on the structure of modern and contemporary urban space in our cities. One of the paradigmatic experiences that expresses in a more evident and radical way the relationship of cause and effect between health and form of living, materializing in a built plan the results of research developed on the house and the city in this period, is certainly that of Ernst May in Frankfurt. In Frankfurt, from 1925 to 1930, Ernst May is director of the services linked to urban planning and architecture and he is commissioned by the municipality to develop plans for the urban expansion of the New Frankfurt. May, through the plan for the New Frankfurt, theorizes and then applies in built projects, a new vision of architecture for the city. The implementation of the Frankfurt program runs parallel to the gradual introduction of open-line constructions and the abandonment of traditional land use and division criteria. Traditionally in Frankfurt, the urban fabric of the consolidated city is densely built up, with the exception of a few narrow light wells and small courtyards. The new expansion districts provide for a building layout that ensures all living spaces equally favourable conditions for ventilation, lighting, accessibility to open areas and services. The plan for Frankfurt's expansion in the Nidda River area summarizes May's strategy in designing new urban expansion areas of the city, interweaving research on the form of the city and the form of living.
In *Urban Planning* May writes about this subject: "The most important decision concerning the validity or otherwise of housing in a large city is expressed in the determination of the form of the city, or, since today it is mainly a matter of expansions of existing cities, in the definition of expansion systems. Although everyone is aware of the misery caused by the densification of masses of men in the large, enclosed and concentrically developed cities of the past, it is rare that any necessary conclusion is drawn from this. It urgently demands the re-establishment of natural living conditions for people living in the metropolises, through a reasonable extensive construction of the cities and through the creation of wide green areas in the central areas. [...] Today, after enlarging the closed urban centres within their natural boundaries, we can build autonomous housing estates in the free surrounding countryside. In the course of future decades we should confine ourselves to promoting a systematic development that takes into account the suburbs as satellite elements of the cities. These will be provided with all those facilities that the inhabitants may need in their daily lives."[4]
The urbanization of the Nidda Valley, in which the new Siedlungen form a continuous belt linked by the road network and the system of green spaces, represents the reification of these new urban principles. The construction of the individual neighbourhoods testifies to the continuous experimentation with the form of the safe and healthy open city. The total abstraction of the open block that characterizes the form of the Westhausen district (1929-31) is therefore a paradigmatic example of how the need to build safe and healthy living spaces impresses on the shape of the city a decisive and indelible mark. In Westhausen, the series of abstract buildings, which follow one another in a regular and cadenced rhythm, represents the theoretical approach of the isolated block as a unique matrix for the construction of the city. In fact, we see a series of buildings repeated, and infinitely repeatable, perfectly equidistant from each other and without any relationship with the street, but arranged on a homogeneous green plane.
The look at the visions of the city defined, promoted, and applied by the Modern Movement, documented through the reference to the story of Frankfurt, of which the above considerations are not exhaustive because not aimed at a type of urban analysis capillary and comprehensive, demonstrate the power of the impact that research on the quality of life, standards of health and safety of individuals have on research related to the city and housing.
Before opening a reflection on what should be the new form of the city and the new form of living after the pandemic of Covid-19, it is useful to take a step back and dwell on the essential, original and substantial meaning of the concept of living, in order to identify a shared cultural and semantic field of investigation on which to develop specific and timely considerations on the future of our cities, our homes and, in essence, of man.

2. I am, I dwell

In these last months, characterized by vulnerability, isolation and health crisis due to the Covid-19 pandemic, the cultural debate, multidisciplinary in scope, has produced a considerable amount of contributions on the vision of the world after the pandemic. There have been questions about what kind of lasting impact Covid-19 will have on our cities, on our way of dwelling, and how and if the face of public spaces and housing will change. Many architects, urban planners and sociologists have hypothesized some possible directions of a change that will occur in different areas of living and at different scales.

Many reflections are aimed at imagining ways in which buildings could help limit the spread of future epidemics, ranging from the layout of interior and public spaces to the use of innovative materials. Workspace represents the centerpiece of the experimental field of post-Covid-19 strategies. The adequacy of open, shared, co-working spaces is gone. Public opinion and disciplinary debate foresee the return to a traditional spatiality built on the separation of spaces and a lower density of use. Others sanction the end of the era of the vertical city, based on the exploitation of the space with large housing densities and the use of the elevator as a connection system, now considered an unsafe place to live. All this could have a great effect on the skyline of metropolises. Skyscrapers would become more expensive to build and less efficient which could reduce the economic attractiveness to investors of building that high rise, whether for office or housing.[5]

The urban vision sets the gaze on decentralization: it imagines the structure of the city distributed on urban land with smaller units, such as hospitals and schools, on a larger part of the urban fabric, through an enhancement of local and neighborhood services. The presence of greenery, saving both the quality of public space and the healthiness of daily life, is an essential and indispensable element of the city of the future, of post-Covid-19 life.

The reflections on domestic spaces focus on advice for a new way of furnishing, equipping spaces for different and new domestic functions that until now were carried out mainly outside the home: flexibility and transformability are the keywords of the new living. The pandemic has emphasized the urgency of a sustainable and balanced way of living on earth: in response, we hope for a global diffusion of clean and renewable energies and increasingly advanced technologies that regulate man's ways of living. Technology is the theme that represents the lowest common denominator of most of these reflections. From contactless technologies, applied to every single and unthinkable aspect of daily life, to the application of plant systems not only energy sustainable but also able to ensure safety from a health point of view, one imagines a way of living, and consequently of building houses and cities, focused on the efficiency of the technological apparatus, rather than on the cultural and humanistic meaning of dwelling.

Therefore, in the past as today, every crisis, especially in health, corresponds to a change in the way of dwelling and, consequently, a new way of designing. The deeper the crisis, the more violent it is, like the one triggered by the pandemic in recent months, with serious consequences both from the point of view of the safety of people's health but also of the established habits of dwelling as individuals and as a society, the more profound the reflection on the reform of the way of designing should be.

But shouldn't a new way of designing be intimately linked to a new way of dwelling? What is most striking about this concise and non-exhaustive review is the concentration of thought on the definition of reforms that exclusively concern the instruments through which man inhabits the earth. The emergency context from which these reflections derive has frozen our gaze solely on instrumental questions and less on substantial reflections. Technologies, furnishings, housing density are issues that do not bring the discussion back to the true meaning, deep and ancestral, of dwelling.

The reflection that should instead arise from the devastating consequences of this pandemic, as well as from those that have dotted human history, has an existential, cultural, humanistic nature. It should aim at a substantial rethinking of the meaning of the relationship between man and place and of the concept of dwelling. We must have a new awareness of what it means to inhabit and, therefore, learn to inhabit again. And, therefore, to build.

The writing of Martin Heidegger, *Building, Dwelling, Thinking*, becomes in this context a reference of extraordinary importance and clarity to lead the discourse to the deeper meanings of the question. What is interesting in this writing is the reversal that Heidegger implements to the hierarchical sequence build-habit, typical of the technical era. "Only if we have the ability to dwelling we can build."[6] Dwelling and building are not the object and theme of knowing, but the task of thinking. Heidegger publishes the writing in 1951. These words reread today, in light of the current situation and in the hope of determining a possible future, sound like a warning to take a step back and consider the ontological meaning of the issues. Building is not instrumental to dwelling, building is in itself already dwelling. Heidegger's pages remind us what it means to build and what is the existential relationship between building and dwelling. *Bauen* (to build) derives from the ancient High German *buan*, which means to inhabit, to remain, to hold oneself: it belongs to the same etymological constellation as *bin* (I am). Therefore, building has a higher and deeper meaning than constructing buildings, but it outlines

an essential human trait. If *Ich bin* (I am) properly means I dwell, then the way in which man is in the world is that of dwelling.
Heidegger specifies that dwelling is an ontological concept, not a behaviour that, from an architectural and urban point of view, indicates functional areas, such as the place to work, to live or to spend leisure time. I am, therefore I dwell, indicates the essence of man, what characterizes man and distinguishes him from other dwelling beings. But building, *bauen*, in its original semantic meaning, is not limited to this meaning. At the same time *Bauen*, also means to guard and to care, that is, to cultivate the field, to nurture the vine. Such a building (bauen, cultivation), in fact, only safeguards the growth that matures from itself. Building in the sense of guarding and caring is not aimed at mere production. The word *Bauen* therefore encapsulates the essence of the meaning of building: to build is to inhabit, to build is to guard and cultivate, to build is to erect. These derived modes of *bauen* are included in the original meaning of dwelling. [7]
Giorgio Agamben, who in 2018 published the essay *Abitare e Costruire* on these themes, writes: "I think we can agree that something like architecture is possible because man is an inhabiting being. Dwelling-or, rather, the nexus between building and dwelling-is, that is, the a priori, the condition of possibility of architecture. Architecture is the art of construction, insofar as it is also the art of habitation." [8]
Agamben's reflections, in the same way as Heidegger's, are based on the original semantic analysis of words as a vehicle for the epiphany of deep meanings. The verb *habitare* does not only mean *to be habitually, to dwell*, but first of all to have stably or usually, to have the habitus or the habit of something. Dwelling becomes in this sense an ontological category. "Dwelling means creating, preserving, and intensifying habitus and habits, that is, ways of being." For this reason, man needs not only a den or a nest, but a home, that is, a place to *inhabit*, where he can build, know and intensively exercise his *habits*. Building, which is the object of architecture, presupposes or has constitutively to do with habitation, the faculty of dwelling. [8]

3. Seeing, listening, caring

In a situation of globalized crisis that invades all aspects of human life, both private and collective, what is the relevance of these reflections on dwelling? What can be their teaching in defining the features of a new way of building? The pandemic, economic recession, isolation, social disruption and climate change urgently require a rethinking of values so that architecture, understood in its broadest sense as the construction of places to dwell, can address these problems with a long-term vision.
The causes of the current emergency conditions and the global crisis can be traced back to the oblivion of the authentic meaning of building, especially in the generally widespread and shared customs. dwelling is not experienced as the fundamental trait of man's being. According to Agamben, the rupture of the nexus between construction and dwelling has defined a radical crisis for architecture, with which those who seriously practice this art cannot help but be confronted. "The unity of dwelling and building has at some point been broken. The essential condition of architecture today is modern man's impossibility or inability to inhabit and, for architects, the consequent rupture in the relationship between the art of building and the art of dwelling." [8]
A possible trajectory for the future, therefore, is the re-covering of the ontological sense of dwelling. A dwelling, and therefore a building, aware, adequate, that identifies a balance between man and nature. Therefore, recovering Heidegger's dialectical matrix, a way of dwelling that does not have the care of the place as its purpose but as its primary meaning. In short, we could say sustainable dwelling.
The word sustainability, in this context is not considered as an end, but as a condition. Recovering the origin of the word home, that is *oikos*, we realize that the concept of home is intimately connected to that of environment. Ecology, from the Greek *oikos-logia*, that is to say, the discourse on the house, therefore, not only has a general meaning of studying the relationships between dwelling beings and the environment, but indicates precisely the careful and meticulous care of the place where one dwell, of one's home, of the delicate balances that govern it. In this sense, home is the environment, the place where we dwell.
The condition of sustainability, at this point, could be defined as the congruence of being, and therefore of dwelling and building, with the ecological dimension, in the framework of a general harmony between man, nature and architecture. That harmony has characterized architecture for millennia before the industrial revolution altered the life cycle of the planet. An architecture in which sustainability is no longer perceived as something external and isolated, because it is ontologically inherent in every aspect. In the contemporary architectural debate, however, sustainability is often seen as a structural, technical and ideological fact, which transforms architecture into an environmental phenomenon.
According to the hypotheses formulated here, we do not intend to propose specific design solutions or quick recipes, easily reproducible, that can trace the idea of a new way of dwelling, an error of method that cannot be proposed considering the complexity of the themes that nourish the issue.

Rather, we investigate some trajectories through which we can develop a re-education in the essence of dwelling today. The first level consists, for each individual, inhabitant or architect-inhabitant, in learning to dwell, rethinking the causes of the disconnection between dwelling and building, grasping this crisis as the crisis, since it concerns the fundamental constitutive structure of being in the world. This awareness can be pursued through reflection on several issues that are reversed in the act of construction of dwelling. The spatiality of the house becomes the dress of everyday life of each of us, as individuals and as families, the stage of existence, actions, emotions, ambitions and frustrations. As such, it must be able to accommodate the permanent elements and the variable components of our habits, it must adhere to our identity, not only representing it but also promoting its development.
The second fundamental theme is the relationship between our identity and the surrounding reality, which is reflected in the relationship between dwelling and the environment. If it is true that dwelling means cultivating, taking care and protecting, it is necessary to dwell and build in an ethical way, in harmony and balance with reality. This balance presupposes the recognition of man and the environment as an indissoluble unity. The biunivocal nature of the relationship that binds man and environment is therefore made of balance, awareness and freedom, understood not as the absence of rules but as the absence of claims of exploitation, subjugation and oppression. It is possible to identify a reciprocal relationship of porosity, a threshold space in which this epistemological link between house and environment, between man, house, city and nature is maintained, through which this biunivocal system can maintain a general harmony.
From this point of view, dwell is to take care of one's own space, to be in relationship with space, to bridge the gap between project, building and finally dwelling. The possible solution, suggested by the return to the ontological and primordial meaning of dwelling, should therefore be sought in a thought capable of looking, listening and caring.

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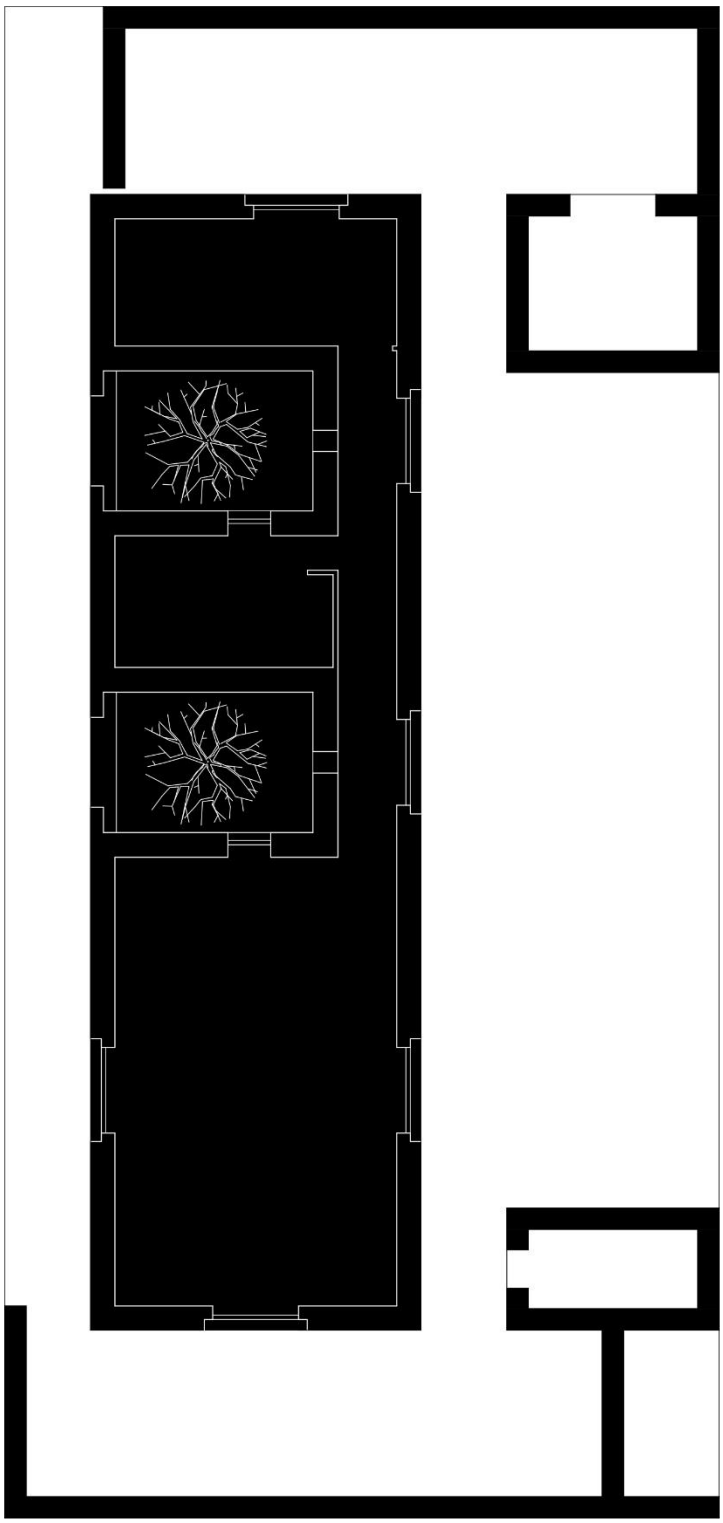

Fig. 1: **Hortus conclusus**. Enclosed space, fenced place, from the Latin root *car* or *gar*, common to *court* and *garden*. Main element of the spatiality of medieval architecture, the *hortus conclusus* is a place in opposition to the chaos of the outside world, defining and protecting a space of order and harmony. In House SR the small private courtyards of the house are the seat of the intimacy of the thought of those who live.
House SR, Martina D'Alessandro Architettura

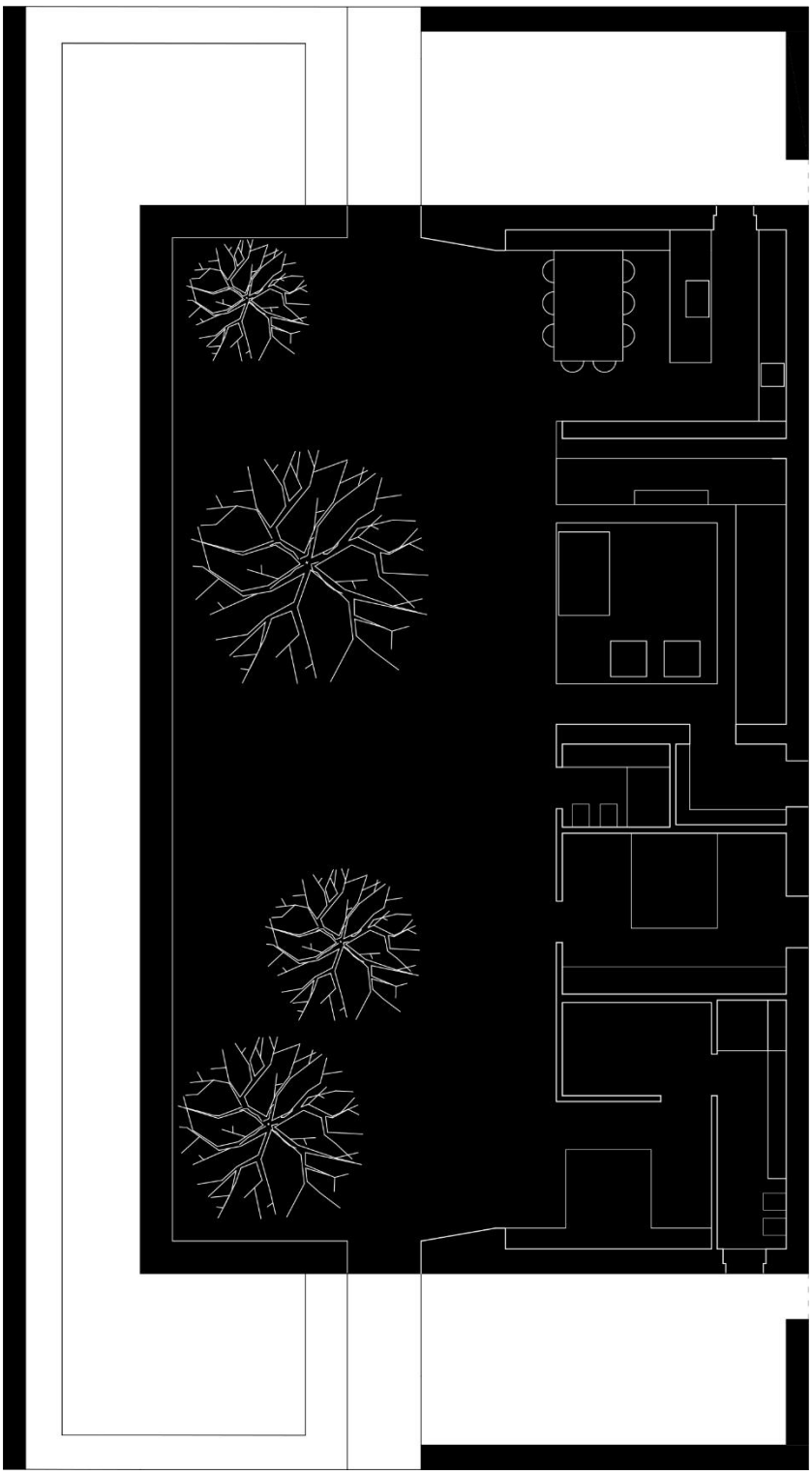

Fig. 2: **Garden**. *Garden*, from the French *jardin*, means a defined land protected by a fence, annexed to the house, where ornamental plants and fruit trees grow, it is a setting for moments of spiritual recreation. The garden therefore, originally, is the place where man takes care of himself and the place. The Indo-Germanic root of the word, *gart* or *ɑard* or *garda*, amplifies the semantic meaning of the word and, therefore, of the place it describes. *Garda* means court, dwelling, house. The garden, recovering the original semantic sphere, should represent the fulcrum in the new way of dwelling. The garden is the essence of the house, ontological space of dwelling. In House SMV the garden is an open-air room, intimately connected with the interior space, of which it represents an extension. The garden defines the place of being, of rest and *otium*. It is a space that looks outwards but is also introspective.
House SMV, Martina D'Alessandro Architettura



Fig. 3: **Window**. The architectural element that represents the porosity of spaces is the window. The window, in addition to delimiting spaces, is a scenic element. It can be background, threshold, frame, filter, representing and defining the point of view. It represents an opening, it puts in communication the internal and external worlds. It opens and closes, unites and separates, allows us to see and be seen, but also to hide and conceal. Window is the boundary between the inside, what we think, what we see, what we can see, what we must see and what we see in reality and that determines an observation. House SR bases its compositional and spatial matrix on the theme of the threshold. The material enclosure of the house contains and protects all the spaces for dwelling, both artificial and natural spaces. The window in this project represents the opening that gives a sense of the world outside, the eye on what is far away.
House SR, Martina D'Alessandro Architettura, Ph. Cosimo Calabrese ©



Fig. 4: **Window**.
House SMV consists of two elements. A wall and a window. The window is inclusive, auspices of the genius loci translated inside by the project. Light, colours and noises unify spaces in an unprecedented, changeable and dynamic unity between inside and outside.
House SMV, Martina D'Alessandro Architettura



Fig. 5: **Porosity**. According to Walter Benjamin *porosity* indicates the intertwining of space and time, that characterized the dwelling, «Architecture is as porous as tuff. [...] Everywhere space is kept suitable to become the theater of new unforeseen circumstances. What is definitive and formed is avoided. No situation appears as it is, thought for ever, no form declares its "so and not otherwise". [...] Porosity is the law that this life inexhaustibly makes us rediscover. [...] Private life is fragmentary, porous and discontinuous». [BENJAMIN, Walter. *Immagini di città*, Torino: Einaudi, 2007. ISBN 9788806189174.].
Porous is the man oscillating between inside and outside, private and public, whose life, like an improvised recitation, it escapes any principle of individuation. Porous is the spatiality of House SR.
House SR, Martina D'Alessandro Architettura, Ph. Cosimo Calabrese ©

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The Church of San Primitivo in *Gabii* : From the Origin to the Ruins

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Abstract
The church of San Primitivo is a construction dates back to the fourth century A.D. Its remains arise within the archaeological area of *Gabii*, an ancient Roman city along the ancient Via Prenestina, whose pavement is partially excavated, a few meters away from the church.
Currently, part of the perimeter walls, bell tower and the frescoed crypt are preserved. A pre-existing apsidal wall, from the Roman era, was incorporated into the structure, but collapsed in 1903.
The first certain information regarding the building dates back to 1030, but from the analysis of the complex stratigraphy of the building, it was possible to go back a long way, to the dawn of the Middle Ages. The analysis of the walls and comparisons with types of churches with similar planimetric characteristics provided useful information for interpreting the presence of particular bi-apsidal conformation, which turned out to be the result of two distinct construction phases. The church was in use until the thirteenth century and then, due to the progressive abandonment of the area, it had become the only inhabited place in that area.
The different construction phases can also be identified in the bell tower, which also shows a masonry at the top, specifying period of phase subsequent to the abandonment of the church dates back to the end of the 13th century, when it was used as a lookout tower along the Via Prenestina.
What is published is the first scientific survey of the building.

Keywords: *Gabii*, San Primitivo, Via Tiburtina

1. Introduction

The ancient center of *Gabii* enters the scenario of the great centers of the Lazio region at the time of the birth of Rome and constitutes, together with *Tibur* and *Praeneste*, the set of cities that controlled the lower valley of the Aniene and the accesses of the sack and of the Liri, as such a political and cultural epicenter of fundamental importance in the *Latium Vetus*.
In such a context the remains of the ancient city assume by themselves an importance that derives from the sacredness of these places closely connected with the Latin civilization, within which lies the birth of Rome.
In particular, as far as the ancient urban area is concerned, a sector has been acquired corresponding to slightly less than half of the entire surface within which the main known monuments and those immediately available fall within.
The eastern suburb, a sector in which this archaeological area is located, represents one of the richest areas of historical evidence of the Roman agro, but at the same time it is among those most devastated by the disordered development that has characterized the urban history of Rome in the second post-war period, a phenomenon to which the disappearance of extremely extensive portions of the countryside, which constituted natural areas of enormous beauty as well as historical landscapes, fruit of a millennial anthropization process, was also attributed. Therefore, among the main motivations



Fig. 1: Map showing the location of San Primitivo in *Gabii* (G.B. Cingolani 1992).



Fig. 2: View of *Gabii* and of the church of San Primitivo.

underlying the acquisition of *Gabii* by the Minister for cultural and environmental heritage, we can indicate the intention to protect this very important archaeological area, attempting to contain the almost completely abusive building that was indiscriminately advancing in the immediate nearby.
Another reason, which led to the acquisition of this area, was to realize a pole of noticeable archaeological interest, located between the Tiburtina and Prenestina, a system of archaeological areas and natural and integral parks.

With the acquisition of the archaeological area, the need was consequently created to elaborate a project to set up the park: in this regard, since 1987 the archaeological Soprintendenza of Rome has elaborated a feasibility study for the layout of the area.



Fig. 3: Aerial view of *Gabii*, pointing out the church of San Primitivo.



Fig. 4: The church of San Primitivo in *Gabii* and traces of the Via Prenestina, on the right.

Thanks to the funds available within the law for the Jubilee 2000, a first intervention was set up for the preparation of the archaeological area, which included both excavation and construction of some infrastructures.

2. The archaeological excavations

The excavations carried out by the archaeological Soprintendenza of Rome were aimed at bringing to light a long section of the ancient Via Prenestina, starting from the eastern boundary of the walls up to a point located near what was probably the forum, a large porticoed square on three sides excavated by Ennio Quirino Visconti in the late eighteenth century. It is thus intended to bring to light a large septum of the Prenestina ancient route, which crossed the center constituting its axis of urban development, at least in the late republican age and first imperial [1]. At the same time it was desired to privilege this ancient route, proposing it partly in its functions, as the main route inside the park.

A consistent section of the ancient Via Prenestina has been brought to light, from the probable point where the eastern gateway to the city was located, to a large public building situated at the western end of the excavation area (Michigan University excavations in 2008-2017).

In the first section, the one to the east of the medieval church, the Prenestina, which can be traced back to the arrangement currently visible in the first century of the imperial age, has obliterated remains of protohistoric age and a chamber tomb. Immediately behind the tower of San Primitivo, the remains of a mausoleum dating from the 2nd century A.D. have emerged. The funerary findings described above - although susceptible to more detailed checks - are data of considerable interest in terms of knowledge of the extent, development and history of the archaic settlement before and after the Roman city [2]. The archaeological investigations connected to the classical city have fundamentally affected an area located to the north of the road, although limited investigations have also been carried out in a contiguous strip south of the Prenestina.

As for the extensive excavation of the urban area, this involved a compressed strip between the church of San Primitivo and a previous excavation located to the west of the cult building. This point would seem to be of considerable importance within the Roman city: in fact, here the ancient Via Prenestina met another path, coming from the north-east and towards the city to identify in the path that led from *Gabii* towards the *Ager Tiburtinus*, the same along which the extra-urban eastern sanctuary is located. Both paths, joining together, then continue north-west towards the sanctuary of Giunone Gabina. At this road junction, immediately to the east of it, a monumental complex was brought to light characterized on the fronted portico in gabina stone pillars, facing onto the roads and articulated in numerous ambient, more than 20 identified ones, unraveled around a central uncovered area equipped with a fountain fed by a cistern below. Some of the rooms are paved with mosaics: one polychrome with geometric designs and another, characterized by a poor state of preservation, with geometric figures. The excavation has also allowed the identification of numerous wells excavated in the underlying gabina stone bench, some of which are circular and others of rectangular shape.

Proceeding in the direction of the San Primitivo complex, on both sides of the Via Prenestina, a series of rooms have been brought to light. Along the northern edge, a paved square has been found from which a road branch winds, oriented north-west / south-east, is overlooked by a series of rooms whose function is still retained.

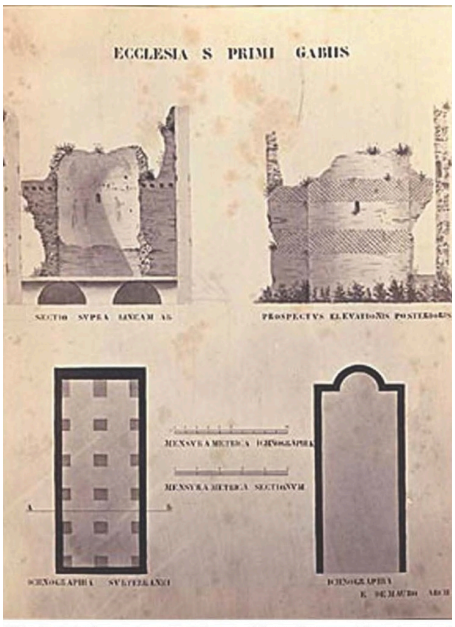



Fig. 5: *Gabii*, San Primitivo church (Parker Collection). **Fig. 6**: *Gabii*, San Primitivo church (Parker Collection).

Similarly, on the southern side of the ancient Via Prenestina, the excavation brought to light a series of environments characterized, in some cases, by numerous building renovations which, even in this case, would seem to occupy a chronological period between the Republican middle age and the end of the 2nd century A.D.

3. The church of San Primitivo

The cult of this saint is connected to the city of *Gabii* on the basis of what reported by the sources: Primitivo received martyrdom along the Via Prenestina, near the *pagus ad nonum* (located at the 9th mile of Via Prenestina) or perhaps in the city of *Gabii*. Subsequently his body was thrown into the waters of the Gabino lake. The first sure news concerning this building date back to 1030 and refer to the noble *Johannes de Georgio* and from his wife Bona, who donated the church of the saints Nereo and Primitivo in *Gabii* to the abbot Lioto, to build a monastery there «*in locum qui vocatur Gabis propemque lacum qui vocatur Bur[rano]*» [3].

One of the most interesting problems associated with these remains is the recognition in them of the seat of the gabino episcopate, diocese attests from 465 until 1060. The life of this place of worship continued until the mid-twelfth century, but in conjunction with the almost total decay of the inhabited center, the building assumed importance only as a place of control and warning along the Via Prenestina.

Of this church mention was made by Fabretti [4], Visconti [5] and Nibby [6], which among other things provided interesting information about the paintings that decorated the apsidal basin - consisting of a classical structure reused, collapsed in 1903 during a violent storm. The apse is considered part of a construction of Hadrian age, reused in the building of the church [7]. Ashby considered the possibility that the apse, partially in *opus reticulatum*, was medieval, due to its low quality and to the irregularity of the masonry [8].

The new survey of the church, done in 2020, thanks to the authorization granted by the Area Archeologica of Gabii (arch. Chiara Andreotti and Dr. Rocco Buchicchio), was useful to better understand the different construction phases of the building.

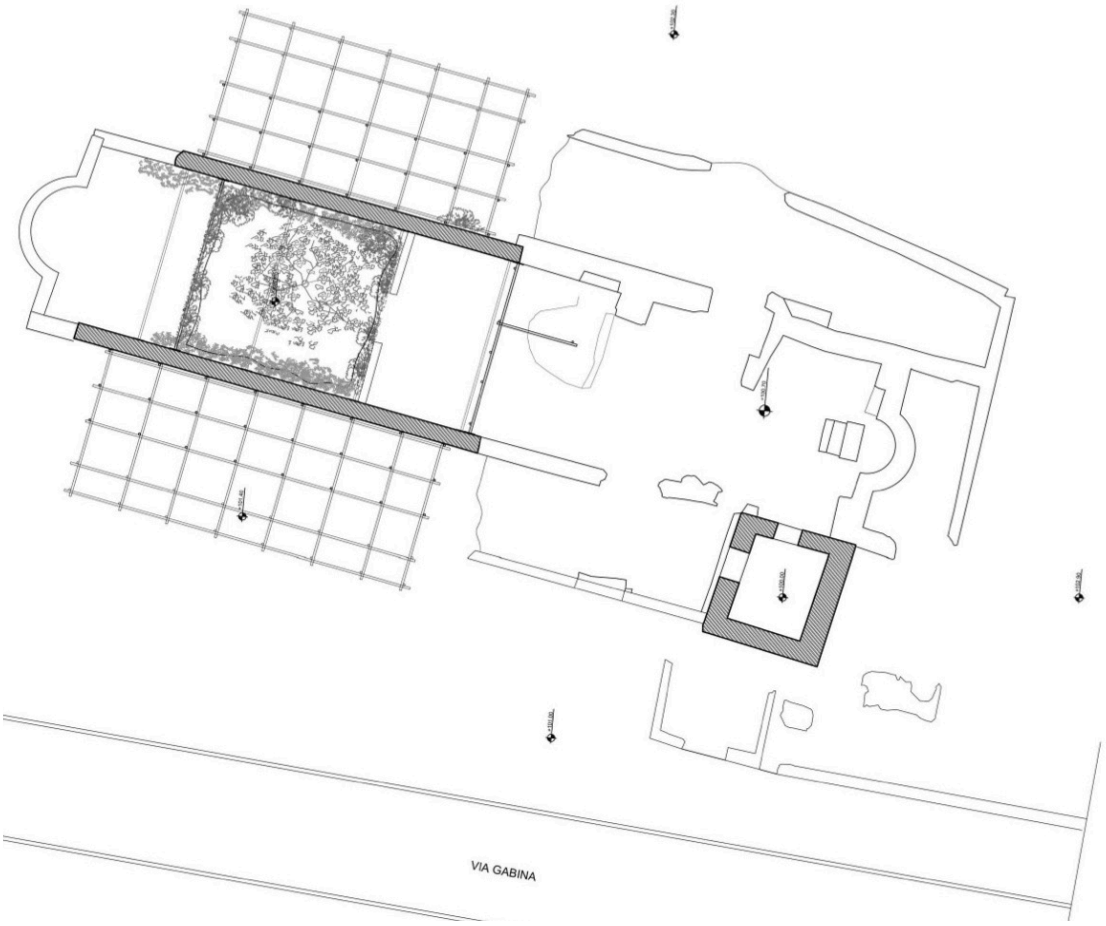

Fig. 7: Map of the church of San Primitivo in *Gabii* (Maduri, Sundar Chamarti).



Fig. 8: Internal - nothern elevation of San Primitivo in *Gabii* (Maduri, Sundar Chamarti).



Fig. 9: External - southern elevation of San Primitivo in *Gabii* (Maduri, Sundar Chamarti).



Fig. 10: Internal - southern elevation of San Primitivo in *Gabii* and eastern elevation of the bell tower (Maduri, Sundar Chamarti).



Fig. 11: External northern elevation of San Primitivo in *Gabii* (Maduri, Sundar Chamarti).

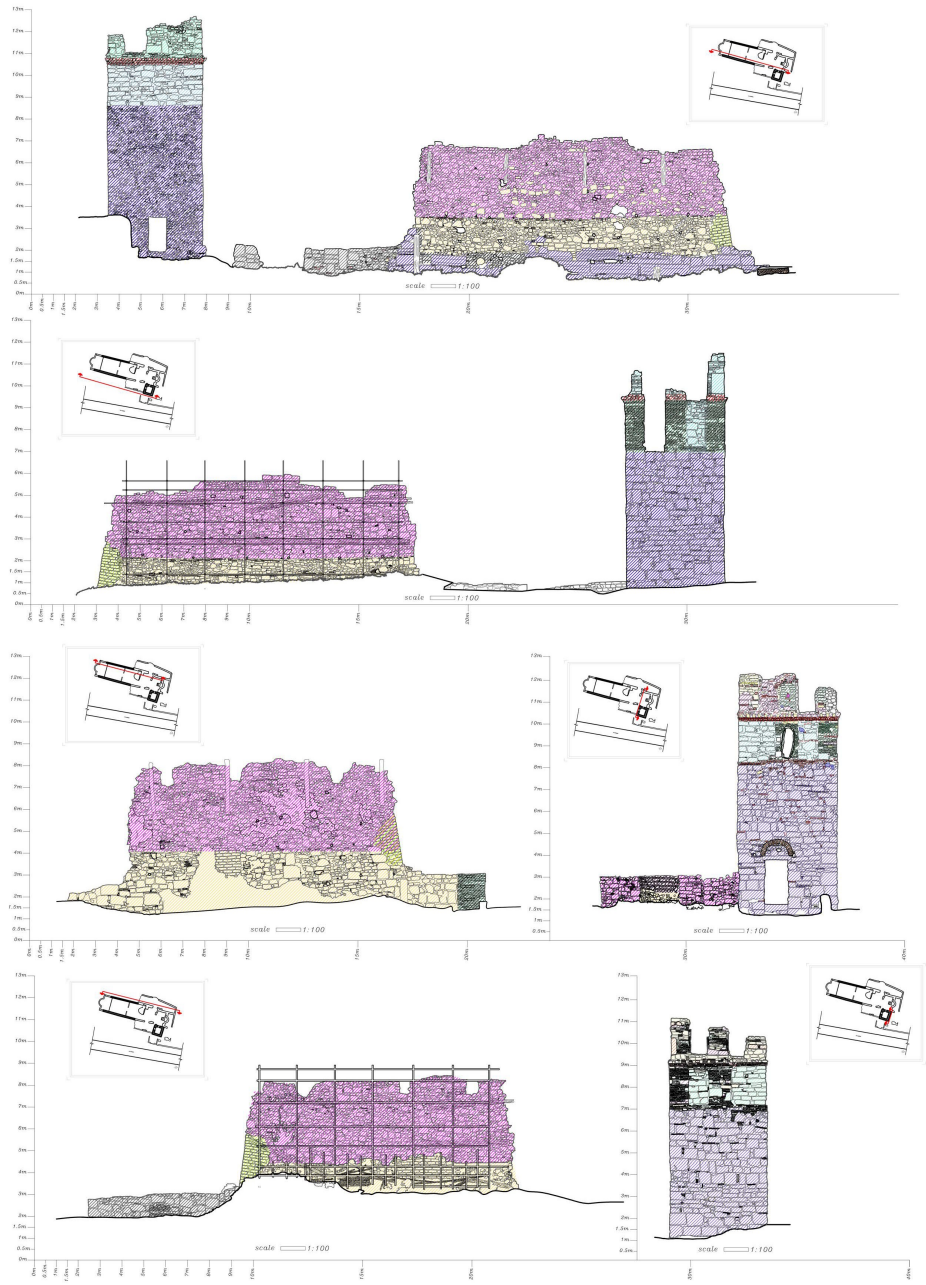

Fig. 12: Masonry stratigraphy of San Primitivo in *Gabii* (Maduri, Sundar Chamarti).

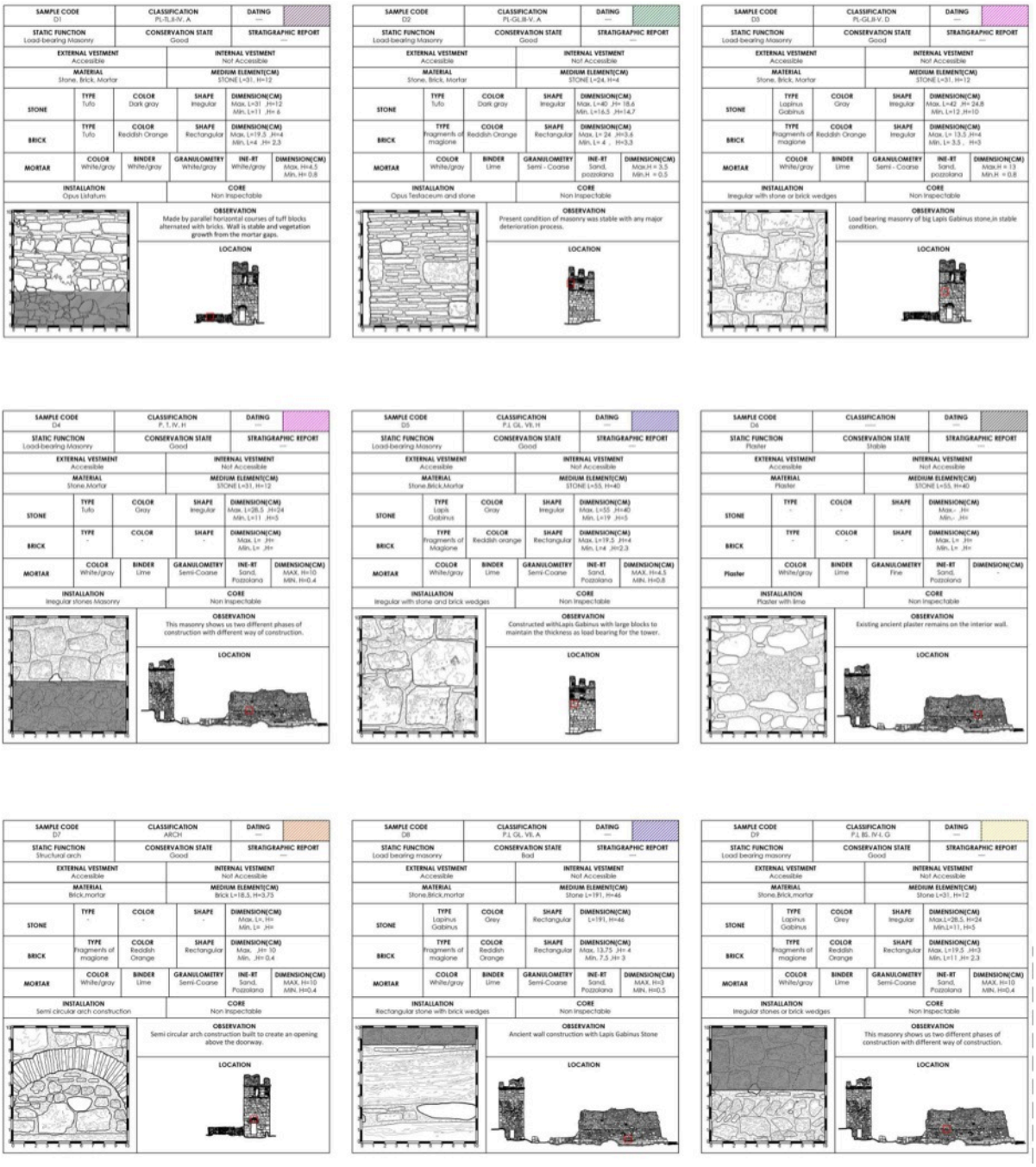

Fig. 13: Masonry analysis of San Primitivo in *Gabii* (Maduri, Sundar Chamarti).

The masonry analysis shows that the church manifestly has different construction phases. One of them involved raising, perhaps in phase with the construction of the crypt or with the construction of the superior church. In the area, in correspondence of the elevated sections, the church has a crypt whose vault was thrown into a sack against the perimeter walls, where some pillars were recognized - probably four per side - and resting on other pillars in the central sector of which at the moment only two have been identified.

Following the realization of this time a part of the fresco decorations referable to the previous lower church was obliterated, in particular three figures of saints or pilgrims were recognized. At present the vault described above is missing, due to a collapse of the structure, in the area that extends from the west apse to the dividing partition between the two wings of the superior church, composed of reused fragments of sarcophagus and inscribed marble slabs mostly incomplete. In the west wing and close to the partition, up to the edge of the vaulted ceiling, part of the pavement of this area is preserved, which presents itself at the same height as the other, but made with bricks and fractional marble slabs, irregularly enticed in a mortar plan. The compressed area between the edge of the emerging

perimeters and the bell tower is not preserved, however, no evidence of an emersion; the excavation has in any case allowed the identification of walls preserved at a very inferior altitude, that is m 1.50 - 1.70 from the foundation plane, more or less aligned with respect to those in high, although with a slightly rotated orientation to the northwest / southeast.
In this zone a presbyterial area has been identified with an apse facing east and an altar close to the latter. The altar presented inside the *fenestrella confessionis*, a slab with dedication inscription probably in Semitic or Aramaic language. The entire area is paved with fragments of re-used marble slabs clad in mortar and has traces of frescoes on the walls. Only the partition panels of the wall and apse are preserved without any representation. Immediately to the west of this area, the two main entrances to the church have been identified, one in the south perimeter wall, the other in axis with the latter - in the north perimeter wall. The different masonry technique, the two phases of openings identifiable on the perimeter walls evidenced by the infill walls, the imperfect structure of the building, the presence of the porticoed area described above and of the west wing partition with its two different floors, as well as the exceptional length of the religious building, which is decidedly disproportionate with respect to the width (30x6.5 m), would suggest the presence of two stages of expansion.
The apse in *opus reticulatum*, probably preexisting, became part of a church, perhaps shorter than the current one. Only in a subsequent phase was the building extended to its current length, taking the shape of two opposing apses [9].
Even the bell tower has different construction periods. The first phases of development are in common with those of the church. The last masonries belong to a period in which, after the abandonment of the church, at the end of the 13th century, the bell tower was used as a lookout tower along the Via Prenestina.
In the area between the sanctuary of Giunone Gabina and the church of San Primitivo, the archaeological Soprintendenza of Rome has been conducting, since 1990, the excavation of a large sector of the ancient city [1]. The excavations started in the past years and continued through jubilee funds, of the municipality of Rome and of the Soprintendenza. They led to the discovery of a long stretch of the ancient Prenestina road on which numerous buildings stood. In particular, a vast square supplied on the front of a portico with pillars of gabina stone, paved with slabs of gabina stone and tuff of the Aniene, in which is located a burrow cistern dug out of the rocky bank, of a type similar to that existing in the sanctuary of Giunone Gabina, as well as a series of underground tunnels for water disposal.

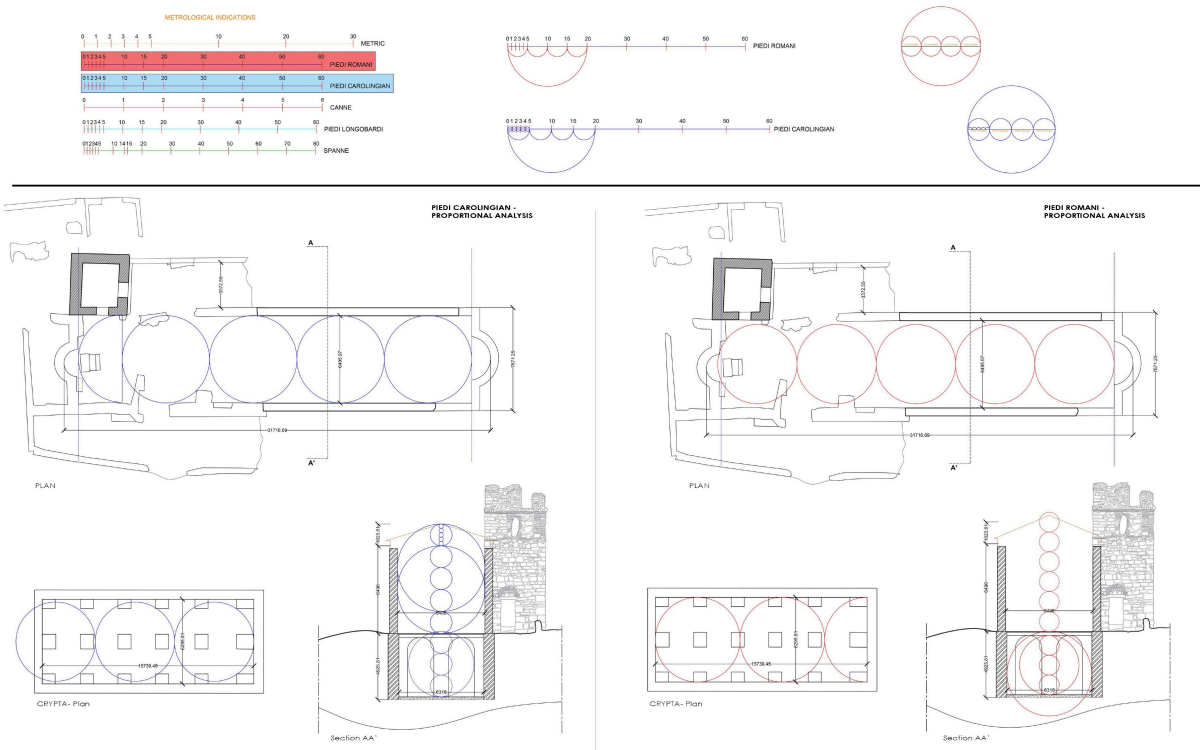

Fig. 14: Metrological analysis of San Primitivo in *Gabii* (Maduri, Sundar Chamarti).

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Methods and Strategies for Recognition, Enhancement and Fruition of Theatrical Architecture in Rome Historic Centre

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Abstract
The proposed study, framed within the research project "DynASK_Dynamic Atlas: a System of Knowledge", aims to develop innovative strategies for preservation and digital promotion of Rome's theatrical architecture.
The first step is to retrace the articulated history of Rome's theatrical architecture, through the study of its distribution within the urban fabric of the city. In particular, an attempt will be made to identify the dynamics that these buildings entertain with the city, with the aim of building a cognitive framework from which both the typological and the distributive evolution of theatrical architecture could emerge, as well as the their influence in the definition of the urban fabric of the historic centre of Rome.
This paper will be focusing on the central role played on this matter by the area corresponding to the ancient Campus Martius. Since ancient times, in fact, it has been identified as the part of the city mostly intended for the building of the monumental architectures in which Roman held their spectacles.
The second step is to develop new and innovative digital strategies for the enhancement of this part of the city, through the definition of "urban museum itineraries", whose attractors are meant to be set up both with on-site information points (managed through the use of QR codes) as wells as through online consultation (WebGis platform) [1].

Keywords: Digital technologies, Preservation, Promotion, Cultural assets, Cultural Heritage

1. The evolution of Rome's theatrical architecture and its role in the definition of the urban fabric of the city

1.2 Spectacles in the Roman World: the question of position (G.C)
Spectacles were an integral part of life in the Roman world. *Ludi*, as they were called, consisted of all those public spectacles and entertainments held in occasion of religious festivals commanded by the calendar and of those promoted for special occasions or commemorations.
Some forms of spectacle - such as triumphal processions, aristocratic funerals, and public banquets - took place in the city itself, while others were held in purpose-built spectator buildings: theatres for plays and other scenic entertainment, amphitheatres for gladiatorial combats and wild beast shows, stadia for athletic competitions, and circuses for chariot races [2]. These forms of entertainment served both as a vehicle for self-advertisement by the socio-political elite and as a means of reinforcing the shared values and institutions of the entire community [3].
The main aspect this paper aims to investigate concerns the question of position of theatrical architecture within the urban fabric of the city of Rome. The first point we would like to dwell into concerns the relationship between the *cavea* – the seating sections of Roman theatres and amphitheatres – and the morphology of the ground on which it was located. In general, three forms of support systems can be identified for the *cavea*, in relation to the degree of "dependence" it establishes with the ground. In the first category, the cavea takes full advantage of the opportunities offered by the ground by creating, for example, buildings dug into the rock or leaning against a natural slope. The second category is a compromise between the exploitation of the morphological characteristics of the ground and the work of man. There may be, for example, the case in which an entire side of the building is leaning against

the slope while the other is entirely built. Finally, the last category, the one with the least degree of dependence, includes all those buildings built entirely or almost entirely on artificial substructures [4].

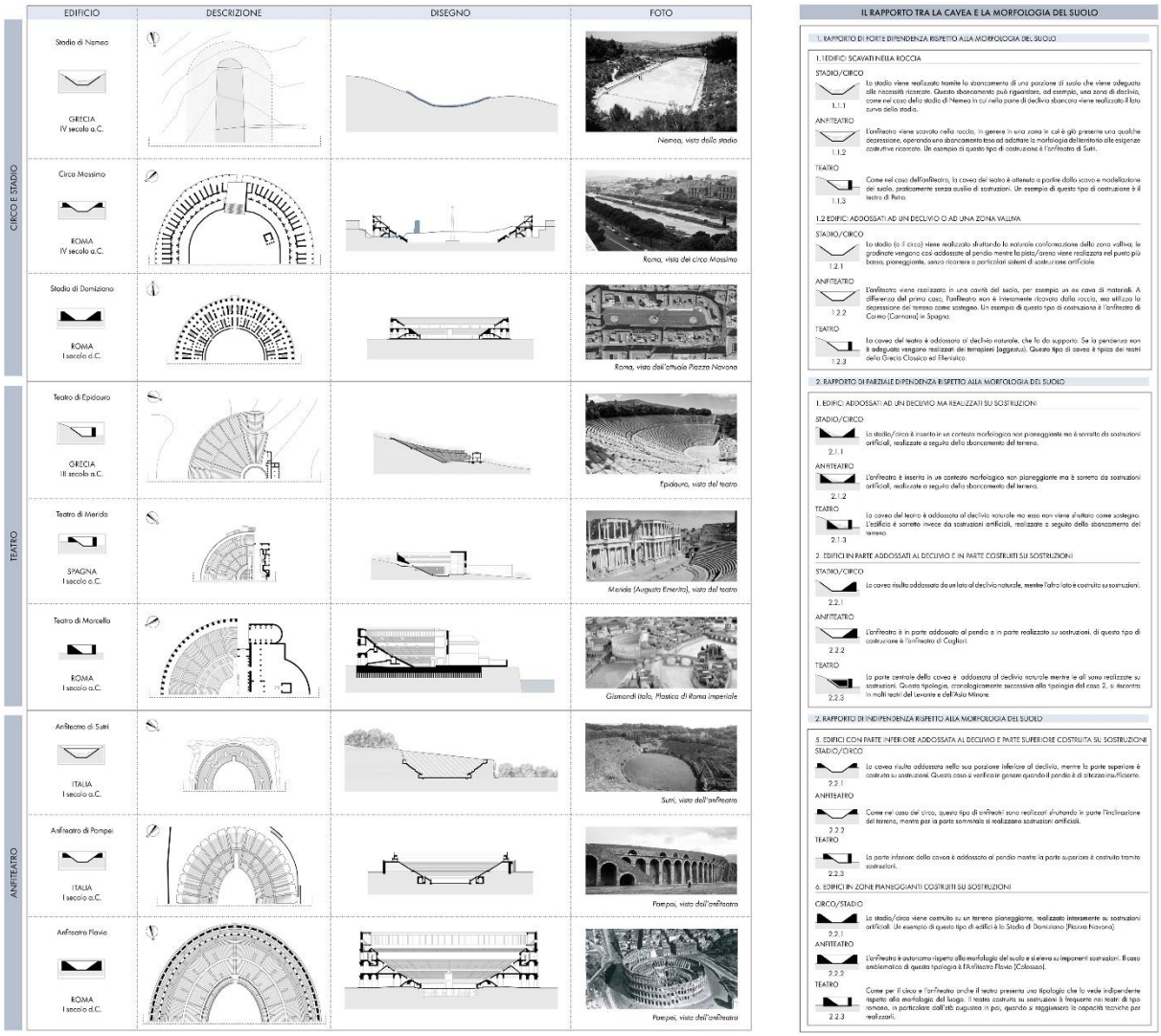

Fig. 1: Cavea's forms of support systems, in relation to the degree of "dependence" it establishes with the ground (graphic elaborations by G. Cecconi and G. Lopes Ferreira).

Regarding the city of Rome - although this line of thought could be extended to the whole Roman world – the choice of site involved a decision as to whether the building was to be free-standing or built against a slope. It can be noticed that circuses – being the oldest type of buildings dedicated to public games – tended to be located whether in valley areas or in the alluvial plain of the *Campus Martius*. In their early forms, circuses were not proper architectural complexes, but rather specialized areas chosen because of the natural advantages of the site. It is the case of the *Circus Maximus*, where the level ground of the Valley of Murcia could be used as a track and the natural slope as a space for spectators [5].
The case with theatres was different. Although until the end of the second century BC, following the Greek model, most theatres had been built against a slope, by the early first century BC architects could build a sloping auditorium even on a perfectly flat site by supporting it on hollow substructures of concrete [4]. This is the case of the first permanent theatre completed in the city of Rome, the theatre of Pompey which was located in the *Campus Martius* along with the other two famous theatres of Rome: the theatre of Marcellus and the theatre of Balbus.
In Rome in particular, being that up until the construction of the theatre of Pompey (55 BC) building permanent theatres within the city was forbidden, this type of building arrived late and it was therefore possible to take advantage of the most advanced construction techniques, as well as the best typological solutions already tested in the rest of the peninsula.
A similar argument can be made for amphitheatres as their permanent form was reached, as for roman theatres, between the end of the Republic and the beginning of the Empire [6].

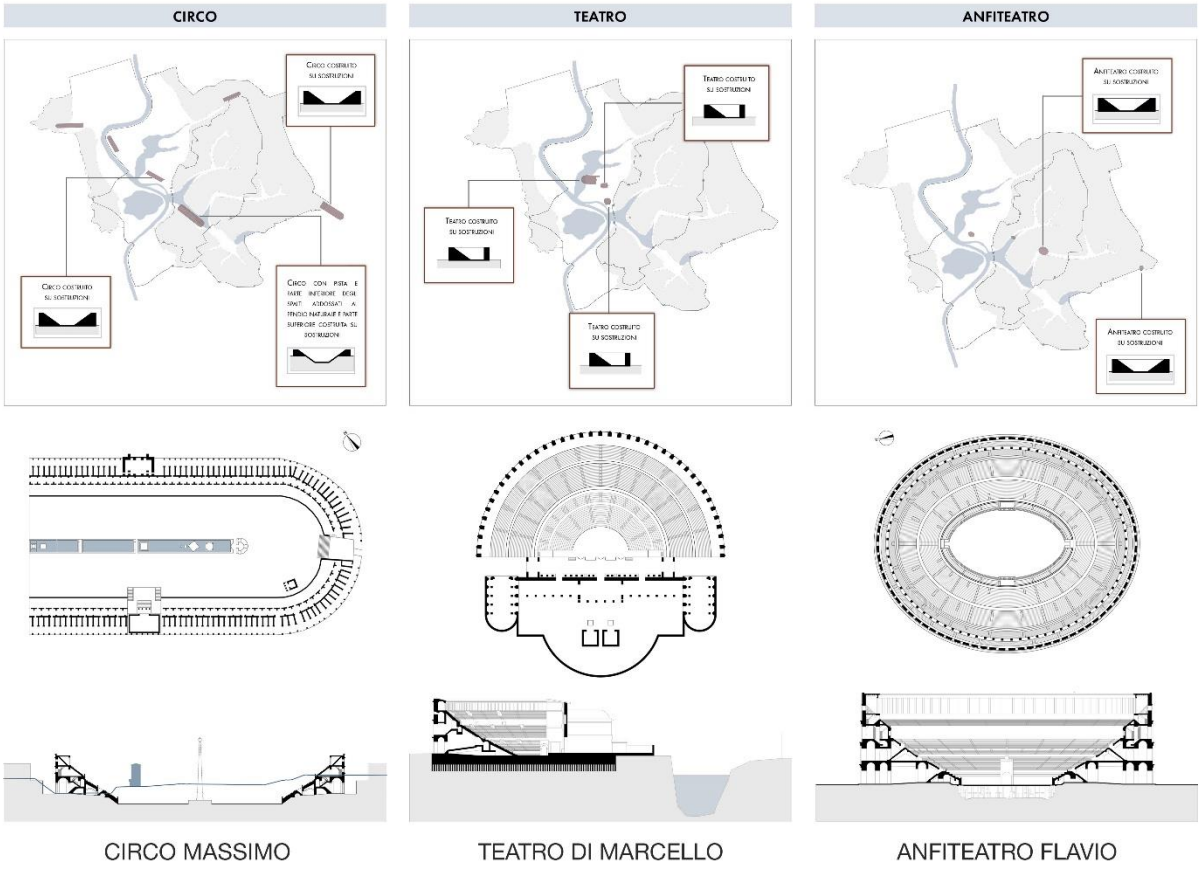

Fig. 2: Circuses, theatres and amphitheatres in Rome: the relationship between structure and position (graphic elaborations by G. Cecconi and G. Lopes Ferreira).

The second point that can be made in regard to the matter of position is the relationship between spectacles and religion. As previously mentioned, *ludi* were held in conjunction with Roman religious festivals as well as special celebrations. In occasion of Roman Triumph, a ceremony held to celebrate and sanctify the success of a military commander, public games promoted the general's – and later the emperor's – status and achievements. It is therefore no coincidence that most of Rome's architectures dedicated to games and spectacles were built along the path of triumphal processions, especially in the *Campus Martius*.

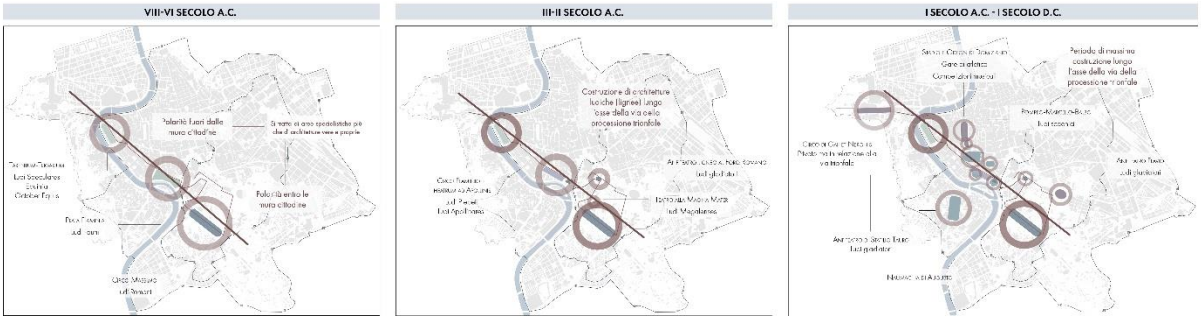

Fig. 3: The evolution of purpose-built spectator complexes built along the path of triumphal processions (graphic elaborations by G. Cecconi and G. Lopes Ferreira).

1.3 The theater as a reflection of the society's transformation process: the evolution of the entertainment buildings from the fall of the Roman Empire to the XX century A.D. (G.L.F.)

From the fall of the Roman empire, the ancient architectures were gradually dismissed as also the need of a physical place to perform games and spectacles. So, during the transition from the pagan religion

to the Christian one, theatrical representations and religious festivities (except for liturgical celebrations) were performed among the streets, squares and also entire parts of the city [7].
Interestingly, in this phase, even if these structures were abandoned, their evocative shapes and even their location strongly influenced the definition of the new Christian religion. New Christian festivities (such as the *Cornomania*, the *Ludus Carnevalarii*, the *Libertà di Dicembre* or the *Festa della Chinea*) wee strategically linked, in timing and modalities, to the pagan festivities of the Roman world. In addition, circuses' shape clearly influenced the architectural form of the first Christian permanent buildings and the same places were ancient festivities took place maintain an important position within the new Rome's ecosystem [8]. For example, theatres, amphitheatres and circuses were included in the pilgrimage routes, a key religious practice for the history of the city. In these routes, buildings and events of both paganism and Christendom are mixed together, as if to prove their current use in the medieval city [9].

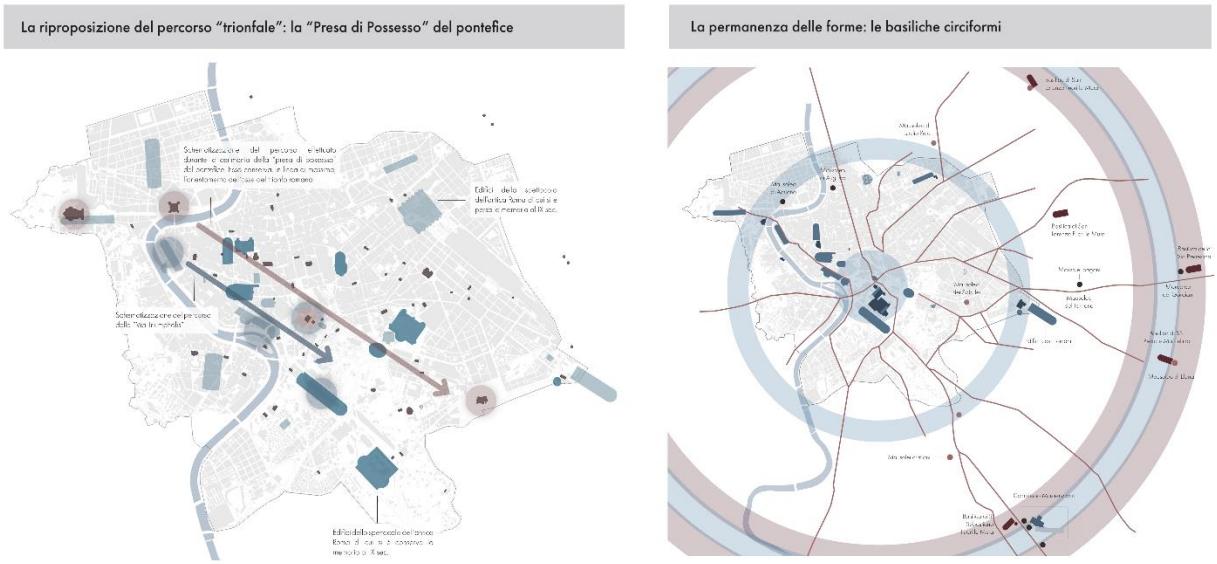

Fig. 4: On the left, the revival of Roman Triumph's path (blue) through the *Presa del Possesso* papal ceremony (red). On the right, the concentric disposal of the *circiformi* basilicas alongside the consular roads: a reference to the concentric arrangement of the Roman circuses (graphic elaborations by G. Cecconi and G. Lopes Ferreira).

First Rome's real theatrical representations appeared under the protection of the popes and only in the XVI century A.D. These representations had a strong temporary character and they were strictly linked to political and religious aspects.
Throughout the century, only three permanent theatrical venues have been documented (the *Teatro in via Giulia*, the *Teatro Anguillara* and the *Teatro del Collegio Germanico*), but the chronicles of the period reported of a numerous temporary installations built for various occasions such as coronations, weddings, triumphal entrances of kings and ambassadors, popular and religious festivals, masquerades, etc. The Colosseum, the Forum, the Capitol, the *Testaccio* area, *Piazza Navona* and *Via del Corso* - such us a large room in Castel Sant'Angelo and the courtyard of Palazzo Riario - are the recurring places where these representations were staged [7].
At the beginning of the seventeenth century A.D. the need for permanent structures began to be felt. Therefore, during the century, a gradual "return" of the theater within the context of private building started. Roman nobility replaced the pontiffs in the function of promoting and funding theatrical representation and, at the same time, religious orders and confraternities gave life to an intense series of representations. Seminaries, Oratories, and religious schools were the alternative places where the Roman nobility could attend sacred and profane performances [7,10,11].
The numerous theaters of this period are mainly built by the greatest families of the Roman nobility (such us the *Barberini, Caffarelli, Colonna, Corsini, Ottoboni, Pamphili, and Rospigliosi* families) and they are mostly located in the ancient Augustan *regio of Circus Flaminius* area and in the *Tridente* area, following the expansion zones of the city. The theater became an elite phenomenon: we had to wait the 1670s to see the first public theatre in Rome, when the opening of the *Tordinona* took place [10,11].
In the XVIII century A.D. - after an initial period of stagnation, due to papal prohibitions – several public theaters (the *Capranica*, the *Mascherone al Teatro Farnese*, the *Granari* and the *Della Pace*) began to appear. They were intended for a paying audience: anyone who could afford it could finally have the

right to buy a ticket. Theater became an economic investment and the figure of the impresario progressively replaced the Roman nobleman in the management of the theatrical city life [10].
New theaters did not assume the aspect of representative buildings and they often remained hidden in pre-existing situations. So, these first structures were realized without any monumental intent and they were characterized by the almost total absence of the most elementary safety and hygiene norms [7,10].
The following centuries were characterized by a great building with the construction of numerous new public theaters and - especially during the first half of the nineteenth century - the restoration of the already existing ones inherited from the previous centuries.
Towards the middle of the nineteenth century theaters became places of civil and political commitment and during the Second Roman Republic they played an important role in the political life of the city, also hosting numerous events and public meetings [10].
After 1870 and the proclamation of Rome as the capital of Italy, theatrical public became more and more numerous and attentive, attracting the attention of many builders who began to invest their capital in the purchase of building areas where to build new theaters [10].
The theater gains more and more a monumental and representative aspect while domestic theaters almost totally disappeared. Alongside the traditional theaters, other types of buildings began to emerge: Arenas, *Spheriteri*, *Politeama*, *Café-concerto* and *Cinema-teatro* [10].

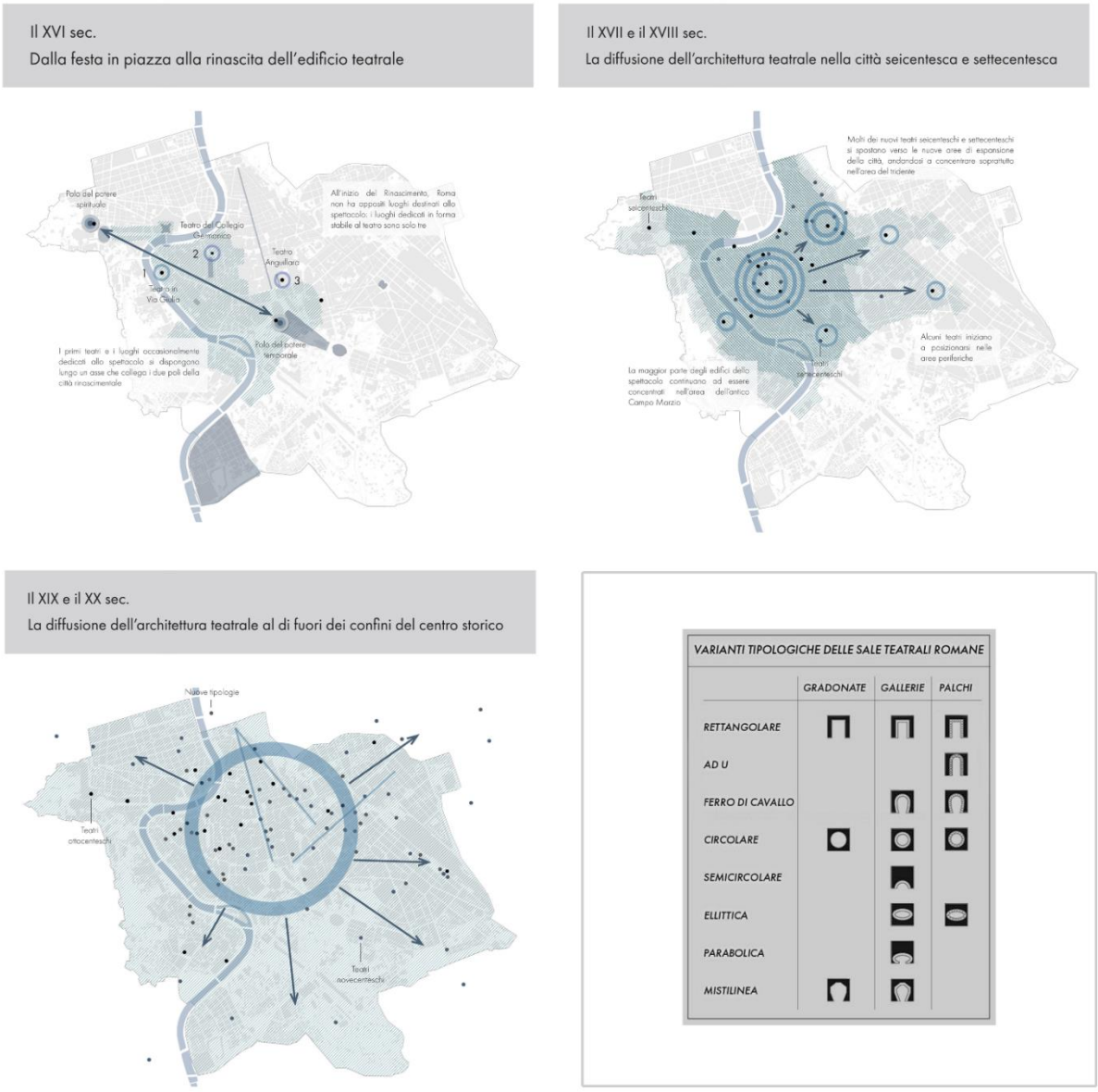

Fig. 5: The evolution of Rome's theatrical architecture in relation to the urban fabric of the city and its changes between the XVI and the XX century A.D, and a schematic summary of the typological form of Rome's theatre hall (graphic elaborations by G. Cecconi and G. Lopes Ferreira).

2. The influence of the culture of spectacle in the topography of the Campus Martius (G.C.)

Located north of the Capitoline Hill, the Campus Martius was a marshy area initially used as a military exercise ground. Over the centuries, the plain developed into the premier entertainment district of the city, with its impressive urban landscape and even more extraordinary and permanent stone theatres [12]. These massive buildings significantly influenced the transformation of the topography of the Campus Martius. One of the most representative examples of this phenomenon can be found in the theatre of Marcellus which was saved from destruction by being turned into a fortress in the Middle Age and whose arches are still clearly visible today. Other notable examples can be found in *Piazza Navona* – whose recognizable shape originated from the Stadium of Domitian – and in *Palazzo Massimo alle Colonne*, a palace located near the aforementioned square and whose curved facade was dictated by foundations built upon the Odeon of Domitian [5].

The focus of this paper is however the theatre of Pompey. Dedicated in 55 B.C. the Theater of Pompey the Great was Rome's first and largest stone theatre. Its concrete and stone technology allowed Pompey's architects to locate the building on a flat, marshy plain rather than on a more conventional sloping hill and its curved walls are still clearly recognizable today in the curvilinear layout of Via di Grotta Pinta, which follows the ancient shape of the cavea [10]. Over the centuries several scholars have tried to reconstruct the physiognomy of Pompey's complex, including Luigi Canina, Victor Baltard and Rodolfo Lanciani. Starting from the fragments of the *Forma Urbis Romae* depicting the theatre – combined with surveys of the existing ancient structures – various hypotheses have been advanced on the physiognomy of the first stone theatre in Rome [15].

To further investigate the relevance that the theatrical vocation of the area had on its urban fabric, it can be point out that on the area once occupied by the porticus of Pompey, in the eighteenth century was built one of the first example of Italian-style theatres, *Teatro Argentina* [13].

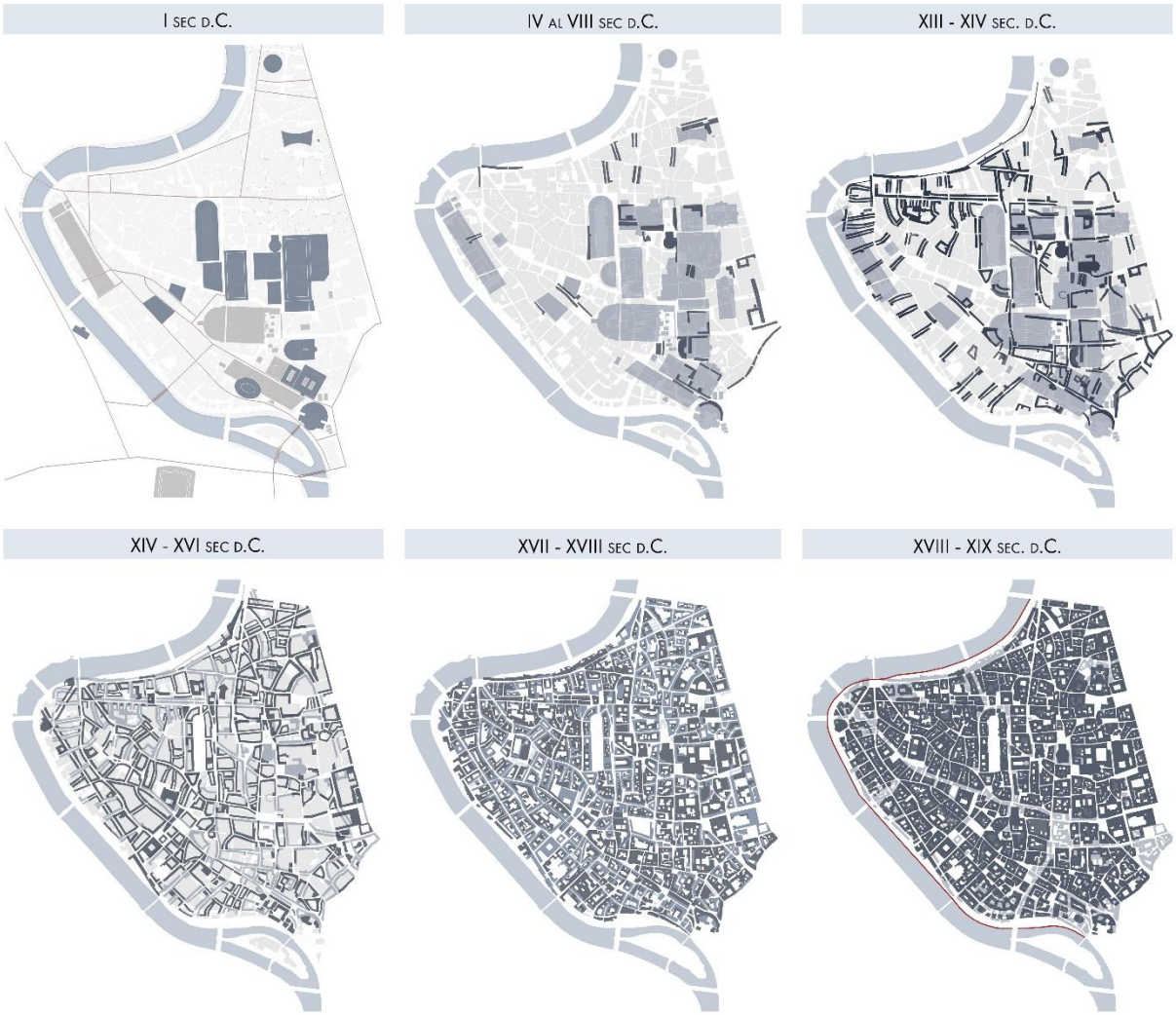

Fig. 6: The evolution of the urban fabric of the Campus Martius (graphic elaborations by G. Cecconi and G. Lopes Ferreira; based on the work of [5] [14] [16]).

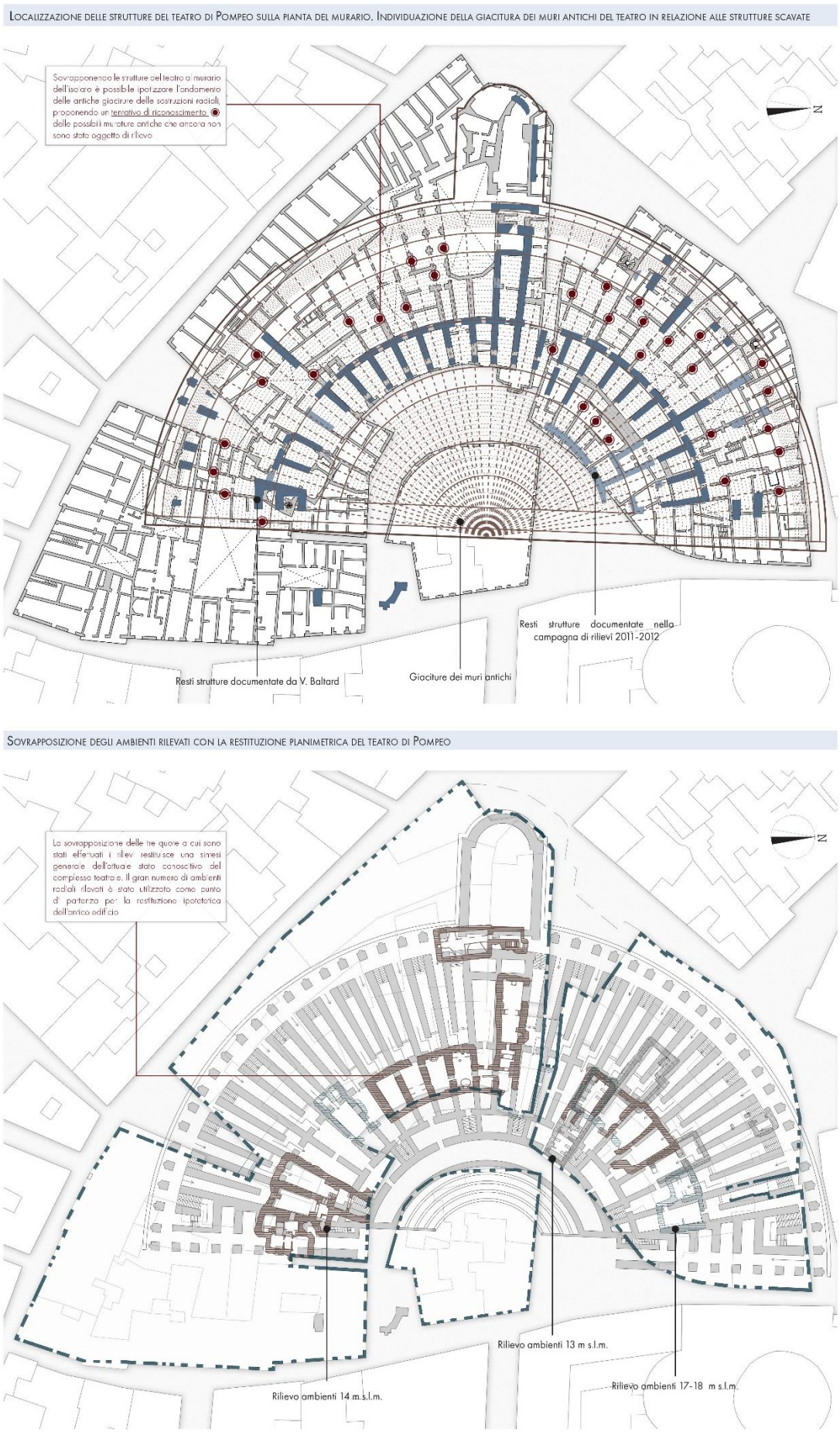

Fig. 7: Preliminary studies for the reconstruction of the theatre of Pompey (graphic elaborations by G. Cecconi and G. Lopes Ferreira; based on the work of [15] [17] [18]).

3. The enhancement project: an itinerary through the theatres of ancient Rome for the enhancement of artistic and architectural heritage of Campus Martius (G.C. & G.L.F.)

The study on the Campus Martius led to the development of new and innovative digital strategies for the enhancement of this part of the city through the definition of “urban museum itineraries” whose attractors have been set up within environmental oases, spaces dedicated entirely to circulation pedestrians who can thus enjoy the city safely. The fruition of these sites is meant to be set up both with on-site information points (managed through the use of QR codes) as wells as through online consultation (WebGis platform) [19] [20].
The itinerary proposed here starts with a visit to the theater of Marcellus and continues through *via del portico d'Ottavia*, a road that follows the ancient route of via Triumphalis. Along this street it was once possible to admire the *Circus Flaminius* and other majestic buildings such as the Temple of Apollo, the Temple of Bellona, and the *Porticus Octaviae*. The tour continues towards *Campo de 'Fiori* where it will be possible to use a QR code to view 3D reconstructions of the theatre of Pompey. Arriving in *via di Torre Argentina* it is possible to admire, on one side of the street, the facade of *Teatro Argentina* - an eighteenth-century example of the city's theatrical scene - and on the other side a holy area, dating to the Republican era, with four temples. From this point the itinerary continues in *Via delle Botteghe Oscure*, with its last stop at the National Roman Museum - Crypta Balbi, the place where the theatre of Balbus and its annexed crypta once stood.

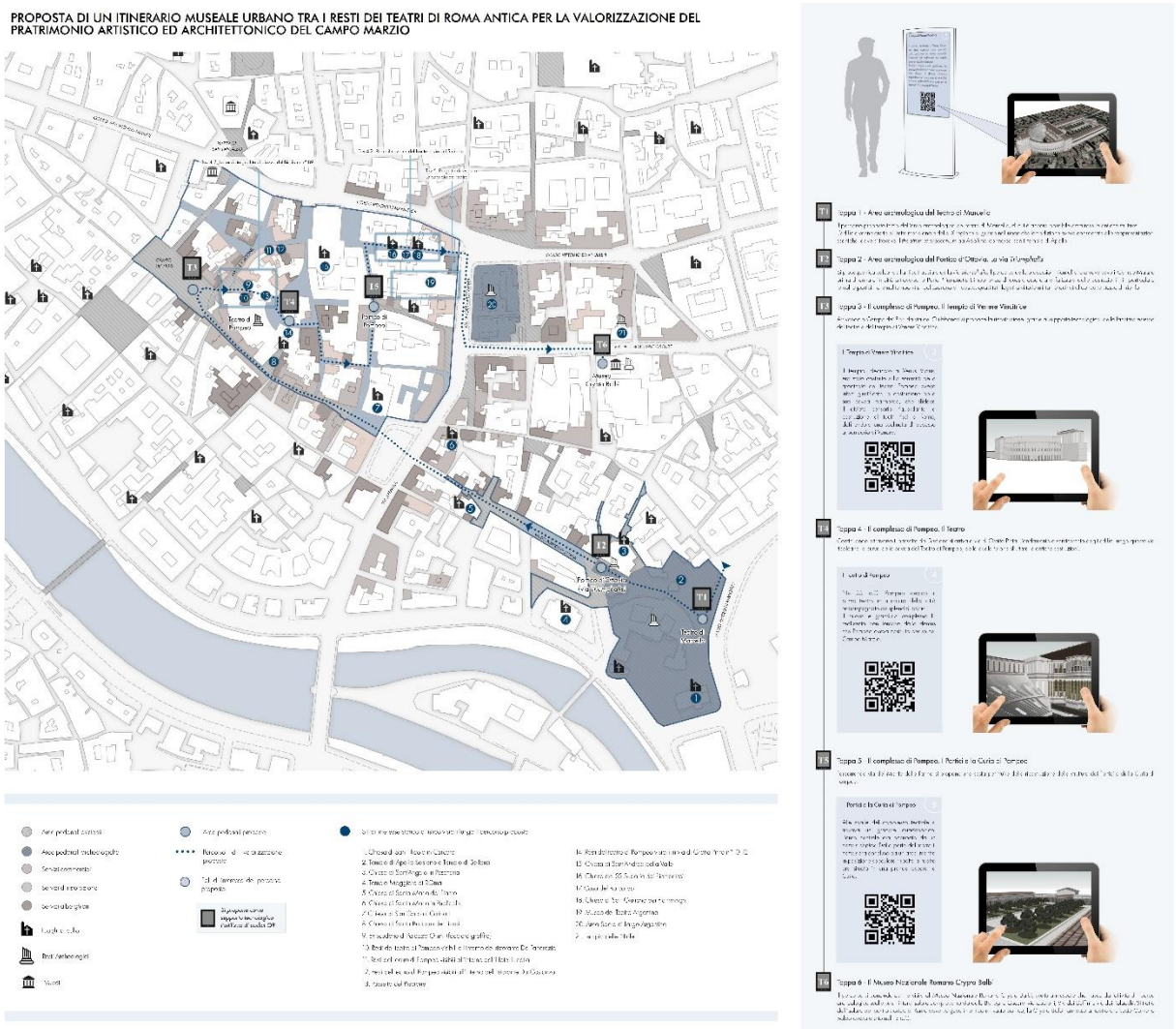

Fig. 8: The enhancement project: an itinerary through the theatres of ancient Rome for the enhancement of artistic and architectural heritage of Campus Martius (graphic elaborations by G. Cecconi and G. Lopes Ferreira)

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[1] This article, written in collaboration, contains the research conducted by the two research fellows Giorgia Cecconi and Giulia Lopes Ferreira; The abbreviations (G.C.) and (G.L.F.) next to the name of the paragraph or sub-paragraph indicate the respective contributions.

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Searching for the human scale: transformations and "cultural heritage metabolisms" in the Monastery of Santa Clara de la Columna in Belalcázar (Cordova, Spain)

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Abstract
There are several architectures that have remained intact throughout history and nowadays we can admire them as cultural heritage buildings. These "crystalized" constructions have not been capable of keeping their original use and conforming to social changes, although at the present time they are representative of historical and architectural values. On the contrary, there are architectures that have kept their original use and that have been forced to change themselves in order to adapt to contemporary biorhythms.
We introduce the case of the Monastery of Santa Clara de la Columna in Belalcázar (Cordova), founded in 1476 and with an uninterrupted presence of Poor Clares. It is exemplary of how, maintaining intact the Gothic-Mudéjar architecture, a cultural heritage building can constantly adapt, over time, to embrace new archetypes.
At the current time of pandemic, this architecture, improved as a result of historical events, has a lot to show, through a number of fundamental and healthy dichotomies: individual and communal spaces; work and study spaces; meditation and entertainment spaces, etc. The present research aims to underline how this architecture has been capable of combining its cultural heritage value with healthy needs and the human scale.

Keywords: Belalcázar, Santa Clara de la Columna, human scale, conservation, human needs

1. Introduction
The Monastery of Santa Clara de la Columna in Belalcázar, declared cultural heritage architecture in 1982, represents one of the finest examples of the Gothic-Mudéjar architectures in Cordova.
On the 6th of November 1444, in exchange for support in his military operations, the king Juan II granted Gutierre de Sotomayor the territories of Gahete and Hinojosa[1] that remained under domination until the 19th century when the privileges of the nobility were definitely abolished. Afterwards Alfonso I, illegitimate son of Gutierre de Sotomayor, changed the name of the county from Gahete to Belalcázar.
The promoter of the foundation of the first convent in this place was Elvira de Zúñiga, wife of Alfonso I and daughter of the count of Plasencia, who decided to encourage the construction of a convent of Franciscan friars with an annexed building as a familiar Pantheon of the Sotomayor. The foundation of the convent, with a considerable investment, was clearly intended to promote the prestige and the lineage of the family.
After the death of Elvira de Zúñiga in 1483, her daughters Leonor and Isabel decided to reside in the property adjacent to the convent in order to lead her lives in a conventual and contemplative way. They

[1] "Hinojosa y Gahete con sus vecinos y moradores, términos, rentas, jurisdicción civil y criminal alta y baja, prados y pastos". MOLINERO MERCHÁN, Juan Andrés. *El convento de Santa Clara de la Columna de Belalcázar*. p. 36.

lived for a period in a feminine community whose did not identify itself as a religious order but merely as a laic group. After time, only in the last decade of the 15th century, the real conversion of the Franciscan convent into a feminine order consecrated to Saint Clair of Assisi took place: the friars moved to another convent that was erected *ex professo* from the countess Teresa Enríque and the Poor Clares − from the convent of Nuestra Señora de la Consolación de Calabazanos − arrived in Belalcázar[2]. These first nuns, following the Rule of Saint Clare of Assisi, dedicated the convent to Santa Clara de la Columna in honour of the relic of Christ and became a recluses officially in 1494.

Nowadays the monastery, adapting to the nouns' needs and the touristic necessities, is divided into the public access area and the area of reclusion (fig. 1). The first one is the most ancient part of the complex, characterized by the presence of the main cloister, the church, the familiar pantheon of the Sotomayor – at the present assigned as auditorium – all the main communal spaces ordered around the galleries, and some of the additions by the nouns in the last decade of the 15th century as the communal dormitory or the infirmary. The refectory is located in the southern part of the main cloister, instead the chapter house in the eastern part, at the present assigned as study room.
The second private part, is totally dedicated to the reclusion, and as the first one is organized around a cloister, the patio of Santa Clara that put in order all the construction.

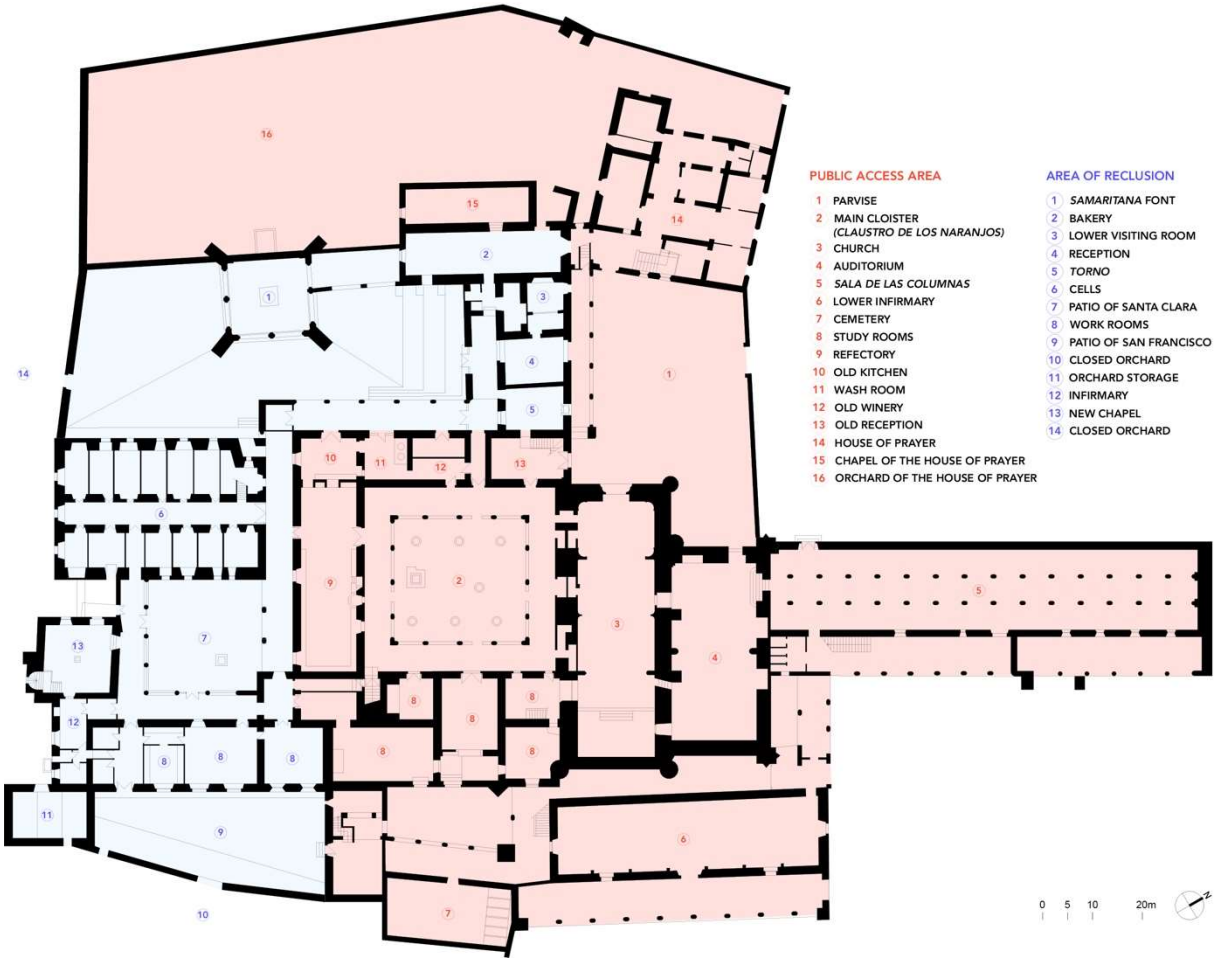


Fig. 1: Current plan of the monastery with the difference between the area of public access and the area of reclusion.

In spite of the continuous transformations throughout the centuries – first of all the transition from the Franciscan friars to the nuns – for adapting this building to the human needs, this architecture has kept continuously its original use conforming to social changes. At the present time we can admire this cultural heritage building as an example of architecture that has been capable of forcing itself to change in order to adapt to contemporary biorhythms without crystalize itself.

[2] The friars moved to the other convent exactly on the 21th of March of 1490. The papal seal of Alessandro VI was officially obtained on the 19 th of December of 1493. MOLINERO MERCHÁN, Juan Andrés. *El convento de Santa Clara de la Columna de Belalcázar*. p. 154.

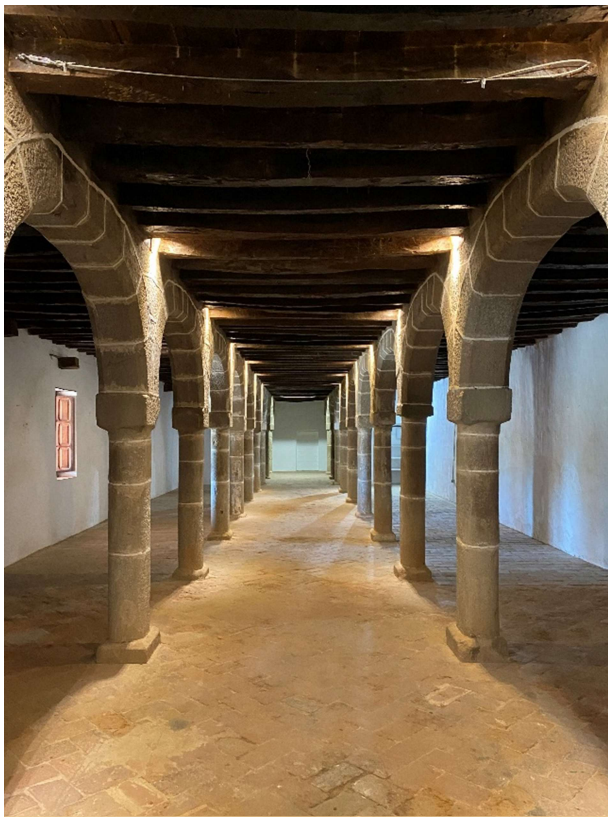
2. Adapting to the biorhythms

The first convent consecrated to San Francis of Assisi was distinctly the result of a single simultaneous constructive process, so for this reason was arranged according to a basic spatial organization with a chapel, a chapter house, a refectory and the cells set up on the first floor around the main cloister. The transition from the convent into a feminine coenobium implicated some changes with regard to the function of spaces.

The first relevant transformation, that allows us to illustrate how this architecture changed following the nouns' needs, was the construction in the last decade of the 15th century of a new area in the northern part of the complex: the ground floor was designed as a storage room (*Sala de Columnas*; fig. 2) and the first floor as a communal dormitory, since the cells of the friars at that point were not enough to accommodate the high number of nouns who arrived in the monastery. This new construction, used as feminine dormitory until the 20th century, implicated others collateral modifications as the ones occurred in the pantheon where it was realised a gangway to connect the main cloister to the communal dormitory. Besides, when the friars leaved, the pantheon ceased being the funeral chapel of the family and became sacristy. Due to the copious nouns of the religious community, the choir that before was reserved to the nobility, assumed a triple function: the space where the Liturgy of the Hours occurred, the space from which the nuns could participate to the masses and at last the music room. The extension of the refectory and the interventions in the galleries of the main cloister are also dated to this phase of transition.

Moreover, the construction of all the annexed secondary spaces is dated to the last decade of the century, as for example the orchard, the laundromats, the cemetery. Undoubtedly the most relevant addition to the complex was the infirmary (fig. 3) behind the church and the chapter house in the north-eastern part of the monastery.

All these additions illustrate not only a religious complex that during the centuries has evolved from a basic spatial concept to a place in which all the functions coexist and are mixed, but also an architecture that has always lived in symbiosis with its own inhabitants. For example, in the 20th century during the Spanish Civil War, when the nouns were forced to abandon her home, the monastery underwent a long phase of decline and deterioration of its structures.



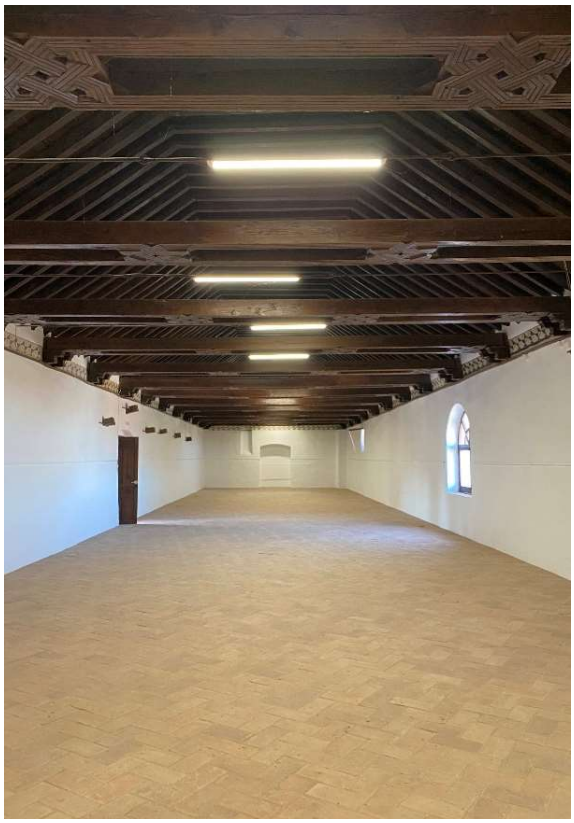


Fig. 2: *Sala de Columnas* (ground floor of the new part built by the nouns).
Fig. 3: Infirmary in the north-eastern part of the monastery, added by the nouns.

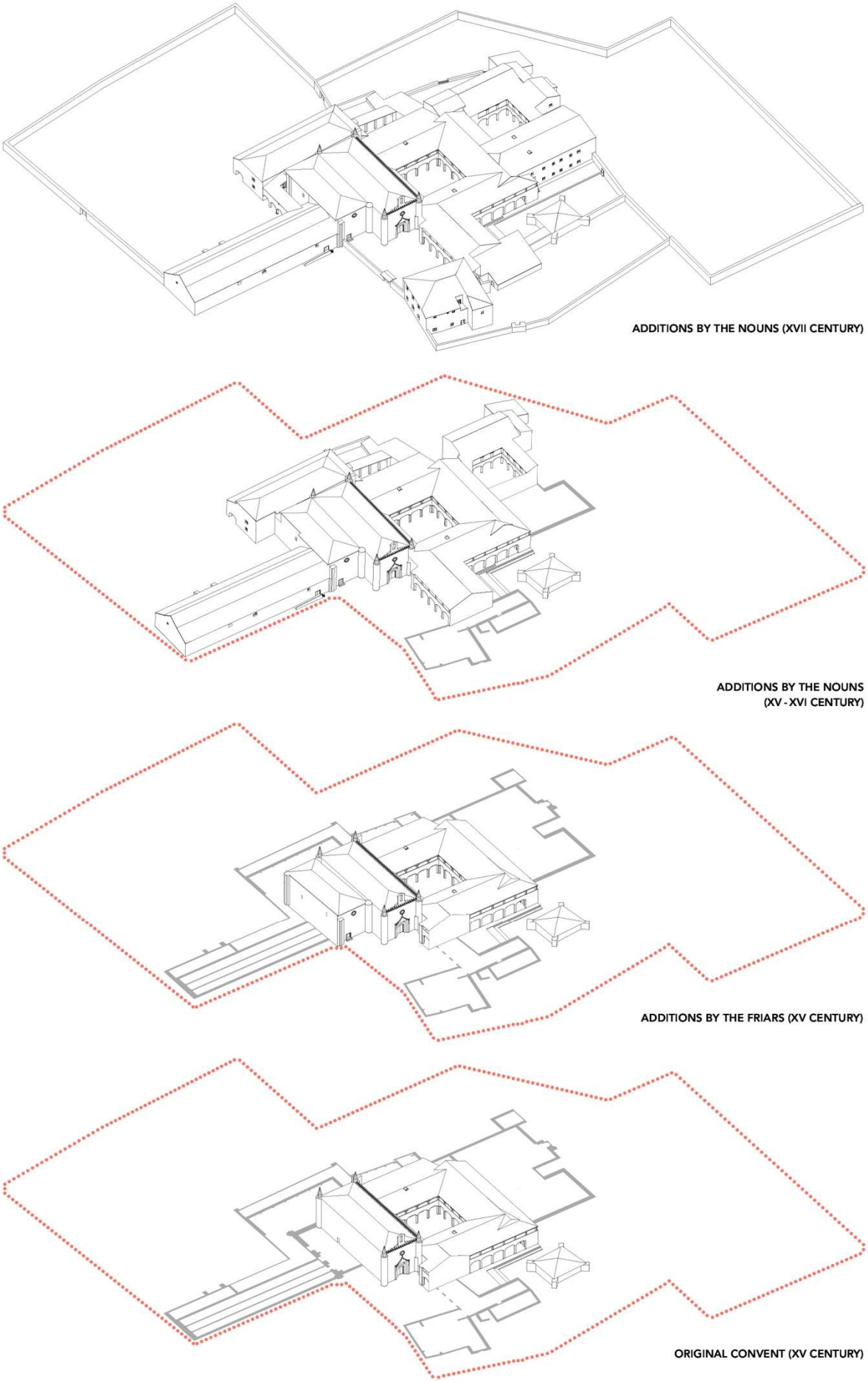


Fig. 4: Axonometries of the constructive phases of the monastery.

3. The monastery as an architectural model

There are some peculiar aspects that make possible the acknowledgement of the archetype of the monastery as an authentic model of life and organization. Le Corbusier, after his journey in Italy, had already recognized the charterhouse of Ema (near Florence) like "a modern city of the 15th century"[3] in which the cell is the basis of a complex spatial and functional system: every space has its exact purpose and every inhabitant of the community has his precise role, like the inner working of an articulate machine. A monastery is also conceived as a model in which a number of dichotomies are present: individual and common spaces, work and study spaces, meditation and entrainment spaces, productive and contemplative spaces, etc.

Especially at the current time of pandemic, this architecture, perfectionated by time, has a lot to show in terms of balance; exactly like in a city, human beings need a particular space in a particular moment and its contrary in another one: the pandemic situation has well put in evidence how the individual spaces lose their meaning without their opposite, the spaces of relation.

Besides, in the monastery of Belalcázar the constructive processes and the typological invariants – material and immaterial – have moved in parallel all over the centuries. This architecture can be considered a model not only for what said before, but also because of a series of physical elements that improve the salubrity of the nuns' daily spaces. The strict connection between inside and outside has always been a constant in the historical architecture, from the atrium of the roman *domus* forward, so in every part of the complex there is a strong presence of nature. The relationship between inhabitants and nature acquires relevance in relation with the productive aspects of nuns' life and above all, because it symbolizes the purification of the spirit.



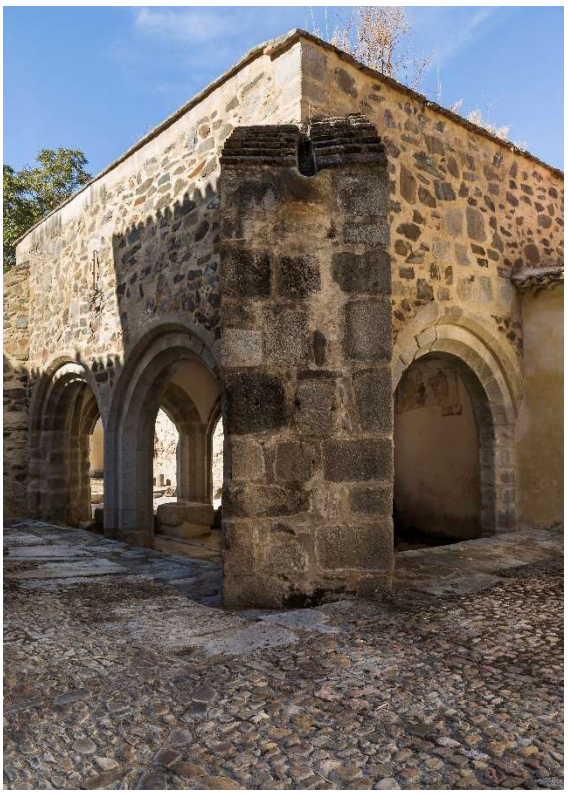


Fig. 5: Main cloister of the monastery (*Claustro de los Naranjos)*.
Fig. 6: Samaritana font in the South-West part on the monastery.

The main cloister, for example, the *Claustro de los Naranjos*, is the centre of the architectural composition and it has been always considered as a safe refuge from the external world; it is the space where the nouns can walk, read, think, meditate but also a common space where chatting and relaxing (fig. 5).

[3] Cf.: VÍRSEDA AIZPÚN, Alejandro. La evolución de la vivienda en las propuestas urbanísticas de Le Corbusier. De la máquina al hogar / The evolution of housing in Le Corbusier's urbanistic proposals. From machine to home. *Revista Europea de Investigación en Arquitectura*. n. 3, 2015, p. 199-218; ZAPARAÍN HERNÁNDEZ, Fernando. Dibujando en la Cartuja de Ema. Ventanas y rampas en la obra de Le Corbusier. *Revista de expresión gráfica arquitectónica*. n. 12, 2007, p. 140-151.

If the main cloister represents the outdoor space for meditation, on the opposite, the orchard is the space connected to the pragmatic themes of daily life as eating, working, producing. Another material invariants, relevant especially concerning to the salubrity of the places, are the ventilation – accomplished by the alternance of external and interior spaces – and the presence of water (fig. 6). It is well known that all the monasteries from the foundation on, count on an articulate water system in order to carry out all the pragmatics activities and to feed the number of fonts in the external spaces[4].

4. The religious community's life as a social and healthy model

The congregation of Santa Clara de la Columna follows the Rule of Saint Clare of Assisi, which defines the manner and the purpose of the Christian's life of the nouns. Among the main cornerstones of this social organisation, it is important to mention: the presence of God, which is expresses by means of the contemplative attitude and the Liturgy of the Hours that marks time in all the different moments dedicated to prayer, labour or rest. As known, in the community of Saint Clare, the Franciscan precepts endure as for example concerning to the provision of the manual labour, executed every day in several different ways (taking care of the orchard, preparing food, or every activity the monastery requires).

Every noun spend her day following a very precise organigram in which everyone has his specific role (abbess, master of novices, responsible for the food supplies, nurse, etc.). Getting back to the comparison between monastery and city, following the Le Corbusier's definition, exactly like in a city, every place has its function and every inhabitant his role: everything aims at the functioning of the system. It concerns a model of coexistence, sustainability, conservation and care for the space in which we live. Besides, the sense of belonging , dictated by the Rule, provides for living in the same place for all the life, without abandoning the monastery, differently from the friars. In the religious organisation of the Poor Clares, there is not a strict hierarchy like it happens in another orders (the Chartusians, the Hieronymites, the Camaldoleses) so the nouns self-manage the organisation of the community.

The intense connection with nature, the absence of a sedentary life style – due to all the practical activities carried out by the nouns every day – and a social organisation that functions perfectly, allow us to define this community like a model.



Fig. 7: The nouns at work.

[4] Cf.: DEL VAL VALDIVIESO, María Isabel. Monasterios y recursos hídricos en la Edad Media. *Vínculos de Historia*. n. 3, 2014, p. 417-420.

5. Conclusion

The contemporary necessities, continuously in progress, today more than ever, require a reflexion about life spaces, suddenly considered inadequate because of the present emergency of the pandemic for Covid-19. The eager research for archetypes to surge as a model, frequently omits virtuous models already present in cultural heritage architectures: buildings that have been capable of developing without distort themselves.

In cases as the monastery of Santa Clara de la Columna in Belalcázar, the building instead of crystalize itself, has adapted itself to the human needs that in every phase presented: the construction of new areas, the extension of others one, the change of some rooms from an use to another. In spite of all these transformations it has preserved its uninterrupted function like religious centre of reference.

In every age, man has tried to adapt the spaces of city to his own needs: in the post-industrial Europe, for example, the awful conditions of life required a reconsideration of the organisation of city in order to resolve these hygienical issues; in the same way, at present time, the health emergency obliges us to rethink about home spaces.

The architectural archetype of the monastery appears like a model thanks to its intrinsic condition of autonomous “island” in which every aspect of life is structured, especially if we compare it with the chaos of contemporary cities. The “wholeness” of the monastery model, allows us to include it in that timeless dimension that exists in architecture, as mentioned by Iñaki Ábalos in his book *Palacios comunales atemporales*: there are some models of construction capable of surviving to time and anthropic changes. We would look at these timeless architectures in order to improve the current inadequate spaces of life, both at the architectural and urban scale.



Fig. 8: General view of the monastery of Santa Clara de la Columna in Belalcázar (Cordova).

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Multiscalar analysis of a fragile territory. Innovative methods for sustainably-conscious design

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Abstract

This research aims to develop a methodology of geometric analysis of the territory that allows quantitative multi-scale evaluations that can be carried out using a specially designed digital tool. The difficulty in working with this type of procedure is the sectionalization of technical skills between those who work on architectural scale design and those who work on a territorial scale. The methodology undertaken has a workflow capable of exporting data from a GIS tool and importing them into a three-dimensional modeler to carry out multiple types of analysis at different scales. For reaching this aim, an ad hoc procedure has been developed to standardize the workflow. This procedure aims to have maximum freedom in processing model geometries; therefore, it was based on Nurbs mathematical models. The case study in which this research methodology was applied is a city on the Abruzzo coast. Starting from the cartographic data of the Abruzzo Region, the three-dimensional model of the territory and the built-up area was developed, thus forming a basis for further analysis. This working methodology guarantees efficient results with a low human iteration to generate the final model. Some of the procedure's limitations have been explained in detail, mainly due to the structure of the components used.

Keywords: GIS, parametric, multiscalar, sustainability, landscape

1. Introduction

The following research work has been developed within the Fragile Territories project at the Department of Architecture and Urban Studies of Politecnico di Milano, collaborating with the Department of Civil, Building, Environmental Engineering, and Architecture of Università degli Studi di L'Aquila. The clear distinction between modeling at architectural scale and modeling at territorial scale is one of the premises that gave rise to this research. In fact, the works related to these two branches are carried out by different professionals and with different tools at different scales. Instead, this methodology preconfigures a workflow that fuses two worlds that usually travel parallel to few contacts, producing synergistic benefits from a controllable approach on both fronts. The digital tool developed with this research, based on parametric and algorithmic methods, has an analysis capacity usable in multiple scenarios and at different scales. Based on parametric and algorithmic methods, the digital tool developed for this study has an analysis capacity that can be used in multiple scenarios and at different scales. This methodology has been developed for two purposes: spatial analysis for sustainable mobility and buildings' energy audits. The synergy between space and urban scales is helpful because granularity and accuracy can be applied to the same algorithmic tools. It is necessary to link the individual data to have one system that provides results of acceptable accuracy at all levels of investigation. Based on these considerations and data availability for the individual territories, it was considered appropriate to begin the acquisition of the territorial data from which it has been possible to assemble a geographic information system in which geometries (points, lines, surfaces, etc.) are linked

to databases that describe their different features. Secondly, the analysis of buildings for the purpose of energy evaluation was developed. The analysis of solar radiation is carried out on each building with architectural instruments and is the case study of this work. If this analysis is carried out at an urban/territorial scale, the third dimension is overlooked. This simplification results in massive gaps in the analysis, which will be explained in detail. Such tests typically take place on an architectural scale, taking into account the characteristics of single construction. By contrast, with the current methodology, the esteem of a complete area can be made because the accuracy of the data taken from the regional database makes it possible to characterize different analyzes closely related to geometry. These analyzes are particularly useful for advanced urban planning, as shown in the Climate Plan CH 2025.

2. Research

The data processing method explained in this paper aims to make geometrical manipulation and analysis of specific areas easier to achieve a three-dimensional model, starting with territorial cartographical data. The scientific literature concerning this particular work is yet to be consolidated because illustrated methodologies present some differences, although seemingly similar to the methodology under discussion. Among the topics of this review, there is the use of DTMs for the digital reconstruction of parts of this territory to perform NURBS analysis for hydroelectric engineering based on territorial modelling with Mesh technology. This research utilizes tools from the GIS family as well as the typical methods of generative modelling.

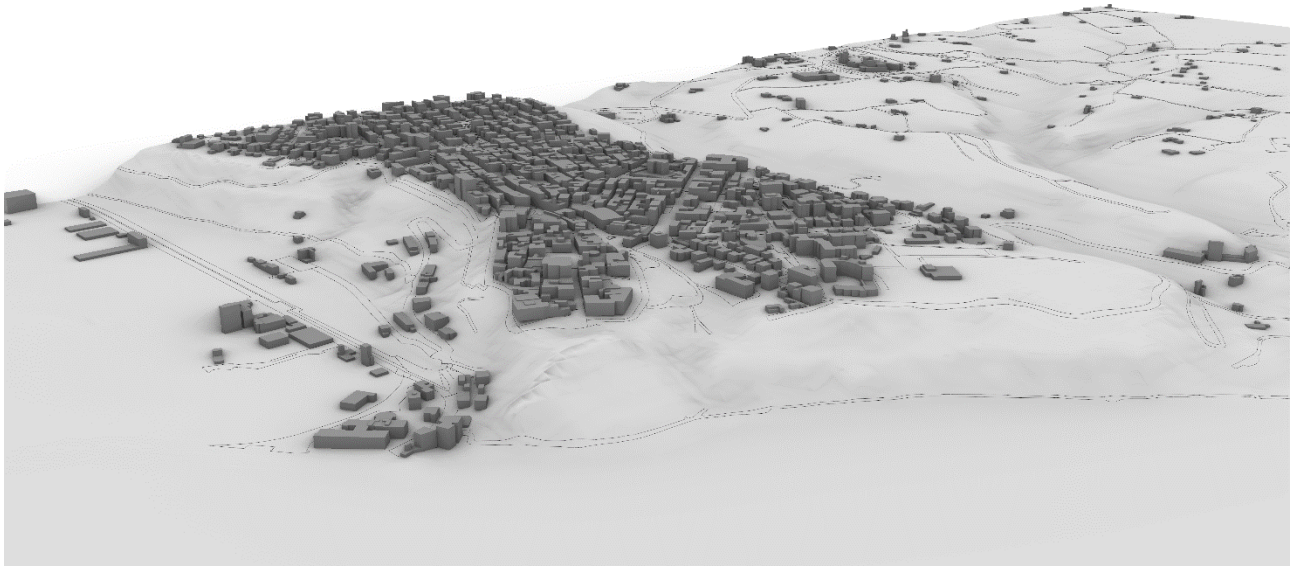

Fig. 1: NURBS model from DTM raster.

The methods described above have been used in Ortona (Italy) which was chosen as the case study area. Data for the case-study area's parametric 3D model were found by selecting them from the Abruzzo Region's Open Data cartographic database. Data from the raster DTM, in particular, were used. Digital terrain models are used to describe the morphology of a territory; they are organized in grids, with each point determined by its interpolated height. The DTM grid used is square, and each element measures 10x10 m, allowing it to have sufficiently accurate data as a starting point. The use of Grasshopper, a digital parametric tool designed for a visual scripting language, was critical for managing this amount of data in three dimensions. As a result, the procedure provides a cloud of georeferenced elevation points that faithfully represent the case-study territory. Instead of meshes, the mathematical structure known as Nurbs was chosen for this purpose. This procedure can generate a surface that passes through each point of a three-dimensional grid; this decision was made due to a Nurbs modeler's inner strength as Rhino, which bases his strength and operational efficiency on the generation and manipulation of mathematical entities. The ability to easily extract curved contour lines from a landscape is one example of NURBS architecture's flexibility; however, if the same transformation is applied to a mesh surface, the result is polygonal. For this form of service, NURBS are not always the best choice. For broad portions of terrain, Using Delaunay triangulation, mesh models will lighten the computational burden and speed up the algorithm by skipping calculations of all the parameters needed to construct

the mathematical surface. The procedures for representing other vectorial data (buildings, urban perimeters, railways, roads, exc.) are similar to those described above. Some of the steps in this procedure contain unusual cues for further elaboration and research. In particular, after importing the points and creating first-degree interpolation lines between them, the problem encountered in the structuring of the algorithm aimed at displaying the buildings was obtaining vertical, closed extrusions of a value equal to the exact height of the buildings. To address the first issue, the centroids of the geometries were extracted and projected onto the NURB main surface. The geometries were then translated vertically along the vector that connects the centroids to their projections and extruded by a value, extracted from the attributes table database, equal to their true height from the data associated with each geometry. The same model can be used to conduct energy analyses on buildings. Through the use of parametric tools such as Ladybug (a plug-in for Grasshopper), it is possible to combine EnergyPlus weather files (EPW) and three-dimensional models for a better understanding of the weather data and visualization of the building performance analysis results. Figure 2 depicts a basic example of this analysis, in which solar hours are drawn within an illuminance; multiple energetic and environmental analyses can be performed using the same methodology, within the same digital ecosystem.



Fig. 2: Sunlight analysis on the NURBS model from EPW database.

The procedure is inextricably linked to the EPW database, which stores daily data on average ground temperatures and sun positions recorded by monitoring systems in specific areas throughout the year. Italy does not have a uniform coverage of weather data-collection stations, and the nearest one in this case is in Pescara (which is 30 km away from Ortona). The algorithm used to perform the previously mentioned analysis is based on projecting a mesh of a specific pitch onto the 3D model (5 meters for the case-study, shortest pitches requires longer computational times but guarantee higher precision). Ladybug generates sun vectors from EPW data for the selected location and calculates shadows cast by buildings and terrain accordingly.

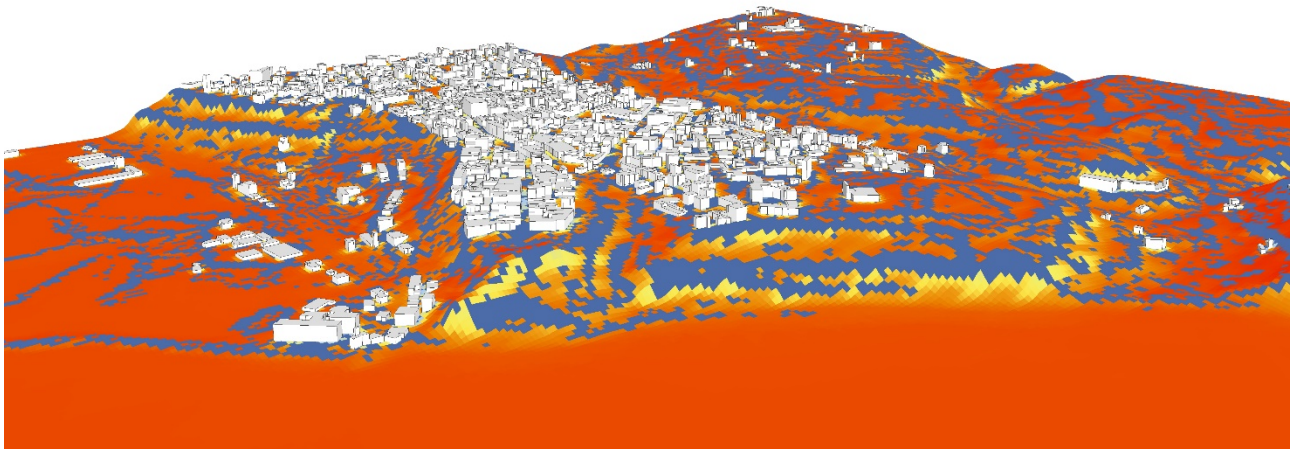

Fig. 3: Solar radiation analysis on the NURBS model from EPW database (axonometric view).

Colors in Figure 2 depict how many hours that area is exposed to direct sunlight in a given day or period of time, as explained in the legend (21 June in this case). Figure 3 shows different data. In this case the algorithm calculated the radiance power on the terrain, considering buildings as obstacles.

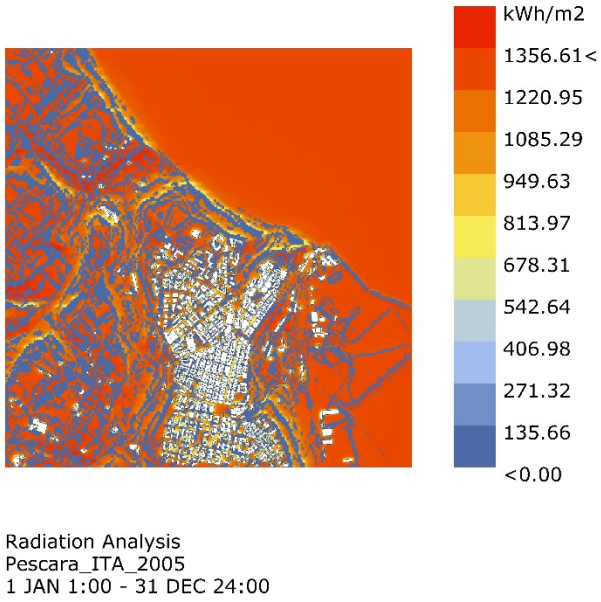

Fig. 4: Solar radiation analysis on the NURBS model from EPW database (planar view).

As shown in Figure 4 each element of the mesh is coloured according to the mean value of kWh/m2 calculated in that specific location through the entire year. This allows to comprehend the perceived potential for outdoor comfort (or discomfort).

3. Conclusions

This type of simulation could be useful in considering a method of urban and territorial planning that considers environmental aspects, with consciousness and awareness of small and large scale phenomena. The applied methodology collects data from sources, both belonging to the open Abruzzo geodatabase; the first provides the raster Digital Elevation Model, which serves as the foundation for the terrain analysis. The second type of data is the vectorial Digital Technical Regional Map, which serves as the foundation for buildings and map signs. More advancements and benefits for both designers and users will come from tracking those results over time and comparing them to input values calculated during the planning phase.

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Cultural heritage and its enjoyment in pandemic times: comparison of cultural approaches in India and Italy

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Abstract
The restraints due to the Covid-19 pandemic have not only deeply changed our daily habits but have also affected the world of culture, as gatherings of people and visits to places have been banned. This situation has highlighted strengths and weaknesses of cultural systems and tools supporting the public 'use' of heritage, as well as the need for innovation for the safeguarding and 'production' of heritage. Indeed, the response of the various cultural actors disclosed their real priorities revealing sometimes inadequacies or, vice versa, creative capacities. The health emergency, confirming the socio-economic role of culture, affected the bond between people and cultural heritage. This paper aims to explore what happened in two very different geographical and cultural contexts, India and Italy, and to identify impacts and actions undertaken to support the cultural sector, and to maintain communication with audiences. There is an increasing recognition among all stakeholders of the role of information technology for providing 'virtual access' to cultural heritage, and for supporting initiatives for ensuring resilient, sustainable livelihoods for artisans and workers, as custodians of traditional knowledge. The comparison shows how heritage represents a fundamental factor of community resilience, and how different approaches offer opportunities for contamination, containment, recovery, and resilience. Broader reflections can be considered for the future role of Cultural Heritage in the real life of citizens.

Keywords: Communication for Cultural Heritage, Digitisation for Inclusion, Virtual Accessibility, India, Italy.

1. Introduction
The Covid-19 pandemic has had not only profound social and economic impacts on people's daily habits but also on the cultural and creative sector, both considering the production and consumption perspectives, across the globe. Since gatherings and visits to cultural places have been forbidden, the sector had to adapt to the emergency, whose containment measures and successive 'lockdowns' highlighted the central role of 'people', such as the workers in the sector, the audience, remained physically separated from the cultural places, but also generally the local communities, such as those belonging to living and historic city centres as Shahjahanabad in New Delhi, which have showed undervalued capacities and traditional building and planning morphologies that imparted considerable resilience. Further, the pandemic pinpointed the necessity for targeted initiatives to support artisanal communities through improved access to the public and the market, and the importance of equitable cultural and community centred development efforts that improve the sanitary working and living conditions within the historic city centres in India.
The sanitary crisis has confirmed the socio-economic role of culture, stressing the relationship between people – workers, local communities and audiences - and the cultural world. Indeed, the enjoyment of cultural heritage has to be seen as a whole, not limited to the final "consumption" of art and culture, but also considering the creation and production phases, with the work of small craftsmen and handicrafts workshops, for instance.

2. Measures and constraints: effects of the pandemic on the cultural sector

Following national guidelines, both countries faced a complete lockdown, whose restrictions to protect the public health surely had a huge impact on the cultural and creative sector.

Due to an increasing spread of the Covid-19 virus around Italy and rising cases in the population, on 08th March 2020 a Prime Ministerial Decree ordered the interruption of any public events, shows, and performances of any kind, and the closure of cinemas, theatres, museums, libraries and archives, archaeological and other cultural sites and institutes, both public and private [1]. For nearly two months Italy faced a total lockdown, which required the population to stay home. In the following months different measures were applied to the cultural sector, considering from one side museums and cultural places, and on the other side theatres, concert halls and cinemas. From May 2020 to March 2021 cultural activities and places were able to be partially open with several interruptions depending on the local, regional and general evolution of the epidemiological situation in the country. When possible, the gradual process of reopening required meticulous measures to guarantee the safety of visitors and workers, such as restricted access, the use of face masks and hand sanitizers, keeping a physical distance, and ensure a proper natural ventilation of indoor spaces. Many museums and cultural places, especially the smaller ones, had to adapt their collections and routes, in order to avoid gatherings and close contacts among visitors. Despite some difficulties, it was also an opportunity to stimulate a reflection on new actions to be experimented, to make museums more inclusive and accessible, confirming the role they play in the social life of the communities. Further, performances in theatres, concert halls and cinemas shows were resumed for a while, performing with pre-assigned and distanced seating.

In India, a complete lockdown was imposed by the Central Government on 23rd March 2020 – largely as a preventive measure, though the number of confirmed cases of Covid-19 was relatively small. Similar to the approach adopted by Italy, all archaeological and other cultural sites, institutes, museums, libraries, archives, cinemas, theatres, auditoria, both public and private, were closed. Some iconic cultural sites under the Archaeological Survey of India, such as the Taj Mahal in Agra, were closed to the public on 17th March, even before the first lockdown of 21 days. On 30th May 2020 steps were announced regarding exiting from the total lockdown, but it was only in June, as part of the phased opening of activities being allowed at places of worship, that 820 of the more than 3000 monuments protected by the Archaeological Survey of India where religious worship takes place were opened to the public. From 6th July with the compliance of the state and district administration, a decision was taken to reopen all 3691 monuments and archaeological sites to the public, ensuring that all Covid-19 protocols were followed, and utilizing digital technology for visitor management. Some states, notably Maharashtra, Odhisha and Tamilnadu, did not open monuments to the public even after this, due to the widespread prevalence of Covid-19, while others such as Rajasthan, heavily dependent on cultural tourism had already opened some monuments to the public at reduced entry rates. The decision to reopen museums, art galleries and exhibition spaces under the Ministry of Culture was taken in November 2020, after adequate preparation for social distancing and all safety protocols. An unusual aspect of the reliance on cultural heritage during the pandemic in India was the widespread encouragement of traditional herbal remedies, part of ethno-medicinal traditions, as well as the practice of Yoga, using digital outreach by the Ministry of Ayush, or alternative and holistic health service of the Government of India. However, in India, the unprecedented first lockdown had some unanticipated consequences - the mass movement of millions of migrant workers back to the villages and small towns from where they had moved to larger towns and cities in search of employment, despite all entreaties and efforts to ensure compliance to the lockdown [2]. The sometimes-desperate efforts of skilled and unskilled migrants to return to their culturally connected places of origin – rural areas and small towns – resulted in recognition of existing vulnerabilities regarding regional imbalances and also the need to provide humane, low-income rental housing for migrant workers and social support systems in urban areas [3]. Another consequence was the quick response on the part of the Government to address the vulnerabilities exposed by the mass migration due to the pandemic – new government policies with great potential significance for regeneration and adaptive reuse in historic city centres such as Shahjahanabad have been formulated, to ensure an adequate supply of low-income affordable housing for migrant workers [4].

3. Actions and initiatives: responsiveness and resilience of the Cultural Heritage

After the closure of Archaeological sites and National Monuments in India to the public for almost three months, there was a calibrated reopening with upgradation of sites with essential facilities for digital ticketing, social distancing measures and security provided for from June 2020 onwards. There

were numerous initiatives of important National museums, State Departments of Archaeology and Museums and the Archaeological Survey of India at the Centre for digital outreach, and also an increased emphasis on improvement of local sites in each town or rural area, rather than a focus on more prominent sites [5]. However, large complexes such as the World Heritage Site of Humayun's Tomb with the Sundar Nursery also became increasingly popular, due to the perception of increased safety during the pandemic associated with the vast, sensitively designed open spaces of the public parks within the historic complex.



Fig. 1: View of the 90-acre Sundar Nursery garden, recently restored. (Author: Niveditaa Gupta)

Engaging and meaningful ways of encouraging interaction of the public with heritage resources included more than 300 virtual exhibitions and galleries being accessible digitally on a specially developed virtual museums platform [6]. Interesting approaches addressed a concern for visually impaired and people with special needs, with efforts made to enable an understanding of art by involving a range of senses in some museums [7].

Significant initiatives were taken by both state and central governments in India to record the specific skills of returning migrant workers in order to provide opportunities for gainful employment in the local areas of origin, so that they do not migrate elsewhere due to lack of sustainable livelihood options at the local level [8]. There was also increased support and promotion of traditional creative industries – an example of this was in the state of Uttar Pradesh that emphasized on identification of traditional products of creative industries (some on the verge of oblivion) associated with each district within the state and provided financial support and stimulus for marketing of these products. The ODOP (One District One Product) scheme was later supported by the World Bank [9]. Support for innovation and entrepreneurship was provided by collaborations between confederations of industries with educational institutions and custodians of traditional skills. The shock and economic disruption of the pandemic highlighted the necessity for stimulus for equipping small craftsmen, MSME (Micro, Small & Medium Enterprises) and handicrafts workshops for innovation and providing entrepreneurship skills. During the disruption of the lockdown, there was an increased emphasis on upskilling and skill upgradation, including in the conservation and heritage management, as well as the heritage education sectors, and recognition of the necessity for different types of online and blended methods in the holistic New Education Policy announced in July 2020, with a greater focus on vocational studies, including traditional crafts.

Another aspect of significance in India, as elsewhere, has been the recognition of suitability and resilience of architectural typologies such as the institutions and social infrastructure (hospitals, schools, community halls) constructed in the late 19th century. The initial lockdowns promoted the enjoyment and appreciation of buildings with traditional features such as deep arcades, shaded verandas, projected balconies, private open-to-sky spaces, terraces, and courtyards, not just as being climate responsive, but also suitable in the time of the pandemic. An increased interest in learning from the planning and building typologies has emerged in the wake of unexpected conclusions of statistical studies that indicate that some historic centres, despite their high densities, have managed to contain the spread of Covid-19 because of their introverted, courtyard-centred morphology and their strong community networks. Initial results of an ongoing study of the Covid-19 spread in

Shahjahanabad by students of architectural conservation in Delhi, based on data released by the Government of Delhi has identified some interesting and counter-intuitive aspects regarding the spread of the contagion in historic areas. Shahjahanabad, despite having the highest exposure to Covid-19 in May 2020 demonstrated a remarkable turnaround after 3 months, and the central district within which Shahjahanabad is located was ninth among the eleven districts of Delhi in terms of number of Covid infections – a substantial improvement over a short period. This was partially attributable to the rate of spread of the contagion not being as quick due to the traditional courtyard structures, compact neighbourhoods and low rise, high density structure of the traditional residential neighbourhoods – kuchas and katras [10].

Guidelines for the various phases of reopening in India have been framed by the Ministry of Home Affairs, and in October 2020, the Ministry of Culture, after consultation with various stakeholders issued detailed SOPs for cultural functions, activities and programs outside containment zones. The rationale given for this was “Covid-19 pandemic has hit the cultural and creative economy all ever the world. However, cultural activities are slowly being resumed. In order to encourage those persons and agencies providing cultural services, as well as consumers of such services, it is important to lay down comprehensive guidelines for resumption of these cultural activities in India” [11]. The organisation of important religious gatherings and festivals has gradually been more efficiently managed, so that large gatherings on the occasion of festivals have changed from being considered as ‘super-spreader’ events to more efficient management associated with the ‘New Normal’.

Eventually, the pandemic with associated lockdowns and containment zones have provided a stimulus for acceleration of digitalization – both for access to cultural content, as well as sale of artisanal products. In India, there has been an interesting link between global and local with the Amazon and Ebay digital marketing initiatives for local artisanal products, and the creation of the ‘India Artisan Crafts Store’ intended for online sales of artisanal products from various parts of the country.

Similar initiatives, actions and ‘digital shifts’ in the cultural sectors have been made in Italy as well. While the Government started adopting a series of financial measures to support the Italian economy, and help tourism and culture sectors, significantly hit by this emergency, many artists and cultural professionals, using the hashtag #iorestoacasa (#stayhome), launched several digital contents and online initiatives on their social accounts, in order to sensitize the population to stay home and enjoy the rich and diverse Italian cultural heritage. In the wake of these first events, the Ministry of Culture created a webpage called “Culture never stops!” to collect all the virtual initiatives organised by the national cultural institutions. Through six sections - Museums, Books, Cinema, Music, Education and Theatre - the platform offers a wide range of videos, web contents and social initiatives, giving the population the opportunity to ‘keep in touch’ with art and culture during the closure of cultural places [12]. Further, using its social media, such as the YouTube channel, the Ministry of Culture continued to share and promote cultural actions, displaying online collections, virtual tours, and streaming shows and performances.

Cultural institutions and places made an effort to find ways and forms to make the art and culture world closer to the citizens, using the digital communication and online contents to bring art and culture within the people's homes. For this reason, the Ministry of Culture promoted the campaign “L’arte ti somiglia” (“Art looks like you”), inviting the population to explore cultural places and sites online and scrolling through the social media accounts of museums, archives, and libraries, in order to look for similarities between artworks and real life, such as people, rooms, pets, etc. Stressing the value of maintaining the relationship, even from home, between the cultural heritage and citizens, everyone could share the comparisons on social media.

In the last decades cultural institutions have often used digital communication and social media mostly for launching and promoting activities and live events, but during the Covid-19 emergency many museums and cultural institutions increasingly used the online platforms to keep in touch with their visitors and expand their audience, having the chance to reach people from all over the world. Not all cultural entities and places were already registered on the most famous social media, and their recent online debut also made some record figures.

An interesting case regards one of the most famous Italian museums, Le Gallerie degli Uffizi [13], which appeared on Facebook on 10th March 2020, at the very beginning of the first lockdown, reaching over 100,000 followers in just one year [14]. The Florentine museum also joined TikTok – a social media mostly used by the youngest – and continued its online activities and campaigns on Twitter and Instagram too, hitting more than 800 thousand followers on the various profiles. The digital boom of the museum complex – that today is the most followed Italian museum on Instagram with over 600 thousand followers – showed a progressive growth of the younger public engagement and a significant female prevalence in the audience. Many virtual initiatives were able to bring the cultural heritage online and share the museum's treasures, albeit remotely, to thousands of people worldwide. Additionally, important efforts in the expansion of the cultural offer on the museum's official website were made, and relevant figures were achieved, with over 18 million views, meaning a 40% growth compared to the previous year.

Among the numerous virtual initiatives available free of charge, the display of fifteen virtual exhibitions, including the 360° virtual tour of the Uffizi's new Venetian rooms, was particularly successful with more than 110 thousand people already virtually visited it, over 4,000 per day. As the Figure 2 shows, virtual tours were created through a faithful 3D reproduction of the rooms and a high-definition digitisation of the artworks. An immersive experience through some of the most beautiful and interesting spaces of the museum gives visitors from home the chance to admire the artworks as in a live tour, moving around the museum. They can follow the suggested route, or choose their own path, getting closer to each artwork and read the captions with the relevant information, while the main masterpieces are also accompanied by in-depth information and details for enthusiasts and scholars.



Fig. 2: View of the virtual tour inside Le Gallerie degli Uffizi.

Another special event is the Uffizi On Air project, organised every Friday and streamed on Facebook, with tours led by curators and specialists from the Galleries that, at the end of the virtual visit, and take time to answer questions and curiosities by followers connected in real time from their homes. Further, the digital offer of the Uffizi is also enriched by live conferences, seminars, and round tables, where everyone can participate not just as auditor, but making comments and asking questions, so that culture does not remain an exclusive domain of specialists and experts but opens to a wider public. Eventually all the digital contents produced last year and displayed on the various social media has been collected and published on the museum's website, so that everyone can easily access them, even those who are not registered on social media. Using digital technologies, the museum was able also to strengthen and renew its remote educational offer: a new programme called Digital Ambassadors of Art was launched, with the participation of nearly fifty schools throughout the country. This first edition aimed at educating young people about cultural heritage, while also reflecting on its potential role for the future of Italy, as an engine for restarting, not just economically but also socially.
The massive production and sharing of digital contents over the last year brings to the attention an important reflection for the next stages of the museums' reopening: even if created for a very specific need and situation, they might play a relevant role for the future of cultural places. Indeed, the access to art and culture through videos, cards, descriptions, and high-definition images directly from a smartphone can be a way to provide a plurality of accesses and multiple levels of information. Indeed, all the digital materials can be explored during the live visits, or before at home, to prepare the tour, or even after, for those who want to know further about the collections and the museum. Therefore, the experience of a cultural place would not be confined to the physical building or site, but it would allow to easily 'bring' it at home.
Another interesting Italian case is the Pinacoteca di Brera [15], one of most important Italian art galleries that even during the war and in the worst years of terrorism had always remained open, but then due to the Covid-19 emergency had to shut its doors as well. Despite the closure, it was one of the first museums able to display and share its artworks online, reaching thousands of users

worldwide. The art gallery had carried out numerous initiatives in the last year and widely contributed to cultural life during lockdown. Indeed, thanks to an external collaboration, almost seven hundred masterpieces have been digitalised in high-quality images and can be admired remotely just accessing on their website, including artworks on loan to the Pinacoteca from other museums and pieces not on display. The online collections are enriched with detailed captions and multimedia materials and references, such as restoration work or 'dialogues' with other artists, thus satisfying the interests of the most passionate visitors. During the lockdown, the Brera Listens project was launched to enhance the dialogue with the public, making it a protagonist. Through an open call for writings, videos, photos and drawings, the Pinacoteca virtually collected material created from the audience and shared on social media. The project included the campaign “Un Museo a Casa Tua” (“A Museum at Your Home”), aiming at sharing some beloved objects, with their stories, and virtually bringing them into the museum, considered as a large house that collects and safeguards the community's treasures. The result is a virtual gallery, available on the website, made of a series of cards, with all the objects that the participants have considered to be the most significant of their lives.
For some years now the museum has presented “Appunti per una resistenza culturale” (“Notes for a cultural resistance”), an initiative in the *myBrera* section where the museum's employees, critics and curators talk about their favourite paintings. Today the initiative *yourBrera* completes the narrative allowing visitors to choose and comment on their favourite artworks of the Brera collection, turning the audience to ‘authors’ of the museum.



Fig. 3: Image from *myBrera* section on the official website.

In mid-September 2020, the Pinacoteca presented *BreraPlus+*, the new online platform that expands the visitor experience with multimedia contents, special programmes, interviews, reports, guided tours and virtual meetings with specialists, actors, writers, live streaming events, concerts, visits to the storerooms and the online restoration workshops, and much more. Requiring a subscription, free for the moment, it allows the user to participate in the life of the museum in an innovative way, to explore, discover, learn and, above all, to get excited and share the cultural heritage. The experimental initiative was born out of the need to overcome distances through digital communication, but at the same time setting the objective for the next future, after the pandemic emergency: expanding the museum's offer by allowing both physical access to the Pinacoteca and, at the same time, a multimedia offer of exclusive contents.
After several months of cancelled events and closure, the world's oldest opera house, the Teatro di San Carlo [16], opened its season with Mascagni’s “Cavalleria Rusticana” for the first time without a live audience. The challenge of broadcasting the performance virtually, on Facebook, was highly acknowledged, with over 40,000 online tickets sold worldwide. As highlighted by Emanuela Spedaliere, San Carlo's chief executive manager: "The possibility that everyone could access the world of opera with this ticket gives us a sense of equality" [17]. This initiative is just one of plenty of

actions and projects organized in the last year, showing the potentiality of the web for the cultural sector, broadening cultural places and institutions' appeal to a potentially limitless audience. Indeed, despite being the only alternative solution to perform over these times of emergency, the streaming events and virtual events could become an interesting opportunity for the future of the sector, creating a virtual stage to see from home, from each corner of the globe.

4. Conclusions

The Covid-19 emergency has exposed many socio-economic inequalities, weak spots and pre-existing vulnerabilities of the cultural sector, such as precarious working conditions, the lack of long-term planning in the heritage management, strict budgets of many cultural institutions, etc. Further, the crisis has deeply tested the resilience of our societies and affected the fundamental right to access to culture [18]. However, the situation also gives new opportunities and chances to improve. For instance, the last year has generally accelerated the process of digital communication and digitisation of the cultural heritage, creating new forms of access to museums and cultural places. The crisis has surely demonstrated how relevant and fragile the bond between cultural heritage and people is, including all those categories involved, from workers to local communities and audiences.

In India and Italy, due to the pandemic, the opportunity to enjoy the beneficial effects of cultural activities on individuals and communities has been threatened in many ways, and as stated by WHO in a report published at the end of 2019: "Engaging with the arts can be beneficial for both mental and physical health" [19], with several positive effects on the well-being of individuals.

However, the comparison between the two countries highlights different aspects, resulting from diverse political, economic, social and cultural conditions, but the sudden lockdowns and following closure of museums and cultural places has found both countries quite unprepared. Italy, following the motto "#iorestoacasa" ("I stay home") has seen itself 'locked' at home for many months, without the chance of sharing cultural and creative experiences live. Virtual visits, digital contents and online events were the only possibility of 'escape', and thanks to the use of digital technologies, many cultural institutions were able to keep in touch with their audiences, even if not always in a planned and strategic way. In India, where the pandemic has taken a different course, the Government and community organisations have, unusually and quite effectively, supported the use of ethno-medicinal preventive measures and practices such as ayurvedic formulations and yoga to avoid the widespread of the disease. The pandemic and associated lockdown has resulted in the creation of synergies and a culture of collaboration between different stakeholders for numerous efforts to implement new forms of cultural sharing with the digitisation of exhibitions, museums and virtual galleries. In addition, as a response to the vulnerabilities highlighted by the pandemic, responsive, equitable and forward-looking policies have been put into place, that may have an implication in the future for upgradation of the historic and traditional building stock in historic cities and historic urban villages, that has been used by low-income migrant workers to urban areas. Skill mapping including mapping of traditional artisanal skills, support for the creative industries in many states has been initiated, digital platforms created to link potential global markets with local, small scale cultural artisanal enterprises, and skill development initiatives taken supported by digital technology.

In both countries, a process of digitisation of cultural resources and experiences might be part of a long-term strategy for the future of the cultural and creative sectors. At the same time digital communication should be considered in the process, since the virtual access is surely an important form of experiencing culture, and even if the digital contents cannot replace physical visits, they can potentially be used for many purposes, such as enlarging the kind of experiences, making them more interactive, more inclusive, useful for in-depth analyses, etc.

Eventually, the creation and promotion of digital contents through websites and social media in recent times has highlighted the role of art and cultural places in relation to the communities, in a very broad sense, including from the local people and territory to a global and limitless audience from all over the world. The chance of getting close and having access, at least virtually, to museums, theatres, etc. from home has surely been an important experience in the cultural sector, opening to new directions for the future.

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EXTENSIVE GEOPHISICAL SURVEYS TO INTEGRATE EXCAVATIONS DATA FOR THE ENHANCEMENT OF THE ARCHAEOLOGICAL HERITAGE: EXPERIENCES IN NORBA

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Abstract
The ancient town of *Norba* rises on a high plateau overlooking the Pontine plain; founded in archaic age, was destroyed in 81 B.C. Due to its state of conservation and potential, *Norba* was chosen for the experimentation of integrated nondestructive methods of investigation to interpret ancient urban forms diachronically. The acquired data are of particular interest for the historical-archaeological reading of the *forma Urbis* (we have identified many roads, domus, the forum area) and allow us to elaborate on solid data projects to enhance representative monuments.

Kewords: Norba, geophical prospections, urban planning

1. Introduction
The ancient town of *Norba* rises on a high plateau overlooking the Pontine plain. The town has been founded in the archaic age; its most important period was between 450 B.C. and 81 B.C. when it was destroyed.

The town is famous for its spectacular polygonal fortifications. The archaeological excavations and the surveys made in the town, within the walls, allowed to recognize the urban planning, characterized by parallel or orthogonal streets, to identify temples, public buildings, *domus, tabernae.* Only a small part of the city has been brought to light.



Fig. 1. Norba: the fortification and the city.

Due to its state of conservation and potential, *Norba* was chosen for the experimentation of integrated nondestructive methods of investigation to interpret ancient urban forms diachronically and to develop applicative potentialities for the planning of protection and enhancement [1].

In addition to repeat finalized drone flights, which have now become commonplace, and the processing of Lidar images, extensive geophysical prospections have been conducted. They have been designed to integrate excavation data, with the aim to propose, through highly interdisciplinary work, more refined methodological analysis paths than the simple identification of buried structures.
The *Norba Project* started in 2017 with new acquisition and processing of extensive geophysical surveys to investigate unexcavated portions of the archaeological site with the aim to enhance the knowledge of the urban plan of the ancient town. Ground Penetrating Radar (GPR) and the Gradiometric (fluxgate differential magnetic) methods have been applied to investigate this site during 2017 and 2018 [2].

2. GPR survey and results

For the measurements a SIR3000 GPR system (GSSI) equipped with a 400 MHz (GSSI) bistatic antenna with constant offset was employed. The horizontal spacing between parallel profiles at the site was 0.25 and 0.50 m. In the investigated areas, a total of 1199 adjacent profiles across the site were collected alternatively in forward and reverse directions, employing the GSSI cart system equipped with odometer. All radar reflections within the 90 ns (two-way-travel) time window were recorded in the field as 16-bit data and 512 samples per radar scan. Furthermore, the perimeters of all selected areas have been surveyed with the use of a Differential Global Positioning System DGPS OMNISTAR 5220 HP in order to have the correct positioning and georeferencing.

GPR reflection profiles were analyzed for preliminary identification of the buried features and for calibration of the instrument. Reflection data, collected in profiles with 0.50 m spacing, were processed using standard techniques, [3]; [4]; [5]; [6]; [7]; [8].

With the aim of obtaining a planimetric vision of all possible anomalous bodies, the time-slice representation technique was applied using all processed profiles.

The GPR amplitude maps, related to the profiles collected with 400 MHz antenna have been analysed and our attention has been focused to the following time-windows: 5.6-8.6 ns, 8.3-11.2 ns and 11.1-14.1 ns, (two-way-time), corresponding to the averaged estimated depths of 0.50 m, 0.90 m and 1.20 m, respectively.

Figure 2, corresponding to 0.90 m in depth, shows a general overview of all observed reflections due to the presence of the hypothesized archaeological structures.



Fig. 2 – Norba, GPR time slices at the estimated depth of 0.90 m.

A GPR time-slices related to two investigated areas (H and K), characterized by interesting anomalies, are presented and described in the following Fig. 3. An analysis of these slices shows that the investigated areas are characterized by the presence of reflections produced from many buried architectural features that are likely walls with different dimensions, cistern and perhaps segments of ancient roads.

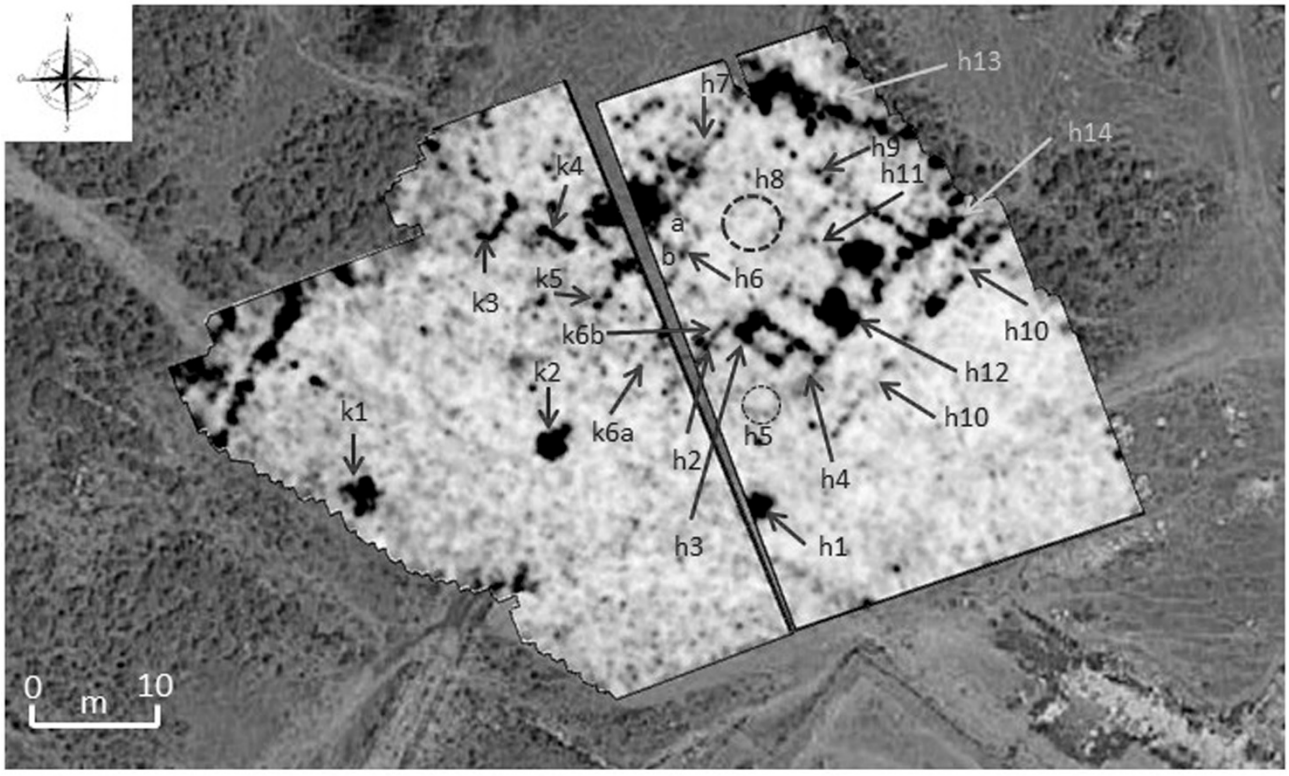

Fig. 3 – Norba, area H and K. GPR time slices at the estimated depth of 0.90 m.

The choise of the Ground Penetrating Radar method for the prospecting campaigns made it possible, after the processing phase of the individual profiles, to work for the processing in the subsoil volume and the elaboration of particular maps according to the depth levels.

The interdisciplinary study was the identification, measurement and coding of each anomaly, the evaluation and selection of the depth intervals functional to the interpretation. The choices have been made explicit, so that the readings and hypotheses could be subject to verification by others.

An interesting example of the acquired results is constituted by the *domus* identified along the road that enters from *Porta Ninfina*: the recognized anomalies made it possible, for the *domus* on the eastern side of the street, to propose the *vestibulum*, the *atrium*, with the rooms facing it. On the opposite side of the road the anomalies indicate the entrance to another *domus*. The street is defined by the opposite entrances of the *domus*; it is accompanied by a linear anomaly, which can be interpreted as the sewer that ran under the street, in consideration of its depth.

The geophysical surveys carried out to clarify where the road that enters from *Porta Maggiore*, beyond the tract brought to light, highlighted indirectly this route, thanks to the identification of the entrance of a large *domus,* which opened along the road. The anomalies relating to the *domus* have been interpreted in comparison with the plans of the houses already brought to light: it is possible to recognize the plan of the *domus* of the traditional *atrium* type, with an underground cistern. On the eastern side it was confirmed the route north east-south west, proposed in topographic research for the traces recognized in aerial photo, in drone images and at ground controls.

The forma Urbis is articulated by a series of terraces in polygonal masonry, forming a monumental aspect due to the large variation in levels which the set out to adjst. The largest terrace dominates the entire urban zone: here the geophysical surveys suggest the ancient city's Foum.

3. Conclusions

The acquired data are of particular interest for the historical-archaeological reading of the *forma urbis* and allow us to elaborate on solid data projects to enhance representative monuments and to continue the excavation of the city streets.

More general, the experiences, that we have illustrated, can be an example of a response to the growing difficulties that hinter the conduct of extensive multi-year excavations and the expansion of the excavation area, due to the lack of funding, the high costs of labor, the costs of restoration, maintenance and management. The prior identification of the potential, consistency and characteristics of the buried remains can direct the enhancement projects to selected areas and contexts.

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Form and role of the market in the contemporary city

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Abstract
In the renowned book from '66 Aldo Rossi illustrates a city composed by "urban artifacts", one of these permanent functions is the market. Both in East and West the market has passed the monofunctional retail space to become a meeting place sedimented in the figures of the urban canopy or the Arab Suk. The success of these two schemes is their active role in the life of the city, an aspect that does not exist in another commercial typologies like the American shopping mall. This text contains some references related to the archetype of the covered plaza, the 'western' version of the market. The technology or the materials have never been a limit for these kinds of buildings, but they are the starting point to experiment new spaces. The brick vaults by Eladio Dieste in South-America, the technological Festival Plaza by Metabolists in Osaka or the minimalist Portuguese Pavilion by Álvaro Siza y Vieira in Lisbon represent a small part of the covered squares designed during the 20th century.
The second part of the text contains a case-study of a new market in Rome, exactly for a covered structure in Piazza San Giovanni di Dio; the project, developed for an international architectural competition, represents the opportunity to design a basics space of the city.

Keywords: architecture, Rome, marketplace, retail market, meeting point

1. Eme et habebis (You will have to buy)
Sociologist Max Weber defines the city as a merchant settlement [1], highlighting the importance and impact of this non-occasional function. Commercial activity has always been combined with the function of relational space thanks to the birth of markets in squares or open-air places. Aldo Rossi, during the analysis of the Roman forum in the third chapter of the book *The Architecture of the City*, describes the division between urban space and market: "around the fifth century the Forum ceased its activities as a marketplace (losing a function that had been fundamental to it) and became a true square" [2]. We are witnessing the birth of the market as an independent element and with its own specific sediment as was observed by Aristotle: "the public square will never be sullied by merchandise and artisans will be forbidden entrance...Far away and well separated from it will be the place destined as the market" [3].
The identification of the market hall as an independent building comes over time to take on different forms, among which the square or the covered street seem to be the recurring typologies. The aggregation of merchants in a single controlled place seems to be linked above all to "easier extraction of rates" [4]. Image of "a static carapace for pulsating innards" [5] perfectly represents this place, whether it is developed according to the image of the public square or the street as the Arab souk.
A perfect description of the market typology is given by Luigi Cosenza in an extract from his university lectures. In relation to the size and quantity of goods collected, we will talk about Magazzini Generali, for large volumes of national and foreign products, markets serving large cities and smaller communities, neighborhood markets and local markets [6]. Cosenza, designer of the Fish Market in the port of Naples, collects in his lectures a series of focuses on some architectural typologies that he has experimented in his enduring career and his words are reflected in Ignazio Gardella's anti-monumental project for the

cattle market of Alexandria [7], where the shed in the roof recalls the “new cattle market” of the Danish Poul Holsöe of 1934 [8].
The building is described as a pole linked to the territory and towards which several flows converge, such as consumers or goods. Even in its internal functioning these flows must be organized so that the layout must allow rapid and direct routes, so that there are no obstacles and delays in the circulation of products, the public, controllers avoiding intersections, false maneuvers or reversals [9]. The space should be without intermediate load-bearing elements, as the interruption of the surface with these elements could lead to distribution difficulties in the future or force compromises [10]. The model described by Cosenza almost totally focuses on functionality. Any deviation from this principle generates an unnecessary increases costs, increases the danger of dirt and dust deposits; but is also expressed in a compositional result which denounces an irrational balance between form and content [11]. But the analysis of Cosenza is not only focused on functional and constructive characteristics of this typology. At the end of his text, Cosenza focuses on also experiencing an aesthetic pleasure in frequenting a certain space facilitates attachment to it, stimulates the desire to frequent it makes it a living and operating the element in the entire urban organism [12].
Cosenza’s debut work is the fish market in Naples of 1929-35; Giuseppe Pagano read this work as a ‘show of strength’ in his article on the number 100 of Casabella [13]. Cosenza distorts the pre-existing neoclassical project drawn up by the Genio Civile, where the clarity of the composition makes it possible to ‘extrapolate’ the parts of the architectural organism and identify the constituent elements. Cosenza reads the ancient, projecting its essential outlines on the level of contemporary materiality: simplify and lighten giant orders, arcades, colonnades and portals, cloisters [14]. The classic forms, such as the vaulted environment, are transfigured through industrial materials such as the large glass surfaces on the longitudinal sides and closing the two arches on the short front.



Fig. 1: Proposal for a new market hall in Rome, view of the main entrance.

The arch as an element linked to the market hall seems to spread above all in the Mediterranean area. In other countries, the main model for the market hall is taken from Victor Baltard’s second project for *Les Halles* in 1863, redesigned according to the image of the *Gare de l’Est* station in Paris in 1849 and the *Crystal Palace* by Paxton in 1851 [15]. Baltard’s first solution is a classic masonry building that it is not in line with the aesthetics of the time dictated by the English glass pavilion.

Until then, the covered markets were made of wood with the typical truss structure of which the *Châtillon-sur-Chalaronne* market hall is the only example still in operation since 1440 (rebuilt in 1670). In Italy, albeit with some differences to French models, the market as an independent building is based on the image of the arcade, a symbol of the historic city inherited from the Middle Ages. From this period, almost all Italian cities had an arched loggia in the main square, a revered symbol of justice and of the municipal government and theater of city ceremonies [16]. The separation of the portico from the building to make it an independent structure takes the features of the loggia like those built in Florence between 1547 and 1551 by Giovan Battista del Tasso. A similar typology with less slender proportion is created in northern Italy such as the market wing in Cavour in 1583, where the word “wing” is directly derived from the French, but the covered market hall is structured differently from the French model. The perimeter walls are left open allowing continuity between inside and outside [17]. The difference with the French typologies also continues with the diffusion of new construction techniques, although a significant turning point can only be appreciated from the 1930s with the spread of volumes inspired by the purist aesthetics of Le Corbusier [18].



Fig. 2: Proposal for a new market hall in Rome, sketch.

It is clear that in the early part of the Twentieth century we have a different idea of the market from the current one; the markets described by Cosenza are essentially environments dedicated to wholesaling and closed on the sides, just like its fish market in the port area of Naples. In Ancona, Gaetano Minnucci created a fish market in 1951 intended as a theater, sure enough, the stands are directed towards the sales counters [19].
In the same years we find the project for the Pescia flower market by Giuseppe Gori, Leonardo Ricci and Leonardo Savioli, carried out following the victory of the competition in ’48 [20]. The covered square, expressly requested by the competition announcement, achieved an incredible success dictated by the two awards of ’53 and ’55, respectively with the prize for the second *Bienal de São Paulo* and the *Premio Napoli* [21]. The great arc toward the city is a powerful image since the past decade with the E42; the main image was the unbuilt *Arco dell'Acqua e della Luce* or the auditorium for 5000 seats by Ettore Stella ed Emilio Garau published by Pagano in the number 154 of *Costruzioni-Casabella* [22]. In the Florentine project, the vault seems to almost fluctuate as it is not linked to the side service-rooms; in the project by Gori, Ricci and Savioli, the service areas are positioned along the perimeter of the lot, acting as a podium for the inclined supports of the vault. Unfortunately, the fence and the current parking in front of the structure make you lose the idea of an open square and integration with the city that was the basis of the original project. The wide urban portal evokes the idea of hospitality, as Bernard Rudofsky describes in his 1964 book *Architectures without Architects*: “Arcades are altruism turned architecture – private property given to an entire community” [23].

The same typology is used in other cities as for the food market in Sanremo designed by the Genoese engineers Fera and Grossi Bianchi in the mid-1950s. The project was recently renovated by the studio Calvi Ceschia Viganò Architetti Associati in 2018-19 project, thanks to which the building comes to life through respect for the original volume and careful refurbishment. The typical scheme of the vaulted market lends itself to be reconfigured as demonstrated by the Sanremo project; the new benches, incorporated into a wooden frame, allow you to revive a building while respecting its initial configuration. This type of vaulted environment has also spread internationally since the 1930s; a covered vaulted market designed by Scholinger-Taverney-Gétaz is built in Vevey, Switzerland. Still on this model we find the Spanish example of the *El Guinardó* market by Bonaventura Bassegoda i Musté of 1953-54, where the problem of lighting and ventilation is solved by means of a roof supported by the arches with a span of thirty meters [24].
The market typology finds further developments in the central plan scheme, where the theme of relational space becomes even more evident being the center of the composition. In 1951 Marcello D'Olivo designed a central plan scheme for the fruit and vegetable market hall in Trieste; a similar architecture was created by Marcelo Carqué in Zaragoza between '58 and '60 rethought in the civic center in the '80s. The central plan market replaces the dome with the vault and overturns the idea of the market as an urban space in favor of a large container. Among the pioneers of these structures, we find the Spanish Eduardo Torroja, of whom we remember the *Algeciras Market Hall* of 1934 who, together with other authoritative figures such as the engineer Robert Maillart or the architect Auguste Perret, is responsible for experimenting with reinforced concrete with a profound influence on subsequent generations especially with the explosion of *beton brut* [25].
The commitment of engineers and architects is aimed at optimizing shapes as evidenced by Felix Candela in a writing of '54, within which he describes the unnatural concept of the dihedral angle and the obstinacy to create "cubic shells" [26]. If this can be justified in residential buildings such as condominiums, in which the economy of height and functional considerations force us to use flat floors, it is not the same when it comes to covering large spaces [27]. Candela refers precisely to Mies's work with the large empty hall of the Convention Hall in Chicago and to Le Corbusier's theories drawn from Giedion's text *Space, Time and Architecture*; the Spaniard dwells on the question that concrete is not suitable for bending work, whenever it is modeled in prismatic beams in which the material displaced below the neutral axis is an overload. By confusing the potential of the material with its real properties, the foundations are laid for that atectonic formalism that dominates modern composition [28]. The market seems to lend itself well to these "neo-expressionist" applications, as defined by Bruno Zevi in the 1950s [29], in which the material is used to its maximum degree of efficiency.



Fig. 3: Proposal for a new market hall in Rome, view from the main street.

In addition to the theme relating to the shape of the architectural envelope, another much discussed topic in the 1950s is the possibility of growing the building according to the multiplication of the modular unit in order to adapt the original layout. Cosenza also talks about designing a typical 'cell to be repeated' modulating until the expected needs are met [30]. Although the works of Luigi Cosenza do not foresee this possibility except for the extrusion of the section or the duplication of the original volume, the idea of modular architecture has been addressed several times by other architects of the Twentieth century.

In the international context according to the work on systems additives or modules linked to large covered spaces such as the *Lambert Airport Terminal* of Minoru Yamasaki and Anton Tedesko of 1956 or the *Bacardi Rum Factory* of Felix Candela; both examples arise from the duplication of the initial cell. A more structured composition, based on the crossing of spaces in sequence, finds their roots in Palladio's studies on Roman baths from the time of Titus and Trajan [31]. Palladio's studies on the thermal complexes of Caracalla and Agrippa, illustrated in the well-known book by Ackerman, go so far as to exasperate the concatenation of the halls up to real paratactic compositions, albeit based on the practice of fantastic reconstruction [32]. A similar aggregative system is proposed by Jørn Utzon in the 1966 *Farum Town Center* based on the pattern of the Arab bazaar of Tehran and Isfahan observed during the *Melli Bank* construction a few years earlier [33].
Unlike the Western market hall pattern, the Arab one is based on a central spine from which several labyrinthine paths branch off. Rafael Moneo, linked to Utzon by his youth training [34], highlights the collimation in the Islamic souk with the meeting place par excellence, albeit morphologically different from the ideal of the western covered square as in Beirut Souks. The appearance of the street as an "urban interior" is also reflected in Western culture. Christian Norberg-Schulz in *Genius Loci*, in the chapter dedicated to Rome, mentions the characteristics of the eternal city as an urban aggregate based on "self-renewal" and an image of "integrated whole" [35]. The street becomes a space where "the Roman street does not separate the houses, it unifies them, and gives you a feeling of being inside when you are out"; the feeling of being inside while outside is appreciable especially in the monumental urban squares, of which Norberg-Schulz highlights a first appearance of this phenomenon in Michelangelo's Piazza del Campidoglio [36]. In the interiors, more precisely in the greatest monuments of Rome, similar experiences are highlighted in crossing a space based on the principles of tectonic architecture. The Pantheon, the *Basilica di Massenzio* or the covered street in the *Mercato di Traiano* are all linked to the image of the spaces excavated in the ravines in the valleys of Etruria; from the excavation of the high tuff walls emerges the theme of the space carved into the rock that "bring us close to the forces of the earth; they bring inside and give us roots" [37]. The huge curved roof brings us back to the concept of "existential space as corporeal extension" taken from the words of the archaeologist Kaschnitz von Weinberg regarding the analysis of ancient monuments whose spatial values are still appreciable today in the contemporary market hall typology.

2. The new marketplace in Piazza San Giovanni di Dio in Roma

The area on which the Piazza San Giovanni di Dio market stands is a focal point of the Monteverde district of Rome. It is located on an important crossroads bounded by the main penetration axis of the Gianicolense ring road, in the North-West / South-East direction, and by Via Ozanam in an orthogonal direction. Two other streets, Via Ghislieri and the perimeter edge of the square to the north-east, delimit the area within a basic rectangle measuring approximately 112x62 meters.

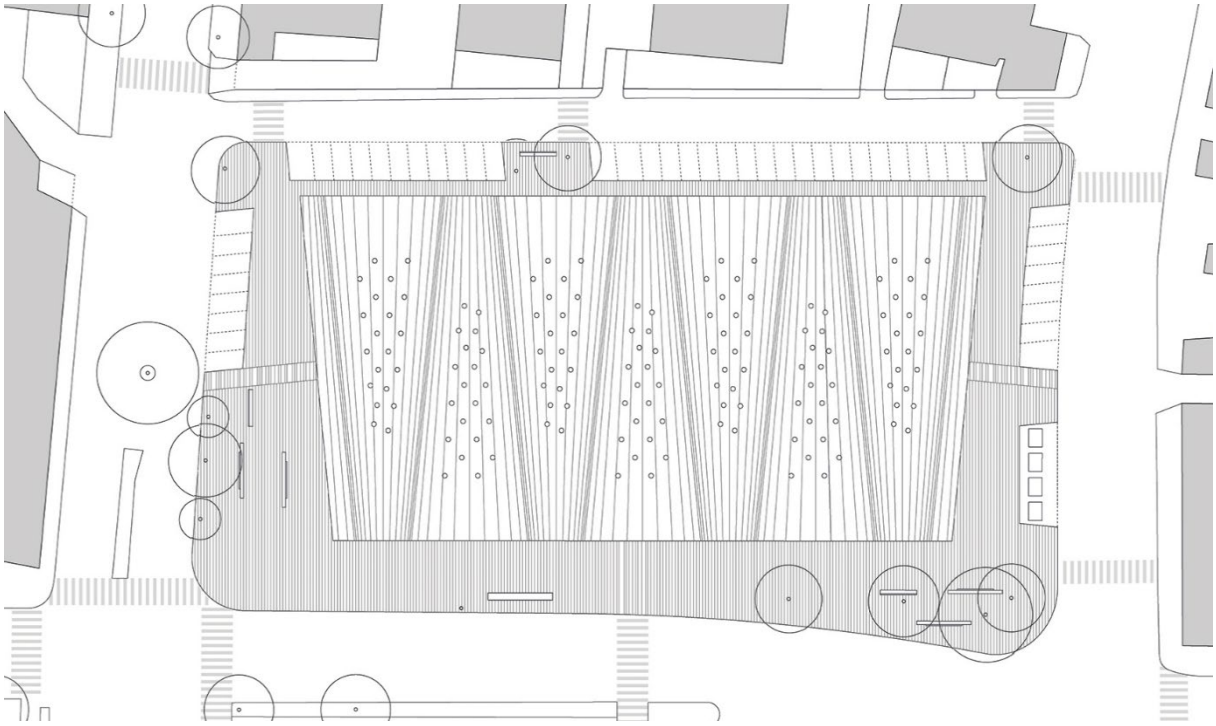

Fig. 4: Proposal for a new market hall in Rome, masterplan.

The planimetric footprint of the marketplace extends over the area following a bar graph with alternating direction on the orthogonal direction to the Gianicolense ring road. Four bars are arranged on the position of the edge residential buildings between Via Ozanam and Via Ghislieri and 4 other bars are, compared to the first, mirrored on the bisector in order to obtain a continuous deployment of the sales fronts along the longitudinal axis of the square. Consequently, with the spreading of the fronts, 7 areas with an elongated trapezoidal plan are created within which the further common activities are housed.
In particular, a first reception point is identified along the crossing that from Via Palasciano reaches the market area, which is duplicated in an opposite mirror on the rear edge of the building. These two areas, in a central position with respect to the overall development of the market hall, are two contiguous squares with a relaxing character, on the outer edge of which there are two cafeteria-refreshment kiosks and two kiosks for the sale of plants and flowers. In the vicinity of these activities dedicated to parking and meeting, there are two paved areas with tables and rest areas to be used even during the hours of market activity ceased, when a perimeter closure system will ensure the safety of the sales areas. In these areas, in fact, the perimeter closure retracts inwards with respect to the front to create parking areas serving the two bars and the two florists.
The whole system is crossed by a median longitudinal path that connects Via Ozanam to Via Ghislieri from inside the market. This way the kiosks on the edges can have three exhibition sides. The intermediate zones included in the expansion of the base of the elongated trapezium host the counters for agricultural producers with rest areas for tasting the products. The internal front of the agricultural counters is made up of the bodies for the toilets, the changing room and the mixed-use deposits, while the internal side of the two-opposite reception "squares" host the spaces for delivery and administrative offices. In this way the space of crossing in both directions recovers a convivial vocation, recalling in the spirit the ancient markets as a place of meeting and exchange.

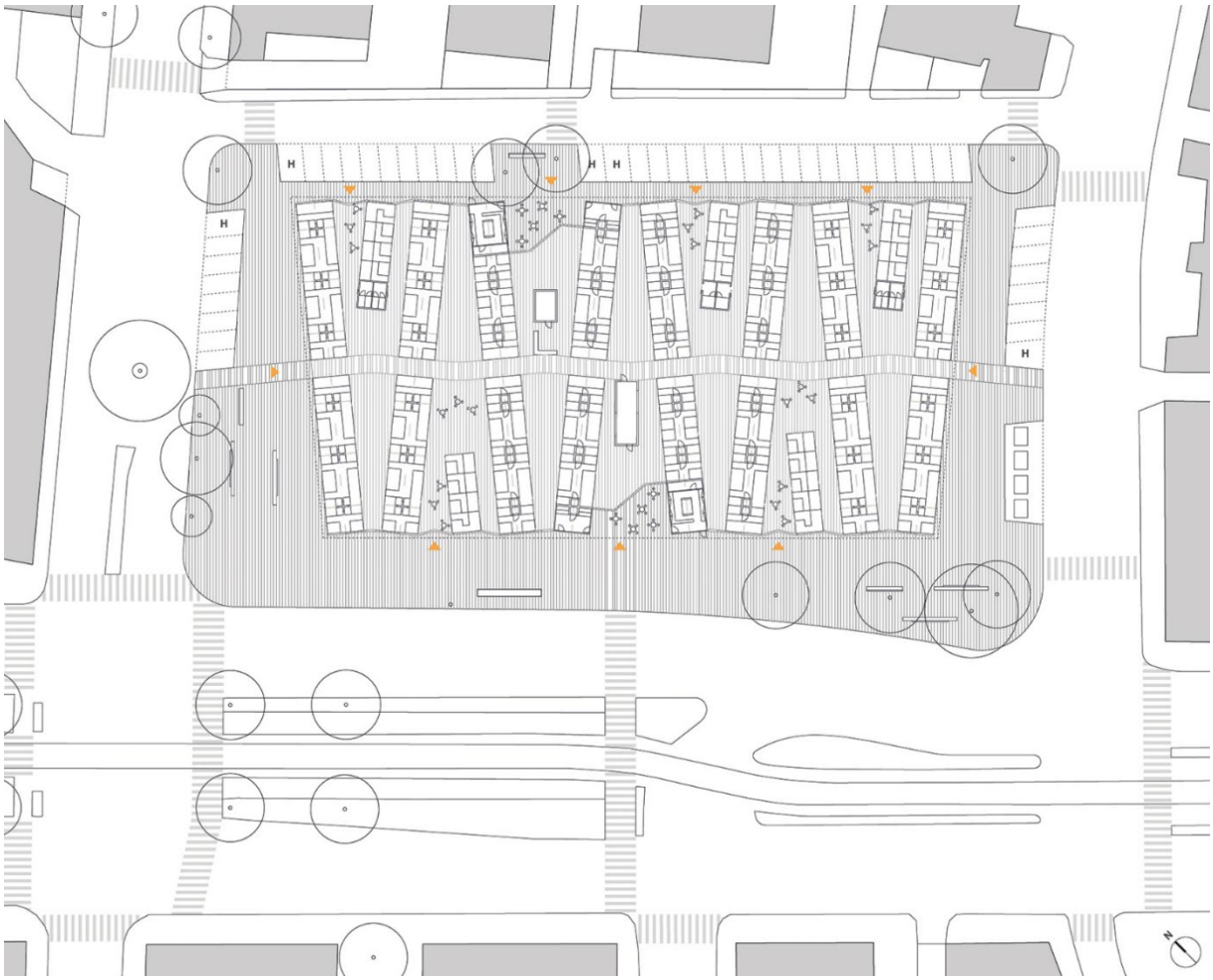

Fig. 5: Proposal for a new market hall in Rome, plan.

The rows of the sales counters are conceived as a plug that can operate on two opposite sides. Each kiosk is crossed by an internal path through which to operate within the sales counter. The dividing point between two contiguous kiosks is marked by a cruciform pillar at the corners of which cold rooms can

be placed, where necessary, washing tanks and small individual deposits. Market coverage rests on the line of point-like supports. The roof is characterized by a succession, with alternating slopes, of inclined funnel vaults. Metaphorically, from above, they recall the enlarged remains of ancient Roman amphorae emerging from an excavation, while from the inside, with the beams of light passing through circular quincunx holes, they evoke a Mithraic space.

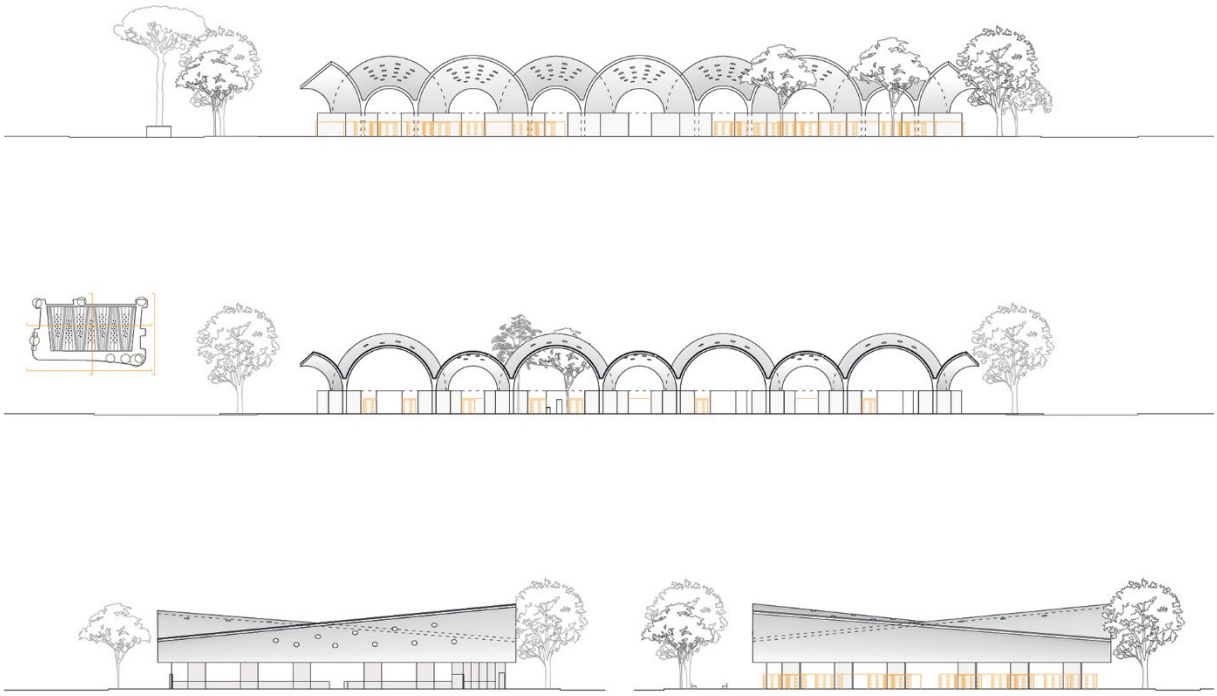

Fig. 6: Proposal for a new market hall in Rome, front and side view.

The funnel shape favors proper transverse ventilation useful for natural cooling during the summer months, while during the winter months the same roof guarantees protection from thunderstorms. During non-operating hours, the market is closed by a system of sliding railings, placed on tracks with a mixtilinear perimeter pattern in accordance with the edge fronts of the external kiosks. The market area included in the extension of the coverage is 3500 square meters in total. The pavement of the market is in continuity with the external area to give unity to the entire Piazza San Giovanni di Dio. On the long side towards the residential edge there are parking spaces arranged in a herringbone pattern, with 3 stalls for the disabled and 4 for the disabled. loading / unloading of goods. On the short sides there are other stalls useful for expanding the overall equipment of the parking spaces. The area for the ecological island is set up on the side of Via Ghislieri. The external corners of the square are marked by the insertion of monumental tree species. Towards Via Ozanam and towards the corner of the square to the south, as well as near the main entrance located on the edge of the building to the north-east, there are rest areas with benches suitably shaded by the foliage of the tree groups. The bus shelter is confirmed in its current position, next to one of the entrances on the pedestrian crossing axis coming from Via Palasciano.

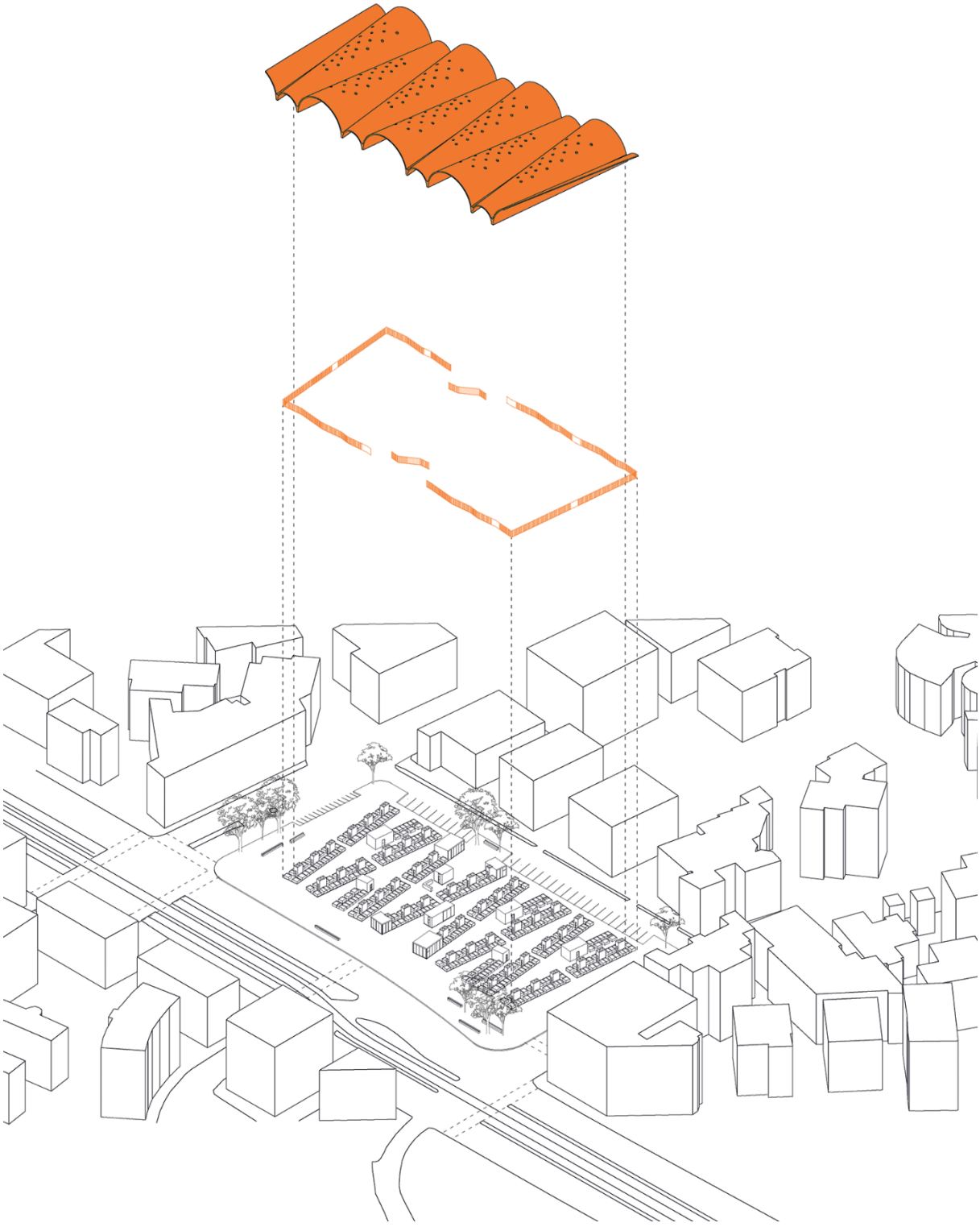

Fig. 7: Axonometric cross section of the market in Rome.

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Dooroom: living in the city of rooms

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Abstract
From the analysis of the room (elected as the primary element-structure of living), the paper proposes to explore private spaces and the different ways of interpreting and composing the contemporary domestic space in an attempt to identify and propose adaptive solutions capable of improving the quality of residential spaces already in place or under construction. In conjunction with the Sars-Cov2 pandemic, starting from the lockdown of March 2020, the theme was developed within the architectural and interior architectural design laboratories coordinated by me at the Department of Architecture and Industrial Design of the University. of Campania Vanvitelli.
The results of the research work with the "Dooroom: The city / house" project try to answer two fundamental questions, namely which house or which city to rethink for the man of tomorrow. The theme of living, in fact, seems increasingly linked to the need to totally reconsider the shape of the private spaces of the house, which over time have become increasingly public and independent from the city.
The research involves the creation of a housing prototype that questions the compositional principles of the home to re-examine the intimacy of the domestic sphere in relation to the new daily life and the different behaviors of its users. The project focuses on the enhancement of minimal surfaces, mixing hybrid and external spaces, the accommodation with a living system based on the autonomy of the room that becomes the compositional matrix of contemporary living.

Keywords: contemporary living, minimale surface, room, domestic space, adaptive space

1. C^2= Home (pre) / City (post) 2021
The profiles of the cities we know, the geometries or the colors of those places that belong to us in the depths, appear as if crystallized in an immobile time, victims of a deep stasis where everything seems the same as always. Yet, it is not so.
It is enough to cross the entrance threshold of many residences, in fact, to understand how much the spaces of private living have changed enormously since the beginning of the twentieth century [1], not to mention what suddenly happened in less than a year as a cause / effect of the last global pandemic. What David Benjamin defines and identifies as home, that is the «physical structure and the spatially localized, temporally defined, meaningful and autonomous conceptual system for the ordering, transformation and interpretation of the physical and abstract aspects of daily domestic life. simultaneous space-time scales, activated by the connections of a person or a community elected as a family unit» [2] seems, today, to gather even more in the forms of its potential and smaller entity, where the room, not by chance, is chosen as an emblem of contemporary living.
Long before the pandemic, domestic spaces were the subject of lightning-fast transformations for years, resulting from splitting actions. In fact, sizeable accommodations, or the large noble apartments of the past, were divided into smaller and more private rooms, with the creation of real microcosms of autonomous and independent communities. All this raises an important topic of discussion on which to pay great attention because the results of these invisible transformative actions, hidden by the untouchable walls of the historicized city and which trivially (due to their reduced scope we have erroneously considered as isolated cases) find, instead, large diffusion in the major European capitals and cities, above all, in the most popular and inaccessible ones (both due to the high cost of rents and the lack of free and available housing).

Slowly we are witnessing one of the most significant changes in the modification of the private space of the house, where the distribution elements or furnishings and the relative dimensional relationships between things and people are completely revised and transformed, often, regardless of the applications required by residential legislation, with the result of poor quality and discomfort in those forced to live those spaces not suitable for life. Thus, it becomes increasingly clear how much the quality of the space no longer depends only on the correct dimensional application of the rooms that are part of the home. Today, a different chapter is opening which focuses on the new needs of contemporary man, to which to respond through a concrete revision of the meaning of living and consequently designing, the new domestic space where, a new the idea of comfort and distribution quality is the first request to be answered.
And following the pandemic, with the decrease in freedom of movement and the impossibility of living the spaces of the city (which filled the gaps in private housing) due to the limitations imposed by the governments of various European countries, in an attempt to stop the transmission of the virus, it is even clearer how consistent those deficiencies are. For years it has seemed more interesting to focus on understanding the phenomena related to the development of cities seen as autonomous organisms, in which to project life in relation to its extended form and to the external spaces offered to the public, which has placed the small in the background. case of the single house making, inevitably, inefficient the domestic spaces in which we live.
The precariousness of domestic environments, compared to the different actions of everyday life, becomes a widespread condition, which affects, in the same way, those who are forced to live in a housing with reduced dimensions and those who reside in houses with adequate dimensions and considerable spaces, without any distinction.
In light of what has emerged, therefore, it is necessary to consider a new relationship between the quality of the space according to its minimum size, taking into account other factors that support the results of the project where the application required by smart communication means, in anticipation of the different study methods or the possibility of working remotely (already professed in advance by several companies to reduce the annual costs of utilities), summarizes the picture of a housing emergency on which it is necessary to reflect for the creation of a new home proposal, attentive to the renewed needs of the present.

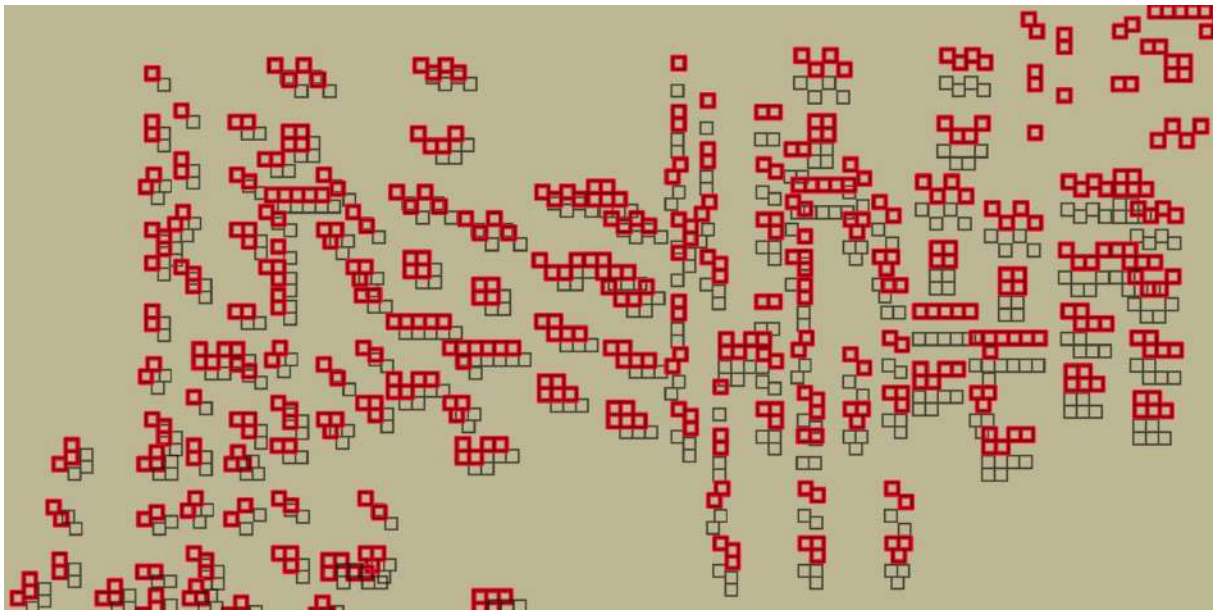

Fig. 1: Maria Gelvi, The city of rooms, digital collages, march 2020

1.1 The room is the minimum size in the construction of the spaces of the Modern

If the experiences professed by the Existenzminimum [3] had already made it clear how much the room was a fundamental element in the development of living, at the center of a debate that founds the cardinal principles of standardization to reduce its useful surfaces to the essential, the he idea of the quality of space which is openly independent of its size and the evolution of compositional processes linked to residential living, returns in many authors of the last century where there is really a lot of literature. It is worth remembering how much from the early twentieth century the autonomy of domestic spaces, with the clear distinction between public and private functions, is enormously investigated and made clear in the theoretical writings of Le Corbusier which he disseminated to the scientific community [4]. It is no coincidence that the *immeuble villas* or the subsequent plant promoted in the various housing

units starting from the construction of the building in Marseille, profess the clear distinction between the spaces of the house in relation to life in the community without renouncing the confidentiality of its spaces. private, where corridors, terraces and loggias are real strengths of the project. On the other hand, to cope with the great demand for housing resulting from the warlike and highly destructive actions of the world wars, the need to optimize the available space becomes an obligatory action that involves all designers in every corner of the planet.
Just think of what happened in those years in Italy that from a predominantly agricultural country became the showcase of a consistent industrialization of construction, based on the need to build housing in a short time and at low cost, which is indisputably linked to the concept of space economy. starting from the minimization of the elements and surfaces useful for living. Thought that has erroneously extended over time, overcoming the reason for an application based on a real housing emergency of the time and which today clearly shows the traces of its failure, especially in the areas on the edge of the historicized city. Those places that we have, for mere simplification, associated with the concept of periphery; expansion areas, far from life and from the welcoming and protected sphere of the center transformed into an inaccessible showcase for residents, in which tourism and commerce determine the use of those areas with assumptions and principles based on earnings.
But going back to the past and looking at the American experience promoted by the mobile living of authors such as Richard Buckminster Fuller, Richard Neutra or Frank Lloyd Wright, other elements emerge to reflect on and which today seem to find an even more defined temporal location compared to their time [5]. Building the home space on the size of a room capable of fulfilling all the functions of living is combined with the technological development of removable housing linked to the idea of temporary living, a decidedly current theme in the contemporary world.
To the aforementioned are added the works of John Hejduk, Pierluigi Spadolini, Marco Zanuso, Giuseppe Pagano, Joe Colombo who on the theme of the inhabited room decline the actions of composing, building the image of the Italian school. The 1972 exhibition celebrated at MOMA "Italy: the new domestic landscape" curated by Emilio Ambasz [6] is the terminus in which to identify the point of maximum research that over the years and for the first time combines design and architecture in an attempt to tell new home rituals in the renovated private space of the house.

1.2 Rooms and small spaces: new protagonists of contemporary living
In precarious and unstable conditions, also accepting the compromise of co-living, many single-member families or young couples live the sacrifice of renunciation by virtue of the wide-ranging benefits offered by the city in which they reside. This has led to the development in different realities, the creation of housing models inspired by the idea of mini apartments, the typical "studios" of the city of Paris, environments characterized by a single space capable of condensing, albeit with its small size, all the demands of its inhabitant. By reinterpreting its potential figurativism, the ideal imagery of the room becomes the symbol of a perfect widespread living in the achievements of tiny-houses, student-hotels or, specifically, collective housing, the latest generation housing typologies that dot the ground built in various Italian cities. and European. A room of a few square meters, in fact, satisfies the needs of a young audience willing to share, a value that is found mainly in the new generations of families who fall within the age group between 20 and 40 years [7].
The types of these new forms of housing can be traced back to two primary structures that interpret the flexible and rigid envelope by mixing its possibilities, focus on the construction of integrated spaces where the theme of customization is one of the strengths. The houses modeled on a prefabrication system are equipped according to the needs of their user, who can also independently modify the internal arrangements, arranging and varying the distributions of the home environment on various occasions.

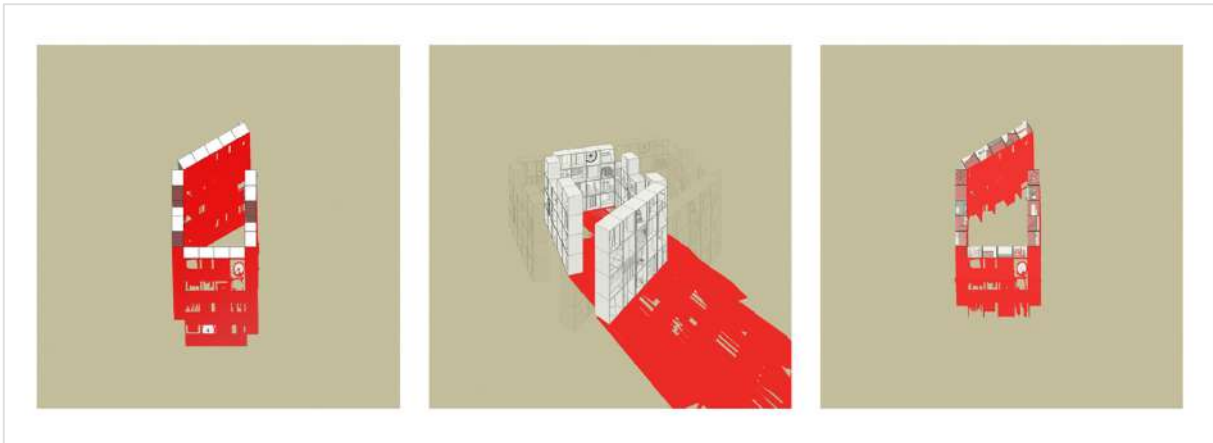

Fig. 2: Maria Gelvi, The room. Ephemeral living. Triptych, digital collages, march 2020

2. Dooroom, a neologism to describe living

With the neologism *Dooroom* (from the union of *domus* and *rooom*) we want to describe that private place no longer just a house or room, in need of an ideological and physical renewal of living for the reasons summarized above.
First of all, it is important to consider the possibility of enhancing the functionality of the home space through the correct composition of its environments, interpreting the minimum size as an opportunity. For this reason, objects and elements of furniture should be arranged by listening to new relationships between body and mind in order to listen to other experiential factors.
This renewed idea of living is synergistically applied to the reorganization of existing spaces, the most lacking and in need of solutions that improve their livability, reformulating their distributions and uses on the basis of a new living that in key concepts can be used according to the same principles for new buildings.
With the design of minimal spaces and the related furnishing elements, without any distinction between the interior and exterior of the accommodation chosen as a single and large body to be modeled, the way is opened for new hybrid housing typologies, which mix styles and languages in an attempt to to bring man back to the center of the compositional and architectural research of the most intimate and private environments which in the present have added, to the previous shortcomings, the need for a sudden adaptability of the spaces where the house has simultaneously become a place of work, study, virtual conviviality and physical and mental well-being.
This clearly showed the difficulties of accommodating all the actions until recently assigned to other spaces and environments outside the home, clearly defining which were the real spaces indispensable for the new living where the insertion of a point of contact with the outside with balconies, loggias or terraces has become a vital and necessary endowment (which few today have) because the individual needs to carry out outdoor activities, such as working or establishing a new form of contact with the neighborhood especially when the city becomes inhospitable or is forced to limit the use of its spaces.
On the construction of a self-sufficient block, also from an energy and production point of view, the "Dooroom: the city / house" project aims to respond to the shortcomings of contemporary living, saving those surfaces that are often not exploited to the best of their ability, with the construction of a housing model based on the addition of private rooms within a large urban block compressed into a square of 104x104 meters, where private and social spaces are designed for the contemporary family made up of a nucleus ranging from 1 to 4 people (2 adults and 2 children).
An urban block that wants to achieve comfort and social well-being by enhancing minimum living areas of 8, 16 and 25 square meters where the house / room are pauses between collective spaces managed by private entities in which to limit the sense of material possession and private property of the users.

2.1 A composition of square rooms: the imaginary system

The definition of the system starts from the room, the primary element-structure of living which in its evocative power of memories and emotions is the starting point in the construction of a semantics of contemporary living [8].
Like a scientific system made up of various interconnected and reacting elements with each other and with the external environment, space evolves and becomes a single large body with its own characteristics and autonomous relationships with the whole.
The attempt is to translate the systemic-relational approach to space and the dimension of living by looking at the experience of the Palo Alto school and the Mental Research Institute founded by Don D. Jackson and his colleagues Gregory Bateson, Jay Haley and Paul Watzlawick.
For the first time, the individual is the center of a system of relationships that are not only internal but combined with the external environment with which he interacts, determining specific conditions [9]. And in this key, the room becomes a constellation of defining elements of its apparatus containing a larger phenomenological system where autonomous systems but in relation to each other as user, space of the ego, external space, matter, are nourished and influenced by each other.
The perimeter, compressed in the geometry of a square iterated to infinity, is the physical limit on which to subsequently modify, add and characterize further geometries attributed to uses and objects contained within the space. It is no coincidence that the square is a simplified form of living that returns since ancient settlements and which in the present takes on a specific role in its being an easily modulated geometry within a pre-established system; *Dooroom* wants to encompass the needs of contemporary living starting from the construction of a system composed of primitive forms considering them as multiple and submultiples, to restore the image of the renewed home sector of contemporary man.

2.2 Outdoor space as an added value to living

We have seen how, today, equipping the home with an outdoor environment has become necessary and more than ever an absolute priority compared to the past. Paradoxically, the action carried out by functions and parts of the city, suddenly transposed within the domestic walls, is one of the reasons that led the user to notice how the absence of previously considered secondary and accessory areas are, instead, extremely essential and useful to improve the livability of the home space.

Balconies, loggias and terraces have been for years simple surface extensions that referred their design definition to the inhabitants themselves, very often the subject of closures and abuses that have compromised their usefulness.

In all their potential, however, these spaces return to attention and become a strong point of the project which in Dooroom sees an interpenetration between the external and internal surfaces of the accommodation, where a significant transformation of these parts takes place, attributing specific uses to them. .

True offshoots that extend outward, and that convey the gaze by closing or opening parts of a device capable of expanding the perceived environment with just a little.

A further possibility of building outdoor spaces and near the home is possible by considering what surrounds the housing, based on the positioning of the module.

An arrangement that provides for an alternating sequence between the inhabited rooms, contributes to the creation of small free areas used independently by the user for all those activities that cannot be carried out within the home.

2.3 The hybrid space that listens to the inhabitant

To encompass all the needs of contemporary living, the environment must necessarily be tailor-made for its user, taking into account not only the dimensional parameters of the objects and spaces around the body but also the functions, movements and sensations that the space reverberates on the inhabitant. and which consequently reflects the same outside.

By combining housing types and construction principles based on the theme of mass production, it is possible to obtain a functional system which, while showing a complex picture of relationships, is more adaptable in uses and in responding to the needs of the inhabitant.

This space which is unique but diversified and where the lack of a distinction between more public parts and actions from strictly private and intimate ones is evident.

The environment that will characterize the home space will be increasingly hybrid and formed by elements that mix traditional behaviors (linked to the sphere of the human body and its physical needs) with actions where certain aspects will predominate such as the material inconsistency, the dematerialization of objects up to to overcome the concept of geographical distance that the use of computers and the internet have recently implemented by changing ways of living and recognizing the space around the individual.

In a continuous up and down of compromises, the value of space and its altered perception are the result of a combination between real and virtual that will tend to strengthen more and more especially because the non-real instantly compensates for the physical and material shortcomings of living. A factor to monitor and take into great consideration in the design of the home space that must necessarily foresee and approach the experiments in the field of multimedia without granting them dominance, which would speed up the abandonment to the physical dimension linked to the bodily experience of the human being. with a very bad quality of space to live in.

3. The experience of the "Dooroom: the city / house" project

The idea of significantly rethinking contemporary living and formulating a response to inconveniences (evident from the March 2020 lockdown) was developed within the architectural and interior architectural design laboratories coordinated by me at the Department of Architecture and industrial design of the University of Campania Vanvitelli. The work involves the design of an urban block that takes up the structure of a reinforced concrete frame (typical construction system characterizing local buildings, often an example of illegal, decaying and abandoned) with beams, pillars and relative structural step provided as a unique data of departure.

The planimetric system provides for a development of 104 meters per side with a depth varying from 10 to 12 meters. The overall height of the volumes is set at 5 levels above ground (inter-floor of 3.30 meters) with the possibility of using the roof as an extension of the domestic space to be used for outdoor activities or for particular forms of local commerce or leisure.

The central space is free and connected to the environments of the first or second level according to the specific needs and characteristics of each cityhouse with maintenance and management entrusted to the inhabitants, where the insertion of productive activities through small artisan shops, services of various kinds is foreseen and urban gardens for each family unit. The design responds to the needs of contemporary families and in terms of variety, users include individuals of different age groups with single-member families or young couples with children for a maximum of four members.

The system provides for an alternation of private rooms for residential use with spaces for relationships, work, study and physical and mental well-being with a continuous integration between the parts and the crossing flows
The domestic spaces are flexible and built with the aim of enhancing the minimum surfaces of private housing where the dimensional parameter varies from 16 to 25 square meters. The rooms, arranged in alternating sequence or with a simplex or duplex battery, are rarely added together and, in those cases, the maximum surface area does not exceed 75 square meters.
Each private space is equipped with a hybrid environment contained in the overall area of the accommodation. This area, partially external or extruded from the perimeter like a capsule, can be used as a place of work or personal leisure in complete autonomy, with the task of improving the management of family activities and significantly expanding the home environment.
All accommodations are equipped with large windowed walls with balconies or terraces that complement each other by enhancing the use of the internal domestic environment. From the design comes a complex system consisting of 13 *cityhouses*, each independent and different from the other, although all coming from the same matrix.
The accompanying images are some extracts from the distance learning work carried out within the laboratories in this period.

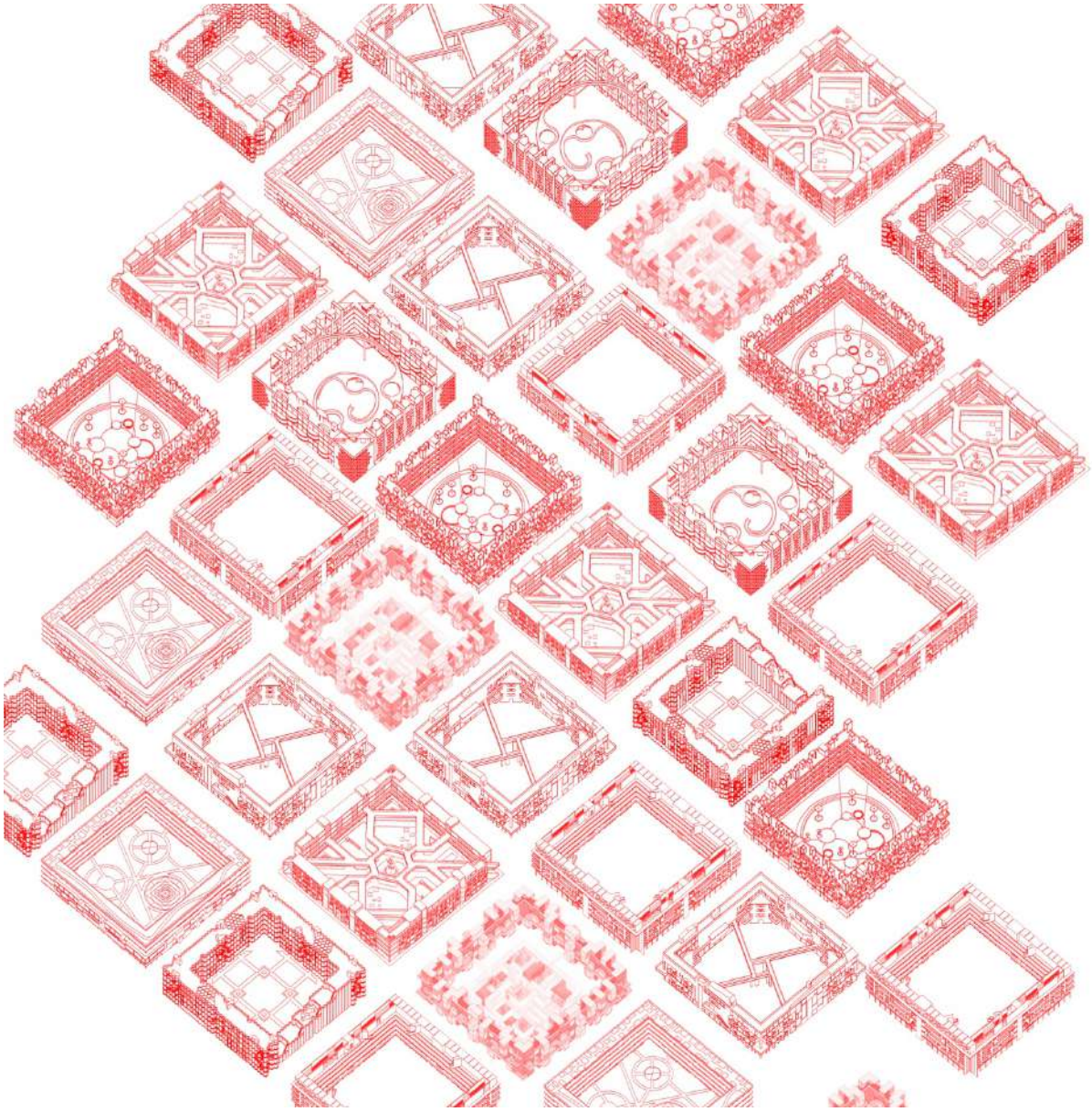

Fig. 3 The cityhouse. living in the city of rooms, march 2021



Fig. 4 The cityhouse. Some internal view, march 2021

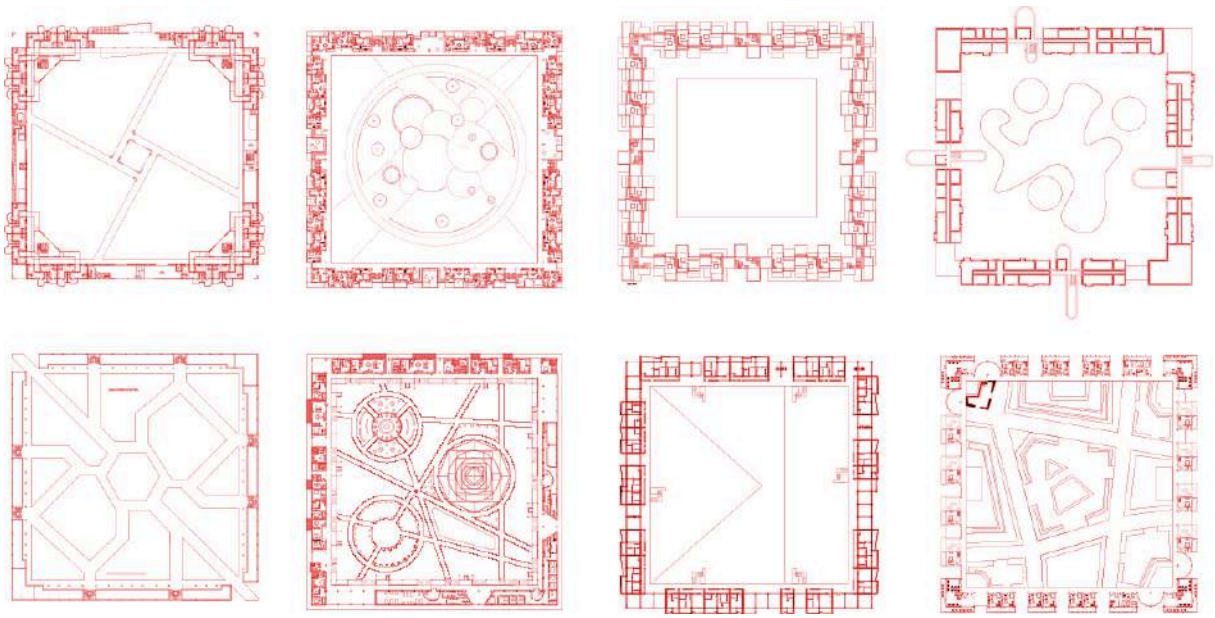

Fig. 5 The cityhouse. The planimetric system, march 2021

The *Cityhouse* project was carried out during the architectural design laboratory at the Department of Architecture of the Università degli Studi della Campania "Luigi Vanvitelli" Prof. Arch. Maria Gelvi, students: Giuseppe Artiaco, Roxana Georgiana Aeonai, Silvia Lenci, Mirco Bashir, Domenico Raucci, Francesca Ferrara, Francesca Panzariello, Nicol Franzoso, Giusy Liccardo, Benito Iavarone, Raffaele Servodio, Federica Salerno, Annalisa Pagliuca, Carmen Sequino, Chiara Arcidiacone, Veronica Ignarra, Dilara Gunaydin, Enrica Mautone, Maria Tammaro, Chiara Pisano, Merve Geçer, Rita Mercuri, Valeria Ipri, Angela Messina, Vincenzo Russo

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Urban spaces' health: green and dry technologies for conservation of historic paving stones

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Abstract
The urbanization processes that have developed in recent years have caused profound impacts on urban spaces' surfaces, due to careless maintenance actions and impacts of climate change.
The alterations of the ancient construction solutions have limited the permeability of the historic paving stones, causing the urban heat island. The waterproof, asphalted and cemented surfaces absorb heat with a consequent decrease in evapo-breathable phenomena and modification of the natural water cycle. In fact, the infiltration capacity of surface waters decreases, the volumes and the aggressiveness of the run-off water increase. In addition, it increases the transformation of pollutants causing the phenomenon of urban smog.
The use of ancient construction solutions provided dry installation systems in a logic of respect for the environment that anticipated the times.
The historical reading and the awareness of the efficiency of the solution are the premise in the choice of maintenance and restoration of urban surfaces to ensure the increase of permeability. Dry solutions and green technologies, combined with the choice of suitable materials, minimizes the impact on the drainage network, in line with the concept of low impact development, returning meteoric water to the atmosphere through evaporation and improving the microclimate. The rationalization of proposed interventions can be measured by parametric assessment of environmental health.

Keywords: historic paving stones, urban heat island, dry technologies, environmental quality, cobblestone



1. Introduction

The image of the majority of our historic centres is marked to a significant extent by the stone pavements and enters the sphere of perception for the essential contribution about the characterization of the surfaces and the identity values of the urban space. In contextualizing the places and subscribing to the importance of the construction culture of stone, the ancient pavement surfaces are responsible for urban quality [1]. This concept is increasingly enriched today with all the options related to the regulation of the microclimate and the achievement of lower impact conditions than the previous ones, thus combining building quality and environmental quality.

Today the issues related to urban mobility tend to converge more and more towards the issues of pedestrian mobility [2], with particular reference to the need to redesign the viability of our historic centres.

The enhancement of urban spaces must "deal" not only with history but also with attention to the environment. Therefore, the recovery and redevelopment approach to the urban scale of the historic pavements must be structured by linking the attention to a sustainable building to the urban history of the places. And in this approach, the stone and its relations with the historical technique, which has been handed down over the centuries, plays an essential role concerning the objectives of conservation and redefinition of the local identity for the cancellations imprinted through sterile repetition actions of extraneous models to the place.

The theme of the conservation of historical pavements transcends the complex interactions with architecture and urban planning and enters the dynamics of regeneration of the city which must be sensitive to innovative solutions aimed at preserving historical surfaces characterized by time and places and to keep the climatic imbalances. While the theme of the revival, on the other hand, clashes more directly with urban transformations, inattentive both to the historical memory of places and to the environmental problems that afflict the climate today.

If the urban space is a community room, as Louis Kahn said, the relationship between the built space and the floor can be immediately perceived both visually and functional, and therefore underlies behaviours designed and verified to guarantee new and weighted balances between history and innovation.

A careful interpretation of the ancient construction systems is therefore essential, for a correct design of redevelopment and maintenance interventions, with the necessary attention to eco-sustainable choices for historical and technical culture and the environment.

2. Urban heat island and soil impermeability

Cities are the areas most affected by climate change, which represent one of the greatest challenges of the 21st century [3]. At the same time, urban areas, in addition to being the main responsible for greenhouse gas emissions, are particularly exposed to the impacts of climate change such as intense storms and very concentrated rainfall. Sometimes, due to unforeseen urbanization or an increase in urban planning load, the sewage systems are inadequate. The washing and erosive effect of rainwater facilitates the formation of landslides, which have already devastated the inhabited areas several times with lethal effects for the population involved. The thermal and radiative characteristics of the materials that make up urban surfaces should not be underestimated. From the United Nations report "Streets as Public Spaces and Drivers of Urban Prosperity", it emerges that the expansion of cities has been accompanied by changes in land use. The waterproofing of the soil does not allow the absorption of rainwater and generates the phenomenon of the heat island with problems related to health and quality of life, especially during the summer with heat waves.

The high heat accumulation of road surfaces and building surfaces, together with that generated by urban activities and the absence of thermoregulation elements such as green spaces and wet areas, are the causes attributable to the phenomenon of the urban heat island (UHI). The heat island is a microclimatic phenomenon that occurs in urban areas and consists of a significant increase in temperature in central areas compared to peripheral areas (Fig.1) [4]. This is a phenomenon caused mainly by the thermal and radiative characteristics of the materials that make up the urban surfaces (in the first place, asphalt and concrete) in which the absorption of solar radiation prevails over reflection and waterproofing. Certainly, the human activities that are concentrated in cities and their immediate vicinity also contribute to the heating of urban areas, both directly through industrial activities, vehicular traffic, heating and air conditioning systems, and indirectly, by altering properties. radiation of the atmosphere due to the high levels of pollution associated with these activities.

Another aspect of primary importance concerns the vegetation, which can contribute to the reduction of heat by reducing the effects of excessive heating. Green areas, as well as water masses, in urban areas play a predominant role in the actions to combat the phenomenon of the urban heat island, since their juxtaposition in urbanized areas generates positive dynamics in terms of thermal balance and evapo - transpirative [5].

The positive effects on the urban microclimate of green belts in the vicinity and within the built environment are, in fact, now widely documented. The temperature gradient that is created between built-up surfaces and vegetated areas determines an important flow of air that allows to eliminate heat but also atmospheric pollutants from the city, while atmospheric humidity conditions tend to stabilize on levels of greater acceptability [4]. Therefore, in addition to a purely aesthetic value, green areas provide numerous advantages for climate adaptation purposes; have the ability to regulate the microclimate of the surrounding air: the mechanism is linked on the one hand to the level of interception of solar radiation, on the other to the evapotranspiration process [6]. In the cities there is a temperature higher than that of the surrounding agricultural areas which varies from 2 ° to 5 ° C; for this reason, they will be more affected by the increase in temperature (Fig. 1) [7, 8]. In summer, in the sunniest hours, the streets and roofs of houses can often reach temperatures above 60-90 ° C. It is possible to estimate the maximum temperature difference between city and countryside ∆tmax, on a clear day, using the following empirical relationship, based on data collected in European cities [9].

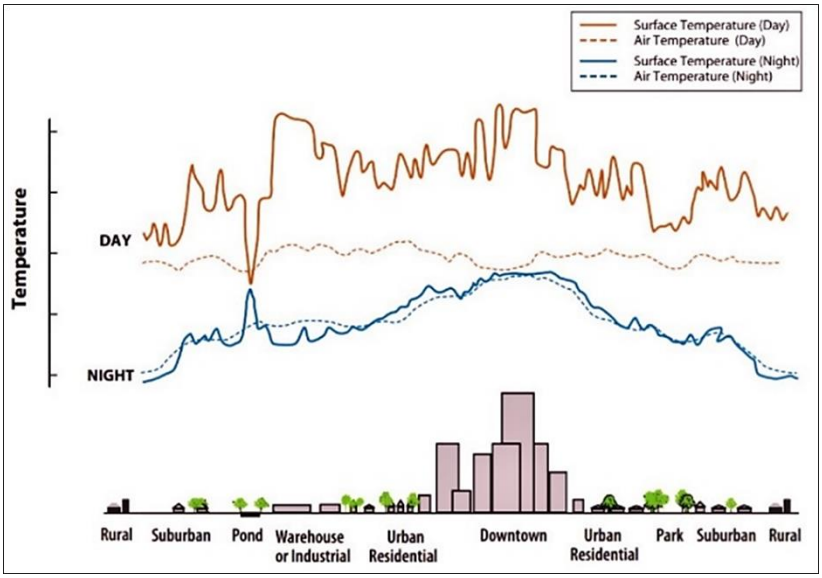

Fig. 1- UHI: Variations of Surface and Atmospheric Temperatures.
Source: EPA, Reducing Urban Heat Islands: Compendium of Strategies.

$\Delta tmax = 2.01 * \log P - 4.06$ (P = population of the urban core) [9].

Urban soil has a poor capacity to retain water; the result is less evaporation, which further reduces the cooling of the air near the ground. The UHI effect makes city homes more and more unlivable, and pushes the use of air conditioners, which, on the one hand, cool the house, on the other, reject hot air outside, hindering the natural night-time cooling of the air. The consequent presence of permeable surfaces helps to regulate the flow of precipitation. Urban soil has a poor capacity to retain water; the result is less evaporation, which further reduces the cooling of the air near the ground. The UHI effect makes city homes more and more unlivable, and pushes the use of air conditioners, which, on the one hand, cool the house, on the other, reject hot air outside, hindering the natural night-time cooling of the air. The consequent presence of permeable surfaces helps to regulate the flow of precipitation.
Studies on the materials used in urban areas have shown that the physical characteristics of the latter - asphalted roads or flat roofs - are factors that change the energy balance of the urban environment [10]. The intensity of UHI is significantly reduced if materials with a high absorption coefficient of solar radiation, such as asphalt or dark-colored tiles, are replaced with materials for flooring and roofing of buildings with a higher albedo [10].
The floors, in concrete and asphalt, worsen the heat island effect, just think of the large surfaces occupied by roads and parking lots in cities and historic centers. In this case, the choice of materials can help to create floors that maintain lower temperatures. In the case of car parks, it is possible to opt for green solutions and draining pavements. It is important that the floors are highly reflective, permeable and made of natural materials. The high value of the Solar Reflectance Index (SRI) indicates a limited accumulation of heat and, consequently, urban overheating.
Elements such as roads, parking lots, sidewalks and roofs inevitably lead to the waterproofing of the soil and consequently an increase in surface runoff and a lowering of infiltration, evapotranspiration and groundwater supply. Soil waterproofing is one of the effects of urbanization that most affect the vulnerability of urban systems and the hydrogeological cycle, leading to a reduction in permeability and an increase in run-off, with consequent flooding. Heavy rains, in conjunction with soil impermeability conditions, generate major problems in the drainage system, since the amount of water that the network is able to dispose of is less than that which reaches the sewer.

3. Urban drainage and permeable surfaces

Urban drainage is a key concept for countering the urban heat island phenomenon and the problem of water runoff that creates consequent local flooding phenomena. The use of drainage materials at the urban level can help restore the natural water cycle, known as the "hydrological cycle". After

precipitation, the rain falls on a natural surface and can be absorbed by soil or plants. The first case is the phenomenon of infiltration, while the second case is the phenomenon of transpiration. After that, the water can evaporate and eventually reach the inside of a stream or river.
Generally, the impermeabilized surfaces are provided with appropriate slopes to convey the water inside the sewer network. Therefore, the normal water cycle previously described is affected. This entails a series of consequences as a reduction in the supply of the aquifer since the water infiltrates to a significantly reduced extent, resulting in a lowering of the level of the aquifer. Furthermore, influencing the water cycle leads to a worsening of the microclimate. If the water is drained quickly from the impermeabilized surfaces, it can evaporate in a minimum part. So, there are a reduction in air humidity and an increase in the temperature in the surrounding environment.
If the rains are abundant, they can overload the sewers since they are subject to higher flow rates than those they can dispose of. Consequently, local flooding phenomena can be generated if the sewers are not hydraulically sufficient to receive intense rains with consequent regurgitation in the street.
The irrational use of the territory has led to an increasing waterproofing of the soil and, therefore, to a decisive influence on the natural water cycle.
Instead, plant surfaces are very permeable. For this reason, the phenomena of evapotranspiration and infiltration of water into the soil are predominant. The fraction of water that flows is reduced to a percentage that can range from 0% to 20% of the total water coming from precipitation. However, if the surface is impermeabilized, the amount of rainwater that can drain can even exceed 90% [11]. This phenomenon is typical, for example, of paved roads or parking lots.
A different approach to avoid these problems is to reduce the impermeabilized areas to a minimum. Predicting and planning the permeability of soils is a key concept that has benefits for humans and the environment.
Surface drainage can be encouraged, at an urban level, thanks to an adequate design of the road network and urban spaces in general, which deserves even more attention in historic centres. In fact, both in the restoration phase and in the new one, construction techniques can be favoured that provide for a stratigraphy that allows a low flow of water and at the same time can favour the infiltration of water into the ground. The solutions for laying historic flooring have always been more careful to provide draining layers in response to functional and efficient logics, without exception, in the name of a state-of-the-art construction, from which it is necessary to start again. Interventions in historic centres, more or less densely urbanized, can re-appropriate the lesson of the past and reinterpret it in a current key in the name of environmental health.

4. Construction techniques of historical flooring and recent interventions

Most of the road surfaces currently made are asphalt, unlike the upper layer of the ancient streets of historic centers, which the Romans called "pavimentum", characterized by stone elements. In recent decades, road engineering has been marked by major changes. The materials have changed and the quality has changed. What remains is the layered structure. In fact, each pavement is made up of a succession of layers of different materials, chosen according to the characteristics of the territory and the destination of the road. The road pavement consists of three main components: the surface, the structure and the substrate. The mantle is the only visible part of a road to which an aesthetic and functional function is entrusted. The mantle covers the structure of the flooring made up of various layers of different materials that often reach a depth of more than one meter. The structure is that part of the road which has the task of transferring the load to the underlying natural ground which represents the subgrade [12]. In fact, the road pavement, in general, is the result of a project that derives from specific needs and requirements subordinated to the historical period in which it is built. The ancient roads within the inhabited centers, unlike the extra-urban roads, were subject to greater intensity and variability of traffic. In particular, they had to guarantee optimal hygienic conditions, especially in terms of runoff of rainwater [13].
Technically, ancient roads already possessed many of the characteristics of modern infrastructures and new methods have only been tried in more recent times [12].
Most of the floors in the historic centers are made of stone. Stone floors have great resistance and, consequently, reduce maintenance costs. In addition, compared to asphalt pavements which are certainly less draining, stone pavements, due to the presence of permeable joints between one stone and another, allow the drainage of rainwater and the evapotranspiration of the soil.
In recent years, the various municipal administrations are gradually engaging in the recovery, maintenance and enhancement of what remains of the historic stone pavements in urban centers. These differ from modern ones not only for the nature of the materials used but also for the construction techniques. A classification takes into account the size and shape of the component elements and installation systems: among the most used, especially in historical contexts, we can include cobblestones (acciottolato), paving (selciato) and paved (lastricato).
In addition, the historic stone floors were designed to ensure the smooth advancement of pack animals that were used for traffic at that time.

Traditionally, the stratigraphy of the ancient road pavement started from the natural sediment. However, if this was wet, a small excavation (about 20-30 cm) was carried out in order to eliminate the unsuitable surface layer and replace this layer with one of gravel. Then a sand bed was formed on which the stone elements (pebbles, flints or slabs) were housed. These stone elements were positioned and then beaten [13]. Beating has always been an important action, both for the stability of the individual stone units, and for improving the mechanism for transferring load stresses to the ground, as recommended by Vitruvius since Roman times.

4.1 Cobblestone: description of the installation technique

The cobblestone is the pavement made with stones with rounded edges, easily recoverable in nature. The first paving with cobblestones dates back to 700 when they were used to ensure the drainage of rainwater to the streets and a more comfortable use of pedestrian and vehicular paths. The use of this technique is functional to the identification of minor historical roads. To make the cobblestones, oblong-shaped stones are used, easily found in the waterways of rivers, in the sea or in quarries. After having been washed, to remove any earthy or saline parts, and after having been selected based on the size, we proceed with the installation dry or, in some cases, with lime. Clearly a dry cobblestone pavement is not suitable for driveways especially if it is heavy and intense traffic. The cobblestone substrate is created by compacting the natural soil with a roller, after having moistened it appropriately to maximize density. Subsequently we proceed with the laying of a layer of about 8-10 cm of coarse-grained sand not screened, within which the pebble is manually inserted, so that the thinnest part is downwards and the axis the greater the vertical. To insert the pebble in the sand, dig the hole with the thin part of the hammer which will also be used to settle the element in the sand itself. It is possible to choose stone units with different dimensions to create particular geometries and sometimes various chromatisms to enhance and enrich more impressed drawings and symbols (Fig. 2).



Fig. 2- Cobblestone floors in three courtyards in Andalusia: a) Granada, b) and c) Malaga. Source: G. Ausiello

After the pebbles have been laid, the entire flooring is compacted using wooden elements so as not to damage or break the elements. The surface layer is then sprinkled with sand and moistened so that the lubricated aggregate can better penetrate the sand bed.

A fundamental aspect to underline concerns the arrangement of the single stone units which takes place individually not only to define geometries and designs in the pavement, but also for permeability. In fact, the pebble is laid on site by tilting its major axis according to the slope of the pavement, so that the water can converge towards the drains or collection systems. The advantage of this technique is that it allows the soil to breathe through the space between one pebble and another. So the nature of the soil is preserved without any alteration in terms of environmental impact.

A final phase of dry cobblestones consists in the application of a lime and water-based mixture, which by inserting itself between the joints of the stone elements and in the sand bed causes an overall strengthening of the entire flooring. However, it is preferable to resort to the construction of the cobblestones without this final phase, as the pebbles, close together and joined to the sand support, are still able to neutralize any alterations.

The laying of the cobblestones identifies a dry technology, but there is also a different method such as the lime pavement, in which the substrate is leveled with gravel and fragments of stone and lean lime mortar are placed on it. The stone elements are inserted into the mortar bed, 10-20 cm thick. After installation, it is necessary to allow a certain period of time for the lime mortar to consolidate, so that the superstructure of the road is temporarily covered with sand and earth.

In particular, in recent years, there have been numerous redevelopment interventions of historic centers and among the various actions implemented there are also those concerning the reconstruction of ancient roads.

In this regard, it is interesting to mention some examples of street redevelopment, including that of via Ragno, one of the main streets of the historic center of Ferrara, with a commercial vocation. This intervention was carried out in 2011 as part of a project for the urban development of the city of Ferrara with the aim of promoting the revitalization process of the historic center through the recovery of the existing heritage. It is an intervention mainly focused on the remaking of the road pavement to

accentuate the predominantly pedestrian character. The project involved replacing the asphalt pavement with natural stone pavements, in accordance with the types of pavement adopted in the main streets of the historic city center (Fig. 3). Specifically, river pebbles were used for the road and bush-hammered Montemerlo trachyte slabs for the pavements [14]. In particular, the intervention involved the demolition of the pavement and any underlying pebbles, probably belonging to an even older pavement, reconstruction of some underground utilities, construction of the road substrate consisting of a stabilized cemented granulometric mixture with a thickness of 50 cm, laying in work of trachyte slabs and river pebbles [14].



Fig. 3- a) Via Ragno before the intervention; b) Simulation of the new paving of Via Ragno. Source: General report Via Ragno, Municipality of Ferrara

The restoration is an action of a certain impact on the consolidated historical context, as, as in this case, the oldest flooring has been erased. On the other hand, the choice of restoring the cobblestones is a frequent operation in historic centers, which demonstrates how, in fact, local authorities and responsible citizens acquire, with each passing day, the awareness of how much cobbled, typical of many small historic centers is linked to an icon erased from the asphalt. But, in fact, the advantage of greater permeability is added to the morality of this choice, which determines an improvement in the microclimate and reduces the impact on the environment. It is a solution that respects the culture of places, the recovery of lost efficiency and, in the logic of sustainable actions, an actively passive choice.

Instead, in the historic center of Ascoli Piceno, restoring and enhancing the streets of the historic center means dismantling and reassembling the original river pebbles and replacing the few that are unusable or missing with industrial products in quarry stone, worked in imitation of the pebbles (Fig. 4).



The case of S. Basile (CS) is different, where the ancient pavements in river pebbles or Cerchiara stone emerge only in part from uneven layers of asphalt or concrete. It was decided to use Cerchiara stone, a stone material traditionally used in the road pavements of this municipality to repave the main axis of the historic center. A small piece of about 10 cm replaces the river pebble, now difficult to find with the aim of re-contextualizing a small town.

The comparison with other European realities is also interesting, as in the example of the restoration carried out in Ronda, in Plaza Duquesa de Parcent square (Fig.5). A skilled workforce carries out the intervention according to the ancient technique and using the tools of the past to demonstrate how much the construction culture of stone is still alive in some real contexts and is not just a legacy of tradition.

Fig. 4- Rua della Campana repaving in Ascoli Piceno
Source: http://www.giacobetticostruzioni.it/



Fig. 5- Repaving in Plaza Duquesa de Parcent in Ronda. Source: G. Ausiello

4.2 Paving

The paving stones are characterized by cubic or parallelepiped stone elements and represent an evolution of the paving with pebbles, almost an intermediate group between cobblestones and paving. The choice of this technique in Europe developed during the 19th century but especially after the First World War. In Italy, particularly in Rome, the most remote use dates back to the eighteenth century and concerns the so-called "sanpietrino" (or quadruccio), obtained from the basalt rock of the Alban Hills. From the end of the 19th century onwards, however, it was porphyry that was most used [15]. There are different devices used: with contrasting arches, peacock tail, regular courses or radans, each chosen on the basis of aesthetic and functional aspects.

The visible face of the elements has a rough finish while the four side faces are slightly inclined towards the laying surface to obtain a truncated pyramidal shape that facilitates the insertion of the elements in a bed of sand. The laying of the pavement begins with the compacting of a crushed stone base; we then move on to the drafting of the bedding layer of 15-20 cm and the subsequent positioning of the stone elements which are sunk deeply with a mallet. Repeated beating with mazzeranghe completes the process; at the same time the pavement is sprinkled with fine sand which, aided by a light watering, penetrates the joints between the elements, filling them. A pavement is well executed when the sand occupying the joints has reached its maximum density. Unfortunately, this dry laying method, especially in recent times, is often completed by sealing the joints with a cement grout or more frequently, with hot bitumen mastic or cold bituminous emulsion. The purpose of this operation is to preserve the edges of the stone elements from smoothing, but above all to make the entire floor waterproof to water. It is obvious that sealing joints with bituminous materials is not an optimal solution in terms of the health of the urban area, as complete waterproofing, as already mentioned, limits soil transpiration and soil permeability.
In this regard, it is interesting to cite the example of the remaking of the cobblestones that characterize the famous Piazza Venezia in Rome, one of the symbolic places of the Eternal City (Fig. 6).
The interventions involved the demolition of the existing road foundation for an extension of about 3,000 m^2, its complete reconstruction and the restoration of the cobblestones pavement with the realignment of the stone slabs delimiting the different sectors of the square. Road traffic due to the continuous passage of cars and heavy vehicles determines, in fact, stresses such as to cause the subsidence of the non-homogeneous and not very resistant substrates on which the paving stones are laid.
The new substrate was made up of cast-in-situ concrete slabs reinforced with electro-welded meshes, having a thickness of 20 cm (Fig. 6). The bedding of the stone slabs and grouting of the joints involved the use of premixed cement mortars in exposure class XF4 (according to UNI EN 206-1: 2006) with high compressive strength, resistant to de-icing salts and freezing cycles -thaw.
The solution of the concrete slab is certainly an improvement from the point of view of the disposal of loads. However, it constitutes a continuous background of very low permeability that does not combine environmental quality and sustainable choices for the environment.



Fig. 6- Refurbishment of Piazza Venezia, Rome. Source: mapei.com

4.3 Paved

The Paved is a road pavement made up of natural stones cut in a regular shape. From a geometric point of view, the stone element has two dimensions that prevail over the thickness and the block takes the shape of a slab, hence the name "paved". It is flanked by the terms basolato and paving [16]. In particular, the definition of basolo is linked to the nature of the constituent rock which is of eruptive origin. The arrangement of these elements depended on the use of the road. The joints were arranged obliquely to the road axis if the road was travelled by vehicles so that the metal wheels did not pass along the joints. Instead of pedestrian paths, traditionally the arrangement of the slabs takes place according to longitudinal courses. For aesthetic reasons, you can also have different equipment, including, for example, the use of sheets of different shapes, materials and sizes [17].
Generally, the surface of these elements is greater than 0.25 m^2, their smaller size has a dimension greater than 25 cm and the thickness depends on the functionality of the road and the type of stone used. Depending on these prerogatives, more or less thick elements can be obtained [13]. Slabs with a greater extension are mainly used in pedestrian walkways since stone materials have a much lower resistance to bending, traction and shear than compression [18].
The subfloor is perfectly parallel to the running surface. Generally, the substrate is carried out dry on a bed of course and well-matched sand, well levelled and compacted, when the slabs are characterized by a high thickness. If more modest thickness stone elements are to be used, a mortar bed is required. If the stresses are high due, for example, to vehicular traffic, a reinforced concrete screed [13, 18] can also be used. Therefore, the stone elements can be arranged on a layer of sand or a screed of a suitable thickness. This layer has a constant thickness of 8 and 10 cm on beaten earth or crushed stone

substrate and 6 cm on concrete. Then, to facilitate the insertion of the finer elements of the substrate into the voids, we proceed with the wetting of the entire superstructure and a beating, without causing damage to the stone elements. The construction technique of this road pavement culminates with a levelling of the surfaces of the slabs with a chisel [18]. It is evident that the dry solution is the one that allows a lower flow of water and that can benefit environmental health.



Fig. 7- Matera, Laying of the paved stones. Source: mapei.com

It is interesting to mention the redevelopment of the pavement in the historic centre of Matera whose road pavement is made with the classic stone paving stones. The intervention also took into account the new functional, aesthetic and safety requirements (Fig.7). In some streets, the pavement has been completely replaced, in others, not all the paving stones have been replaced, but only those with cracks or those that had an irregular shape. The operators uniformed the thickness of all the paving stones. These had a thickness between 25 and 40 cm, but, for the stone elements to be compatible with the reinforced concrete supports, their thickness was reduced to 15 cm. This system can absorb high mechanical stresses caused by the passage of even heavy vehicles and preserve the road pavement from differential subsidence that can cause sinking [19]. The Lucanian capital was also affected by the redevelopment of the paving of the roads in the historic centre, in which the typical paving stones in Vesuvian lava stone prevail among various stone materials. Also, in this case, the choice is based on a restoration project involving the repositioning of the paving stones on a 20 cm thick reinforced concrete slab. The most appreciable attention is the reuse, as far as possible, of the paving stones already present, to be recovered and treated superficially to improve adhesion and, similarly, for the reconstruction of the existing sidewalks, reuse the porphyry cubes recovered from the planned demolitions.

In these two examples, only the attention to the reuse of existing stone elements is noteworthy, while the sensitivity towards installation is lacking. In fact, given the importance of the permeability of the substrate layer, the support of innovation should be used, which offers the possibility of combining high permeability and static lift.

Many municipalities present reports to disseminate the redevelopment projects of the viability to be done, in which the intentions that are presented in the form of good intentions are limited to the most, a talk of urban quality and a proposal to reuse the reworked stone units.

Finally, for a city like Naples, which links the origin of the paving of Vesuvian paving stones to Don Pedro de Toledo, conservation is an essential objective, which must be reconciled with mobility plans that provide alternatives to the use of cars and promote new forms of mobility, freeing the environment. After the return to the ancient that re-proposed the lava paving in the arrangement of Piazza del Plebiscito, it is important to highlight the redevelopment works of urban spaces promoted by the Municipality of Naples as part of the Great Historic Center of Naples project - Enhancement of the UNESCO site, thanks to the agreements between the University of Naples Federico II and the Operational Research Center on the Accessibility of Public Spaces [20]. Furthermore, the paving stones removed during the works of the subway stations, reworked, could be reused in the maintenance and restoration works in other parts of the city.

5. Measure to know. Environmental quality assessment

The attention we pay today to sustainable construction requires us to preserve the stone-built heritage of many historic centres, as regards both the elevated works and the floor surfaces.

Designing and redesigning ancient stone pavements takes on significant value in urban spaces, especially today when pedestrianization and cycling are the expressions of a new way of living in the city. So, the urban space is not limited to being the identity context of the places, but in a broader and more articulated vision that goes beyond the technical aspects alone, it becomes responsible for activating behaviours capable of improving the health of the environment, reducing its imbalances.

The conservation of stone as a fundamental element of the historical memory of many urban centres in our country represents only the starting point, concerning which the quality of the technical-constructive solution through sustainable choices adds virtuous behaviour. And, in this sense, to control the effects on the microclimate it is necessary to reduce the impact that waterproof floors tend to trigger to an uncontrolled extent.

In the design logic of "measuring to know", tools are needed that can quantify the action of permeable surfaces, in terms of reducing the building impact on the environment.

The rationalization of the proposed interventions, in a continuous dialectic between conservation and innovation, can be measured through simulations and parametric assessments of building and urban quality in an increasingly stringent objective of safeguarding the health of historic centres. This means that just as efficiency and behaviour are measured, so the conservation and redevelopment project of historic pavements on an urban scale must look at the parametric evaluation of environmental quality.
One of the possible options to perform this evaluation simply and immediately is the calculation of the R.I.E. (Building Impact Reduction). It is an environmental quality index that serves to certify the quality of the building intervention concerning the permeability of the soil and greenery.
The Municipality of Bolzano has included the mandatory use of this tool in the Building Regulations, to contain the sealing of surfaces and the building impact that buildings have on the environment [21]. Of course, the evaluation using the RIE index does not depend on the climatic or geographical context and therefore could be extended to any reality in our country and beyond.
It is an algorithm, inserted in the urban planning tools, easy to use by the designers. The calculation formula of the RIE index is as follows:

$$\mathrm{RIE}=\frac{\sum_{i}^{n} S_{vi}\frac{1}{\psi_i}+(S_e)}{\sum_{i}^{n} S_{vi}+\sum_{j}^{m} S_{ij}\psi_j}$$

It distinguishes two types of surfaces, those treated with green (Svi) and those not treated with green (Sij) and attributes to each of the different values of ψ, i.e. runoff coefficients that change according to the characteristics of the surface, including above all permeability. Different ψ values are envisaged depending on the type of flooring and the bedding layer. But it is also possible to proceed to the determination of this coefficient in cases where there are few diffused stone surfaces. The numerator contains a value corresponding to the equivalent tree-lined surfaces (Se), calculated automatically by the program once the number and type of tree have been entered. Naturally the green treated surface is the one of maximum permeability. Furthermore, trees are divided into three categories based on their height, the development of their foliage with consequent benefits, differently measurable, in the context in which they are inserted.
The index varies between 0 and 10 and evaluates how much the choice of a specific material-constructive intervention can be an improvement in environmental terms compared to the situation in the present which, through transformations and replacements, has gained increasing waterproofing values. Index 10 corresponds to the case in which the choices envisaged by the project bring high benefits, not only aesthetic but also environmental to the intervention. An index equal to 0, on the other hand, corresponds to an intervention equal to the current state of affairs, in which there are no choices aimed at greater soil permeability and better water flow.
Using the RIE index it is possible to evaluate how the construction of draining surfaces, in general, can improve the quality of the intervention on the redeveloped or repurposed flooring, and, at the same time, also reduce environmental pollution and the phenomenon of the heat island [5].
Therefore, the ultimate goal is that the R.I.E. can be a valid tool aimed at enhancing environmental comfort, according to a synergistic vision of inhabiting the city and building using natural elements of the places, from stone to green. Very often the design actions responding to the ethical imperative of respect for the environment are reread from the past lesson and open towards tomorrow.

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WORLD HERITAGE and DESIGN for HEALTH
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The role of Design for Health and of the Human-Centered Design approach for an ethical and conscious development of innovative *Quality of Life Technologies.*

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Abstract
In recent years, wearable and robotic technologies are making significant advances in a variety of fields, including medicine and social and health care. The development of research in robotics marks the end of its segregation to mere industrial fields: society is increasingly open to the everyday use of safe and reliable technologies for cooperation and human assistance [1].
On this basis, the key role of designers in the development of human-centered assistive technologies is evident: technologies should be designed according to fundamental human rights and to the needs and expectations of people, supporting their independence and improving their quality of life. The scientific and methodological approaches of Human-Centred Design and Ergonomics for Design can provide a fundamental contribution in the development of technologies that embody universal ethical and socio-cultural values.
This paper explores the areas of intervention and the role of design for assistive technologies, with a focus on the national state of the art. This paper also investigates the contribution of design both from a practical point of view (i.e. operational strategies and methodological approaches), and from a research perspective: it underlines the role of the designers as responsible for the dissemination of technologies aimed to support and not to replace the human work.

Keywords: Design for health, Human-Centred Design, Ergonomics for Design, Robotics, Older people

1. Introduction
In recent years, the increase in average life expectancy and low birth rates led to the well-known phenomenon of global population aging [2]. This trend is one of the most critical of the coming decades and will have a significant social and economic impact, requiring a joint effort by all governments, international agencies, professionals, research organizations and private citizens to improve the quality of life of older people and the communities in which they live.
Data from Italy confirm European trends: the average age of the population is 45.7 years and the percentage of people over 65 is 23.1% (2.7 points more than in 2010). In addition, the increase in life expectancy also determines the increase in the population of the over 85: they are the 3.6% of the population and Italy holds, together with France, the European record for the number of ultra-centenarians [3].
The planning of political and social initiatives addressed to the aging population is globally widespread [4]. In Europe there are countless intervention plans to support healthy and independent aging: the implementation of social policies addressed to the over-65 population fits within the scope of the Sustainable Development Goals (SDGs) established by the 2030 Agenda; the 2002 Madrid International Plan of Action on Ageing (MIPAA) highlights the contributions that older generations can have for society, both from a family and a work perspective, by actively participating in the socio-economic development of the communities in which they live; the *Decade of Healthy Aging 2020-2030* highlights the urgency of implementing within a decade all the SDGs addressed to the aging population and the improvement of their quality of life.

High life expectancy is possible thanks to advances in medicine and preventive approaches, greater attention to nutrition, education and economic well-being. However, an older population also means an increase in subjects with pathologies or disabilities and, therefore, problems of economic sustainability for the National Health System. In Italy, the elderly who report suffering from three or more chronic diseases are the 42.3% while the 22% lives with severe limitations in performing daily activities [5].
Aging can cause a decline in physical and cognitive abilities which may lead the person to need a formal or informal caregiver, temporarily or continuously, both for health care services and to perform the Activities of Daily Living (ADLs) [9]. This condition can also lead to the displacement of the elderly from his/her own home to nursing homes, which can be a traumatic event, a source of stress or otherwise highly destabilizing [6]. The environment in which one lives, intended both as the physical one but especially as a set of socio-emotional meanings that it contains, is crucial to the psycho-physical well-being of ageing people [7]. For this reason, most older people want to stay at home as long as possible, maintaining the highest level of autonomy and independence [8]. However, the domestic environment cannot always provide the necessary security or be suitable for the needs that change with ageing. In addition, living at home greatly increases the risk of household accidents but also enhances the sense of isolation and loneliness in older adults.
On this basis, digital technologies will have a significant impact on individual aging in the future and may revolutionize healthcare provision. In fact, research and production in the area of robotic systems and wearable devices are widely addressing the issue of *ageing in place*, offering solutions aimed at maintaining the autonomy of people at home for as long as possible [10] and supporting caregivers in performing their activities. Digital technologies are certainly a resource for aging and an opportunity for research and practice in design. While society is increasingly open to the everyday use of safe and reliable technologies for human cooperation and care [1] designers are responsible for ensuring that technologies are developed with respect for basic human rights and that they embody universal ethical and socio-cultural values [11, 12].
This article explores the areas of intervention and the contribution of design for new technologies, by analyzing the main research trends in national and international contexts and investigating the fundamental contribution of the scientific and methodological approaches of Human-Centred Design and Ergonomics for Design for the development of technologies designed from the real needs of people.

2. Digital technologies: a powerful tool to support *ageing in place*

The elderly is a priority target for the design and development of technological products and services aimed at improving the quality of life and supporting people's health and autonomy.
According to the latest report by SAPEA (Science Advice for Policy by European Academics), the main areas of implementation of new technologies for aging are [13]: (1) mobile applications for physical, social and cognitive health: these make *m-health* play an increasingly important role in monitoring health and supporting the adoption of correct lifestyles, from a preventive point of view; (2) designing smart domestic environment, according to the principles of Inclusive Design, promotes aging at home and provides greater security and support to the ADLs and social connection. A key contribution is also offered by the rapid diffusion of social and assistive robots, wearables and/or interconnected systems according to the Internet of Things (IoT) paradigm; (3) assistive technologies and wearable devices facilitate ongoing follow-up of health status, chronic clinical conditions, and functional capacity through remote monitoring, home physical rehabilitation, brain training, and medication intake/administration control; (4) technology can also transform diagnostic and surgical procedures. Applications of machine learning algorithms and Artificial Intelligence (AI) in the field of aging research offer huge possibilities.
The attention of the scientific community towards these issues is underlined by the presence of a research area focused on the topic of technologies for older people: the *Gerontechnology*, defined by the International Society of Gerontechnologies as "the field of scientific research in which technology is directed towards the aspirations and opportunities for the older persons. Gerontechnology aims at good health, full social participation and independent living up to a high age, be it research, development or design of products and services to increase the quality of life. Gerontechnology lives at the crossroads of advancing technology and advancing age" [14].
This field of interdisciplinary research represents the meeting point between innovative technologies and ageing: new technologies can help people to maintain autonomy and good health, but only if they can be used effectively, efficiently and to the satisfaction of the elderly in the long term.
Several studies prove that new technologies can help to resolve or relieve all those problems related to aging: for example, they can compensate for the decline in physical and/or cognitive abilities [15], sensors and wireless networks can support physiological monitoring in a domestic environment [16], the development of telemedicine can help people in receiving medical care at home [17]. In addition, there are many now-traditional technologies aimed at supporting basic ADLs at home and social interactions in order to fight the isolation of older people [18], and communication technologies such as smartphones or computers connected to the Internet can improve and increase communication with friends and family [19].

The increase in demand for services to support ageing in place, results in the rise of several solutions in the field of Ambient Assisted Living (AAL). They include the possibility of integrating wireless sensor networks, robots and wearable technologies for a wide variety of purposes such as user security, home surveillance, environmental monitoring, social interaction, the installation of personal alarms, reminders of events on the agenda, etc. [20, 8].
Quality of Life technologies (QoLs) offer a variety of solutions aimed at maintaining people's independence for as long as possible. Specifically, they have three main functions [21]: monitoring of the person or the surrounding environment; diagnosis and screening of the health status of the elderly; and treatment of the detected health conditions. They impact five domains: psychophysical health monitoring (e.g., heart rate, blood pressure); mobility (e.g., gait speed, gait support); social connections (e.g., monitoring frequency of interactions, counteracting isolation); safety (monitoring falls and activating alert systems); and ADLs support (e.g., taking medications or helping with various tasks).

2.1 Wearable devices and IoT to support the *Active and Healthy Ageing*

Due to engineering advances in hardware and software, digital technologies, including wearable devices and interconnected products under the IoT paradigm, can support aging at home and maintain people's independence for as long as possible, providing a viable and less expensive alternative to institutionalized care [22].
In recent years, the development and rapid diffusion of interactive devices (e.g., computers, smartphones, and wearable devices) generated a true digital revolution. IoT refers to the connection of devices and products to the Internet, including home appliances, healthcare devices, motor vehicles, etc. Once connected, each product can store and process information on the network independently but also communicate with other devices belonging to the network. It seems clear, therefore, that IoT technologies can be a valuable tool to support *ageing in place*, both in smart houses and in telemedicine and remote monitoring.
The market for devices and objects connected to the network and therefore connected to each other is set to grow exponentially: in 2015, there were more than 5 billion networked objects and, according to forecasts, there will be about 28 billion by 2025. This market, which was worth about $655 billion is set to be worth about $11 trillion by 2025, or 11% of the entire world economy [23].
Wearable computers and smart clothing represent today the new frontier of electronic devices; compact and miniaturized these are directly worn by humans, creating a constant interaction between computer and user. The potential for interaction, created by these devices with humans and ubiquitous computing systems, can be directed in many directions: to help and assist people, to push them towards new patterns of behavior, to change social dynamics, up to the possibility of transforming these wearable systems, massively distributed, in a "collective wearable", a super-organism of interactive personal digital assistants, globally extended [24].

2.2 Social and Assistive Robotics for older people: potentialities and research areas

In recent years, robotics is making significant advances in a variety of fields, including medicine and social and health care. It represents one of the potential solutions for improving the quality of life of the elderly and services to them, enhancing their mobility, communication possibilities, increasing their sense of security and independence and promoting social inclusion [25].
Specifically, *advanced robotics* is among the five revolutionary technologies that have the potential to transform private life, work, and the global economy [26]: in the not too distant future, robots will actively cooperate with humans during the performance of daily activities, healthy activities, and for the promotion of social inclusion [27, 28]. The integration of new technologies in interconnected systems can facilitate the activities of healthcare professionals (e.g., health monitoring, medication intake control, environmental safety) and can prevent loneliness and isolation of elderly people, supporting them in performing ADLs and promoting socialization and active emotional and cognitive stimulation.
Referring to the home robotics market alone, the number of adoptions of robotic systems in the home has increased by 31 million between 2016 and 2019 [29]. The market value of robots for performing difficult or dangerous household tasks (lawn mowing, pool cleaning, floor cleaning, etc.) grew by 13 billion during this time frame. Furthermore, the assistive robotics market is expected to grow from $ 4.1 billion in 2019 to $ 11.2 billion in 2024 with a CAGR (Compound Annual Growth Rate) of 22.3% [30].
The scientific community has provided several taxonomies and classifications of assistive robotics, categorizing platforms based on the type of assistance provided (physical or non-physical), the ability to socialize or establish effective psycho-emotional interaction [31] and formal and morphological features (mechanical, zoomorphic, humanoid) [32]. The need to systematize this wide area is due to the countless fields of application of assistive robots which also implies differences from a morphological and functional point of view. *Medical robots* can support doctors and surgeons during specialist visits or operations and support patients during rehabilitation; *prosthetic robots* can replace limbs, muscles and perform similar functions; *socially interactive robots* can support social communication and people's psycho-emotional well-being; *companion robots* integrate artificial intelligence and learning skills to fight

stress and loneliness; *therapeutic robots*, often zoomorphic, show benefits in interacting with people suffering from dementia, Alzheimer's or cognitive problems; *service robots*, oriented towards efficiency and functionality, provide support to the performance of ADLs.
At international level, research and experimentation involved robotic platforms belonging to the above categories and more: among mechanical robots, Giraffplus [33], Care-O-Bot [9] and the Robot-ERA system [34] guarantee telepresence activities, monitoring of activities and falls, support to the performance of ADLs; desk robots such as Jibo [35] or ElliQ [36], integrate artificial intelligence with the aim of reducing the digital divide between generations and counteract isolation and depression, promoting communication and socialization; among zoomorphic robots, Paro [37] and Aibo [38] are widely experimented for therapeutic purposes and as companion robots for entertainment and emotion management; among humanoids, NAO [39] and Pepper [40] find many applications as walking assistants, social facilitators, motivators for physical activity, help in increasing cognitive activities.
In the perspective of *ageing in place*, research is investigating how robotic systems, connected in the cloud with wearable devices and sensors integrated in the domestic environment can help the elderly to be independent and maintain a good state of health, but also support caregivers in carrying out their tasks.

3. Issues and challenges of Assistive Technologies: acceptability and ethical considerations

Although the revolutionary scope of new technologies is a known fact and their benefits have been demonstrated globally through research and testing programs, it is important to keep in mind that they will need to be integrated within people's domestic environments and daily routines and not be invasive or distort environments and habits. In order to avoid the risk of creating an incompatibility between technology and human activities, it is essential to ensure the effective use and management of these digital products, so that the interaction between people, social and domestic space and technology can be satisfying and comfortable [41], but also reliable and acceptable.
The type of interaction users engage in with new technologies can define the experience of aging itself [42]. However, many traceable products in the area of assistive technology and robotics have been designed with little regard for the social, aesthetic, and emotional relationships that older adults will establish with the product [13]. In addition, societal values and ethical beliefs are reflected within technologies that, in turn, convey them to people [43, 12]. Therefore, the distinctive elements of future assistive products should not be only based on functionality and efficiency: they must also produce an interaction based on attractiveness, convenience, and absence of stigma. For all users, but specifically for elderly, elements such as accessibility, ease of use, and reliability are essential [42].
Several studies highlight the issues of new technologies developed for the elderly. Indeed, sometimes there is a lack of matching between the daily life of elderly people, their needs and the available technologies [44]. In other cases, the low adoption rate of new technologies by older people may depend on inefficient interface design, privacy or security concerns, or economic or socio-cultural barriers [45]. As many solutions to these issues are identified in the greater inclusion of older adults and formal and/or informal caregivers in the design processes, e.g. by co-design sessions and also by an evaluation of such systems based on the age and real needs of the end users [46].
According to Michel et. al [13], assistive technology is limited in its application due to four main issues: acceptance (the use of technology changes among older people and is influenced by factors such as convenience, ease of use, functionality, and personal preferences); overall efficiency and proven results (not all monitoring and care models are able to demonstrate significant improvements, there are still implementations to be made in terms of electronic health records, technological capabilities of telemedicine environments, etc.); standardization (regulation of robotics, wearables, and even data sensing and transmission systems requires and will involve a significant effort by the relevant agencies and strong collaboration between them); financing (technologies have different costs at national and regional level and not always the health system provides full or partial reimbursement, although it would be desirable a free supply for the most fragile people).
Acceptability of technologies is defined as "the demonstrable willingness within a user group to employ information technology for the task it is designed to support" [47]. Safety and usability requirements are closely interrelated and, although both have roots in the field of Human-Computer Interaction [48], they continue to be key factors in the successful implementation of such products and in ensuring a positive overall experience for all users involved.
The urgency of these issues, especially those related to standardization, is increasingly evident: designers and engineers work to create intelligent robots that are adaptive, respectful, and flexible according to the users' needs, but the regulation of these devices is up to politicians and administrations. Their decisions are important in defining, for example, the needs of caregivers in relation to physical or cognitive efforts to care for the elderly, or the best compromise between a sense of dignity and independence and fighting isolation and loneliness.

The increasing use of robotic and wearable technologies also brings with it an increase in ethical issues related to them, both in scientific and humanistic fields. This topic is so debated that it has generated a vast area of research, the *Roboethics* [49], which aims to develop scientific and cultural tools for the analysis of the ethical implications of assistive robotics in order to prevent any abuse against humankind. Ethical issues, in relation to the topic of design for health and technologies addressed to older users, are extremely delicate and need detailed guidelines related to all legal, moral and social aspects [1]. They are elaborated from the socio-ethical implications already addressed in the field of Human-Computer Interaction, following the massive diffusion of computer systems both in professional settings and in everyday private life. Starting from HCI, Friedman & Kahn [50] identify the fundamental human values involved in the design of new technologies and, therefore, also of assistive technologies. They are: human well-being, ownership, privacy, freedom from bias, universal usability, autonomy, trust, informed consent, responsibility, identity, calm, environmental sustainability.
According to Casey et al. [51], the most urgent issues, specifically in the case of technologies for older people, include: changing or modifying the nature of care; replacing human care; human autonomy in the context of any restrictions placed by the robot for safety; negative impact on dignity; emotional attachment of the user and/or over-dependence on the robot; and safety and privacy concerns.
Feil-Seifer & Mataric [31] apply a well-established medical ethical model to identify some key ethical principles in the field of assistive robotics: they should act in the best interest of the patient; they meet the "first, do no harm" principle, whereby robots should not harm a patient; they should empower the patient to make a decision based on informed and not forced care; equitable distribution of scarce healthcare resources.
Sharkey & Sharkey [52] identify six ethical issues, relating them to the potential benefits of using technology for the care and safety of older adults: potential reduction in the amount of human contact; objectification and loss of control; privacy; personal freedom; deception and infantilization; and circumstances in which older adults should be allowed to control robots.
On this basis, it is clear the key role of designers and the effectiveness of their design approaches and methodologies, for the development of truly human-centred technologies, which are built first with respect for fundamental human rights and then adapt flexibly, according to different situations to the values, beliefs, expectations and desires of individual users, supporting their independence and assisting them in improving their well-being and quality of life.

4. The contribution of Design: research and operational strategies for *Human-Centred Assistive Technologies*

With regard to the above considerations, Design for Health and the scientific and methodological approaches of Human-Centred Design (HCD) and Ergonomics for Design can provide a fundamental contribution. These disciplines place people at the center of the design process and involve users in the creative process. For these purposes they differ from many design practices: they focus on the people for whom the product is intended, rather than on the creative process of the designer or on the material and technological properties of the product itself. Through the theoretical and methodological tools of HCD, designers can offer an important contribution in order to identify and evaluate users' real needs and to translate them into tangible design solutions. From this point of view, Interaction Design (ID) and User Experience (UX), intended as the global experience of the user before, during and after the use of a product, can also contribute to the development of products and interactive systems truly based on people's desires and expectations. "Design is an activity of practical intervention and creative expression; it is both a connecting factor between different skills and a tool for innovation. The role of the designer consists in his ability to proactively intervene on what exists, to interpret the complex set of factors that surround us and then to develop design solutions in order to meet people's needs, expectations and desires and also to propose new behaviors and suggest new lifestyles" [53].
Older people need technologies that are respectful, flexible and adapted to their specific needs. The role of design is to focus on the specific features of this target of users, together with ethical and psycho-social issues related to the use of assistive technologies, in order to ensure that they are actually tools to support the performance of daily activities or to help caregivers in the administration of care and assistance. Like commonly used technology products (e.g. smartphones, computers, tablets) new technologies (robots for telepresence, sensors for monitoring physiological parameters, etc.) can help humans to communicate, to be independent, to perform complex or dangerous activities without ever replacing the empathic and interpersonal bond that exists between individuals. These technologies should be conceived as an enhancement of interpersonal relationships and as an extension of human possibilities and abilities. However, this is only possible if they are designed according to a Human-Centred approach.
Research on elderly users has an additional focus: they often perceive new technologies as "constrictive," as mere tools of control, detached from users' needs, and as products that can or may in the future replace human care and assistance. This idea in the collective imagination is amplified by the fact that technologies often make a task slower, more dangerous, and more frustrating, although the

ideal technologies should make a task easier, more efficient, safer, and more enjoyable [54]. Therefore, even in Inclusive Design, researchers and designers work to understand and analyze all the needs of these potential users, so as to develop flexible and adaptive products and services that can be used without any limitations.
The role of the designer takes on multiple meanings: the designer has problem solving skills; he/she optimizes production processes and implements products from every point of view; the designer is a catalyst for the multidisciplinary skills of the professionals within a team; he/she creates and imagines possible and future scenarios, through the formulation of questions about what people want or don't want, desire or need. In this regard, Czaja et al. [55] offer an overview of design principles in relation to older users, with the aim of systematizing all the psychological and human factors to be considered when designing for these users. The researchers provide real specific guidelines regarding input/output devices, design of interfaces, products, environments and services, analyzing the role of assistive technologies and related ethical, social and psychological issues.
The success and benefits of new technologies depend on design from a morphological and aesthetic point of view but also in terms of interaction, user experience, safety and reliability. The complexity of the interaction with new technologies requires a multidisciplinary collaboration and their effectiveness depends on the analysis of the users' needs. However, very often the HCD approach is not embedded within the development processes of these technologies. Only a few studies attempted to integrate the scientific view of Ergonomics/Human Factors and HCD within the intervention area of human-robot-assistive technology interaction.
Some of the design principles for applying the HCD approach to the domain of new technologies are summarized by [56]: priority of human needs and requirements; clear communication to users of the potential of technologies; integration of quantitative (weight, size, etc.) and qualitative (sensory qualities, cultural context of reference users, etc.) design criteria; adequacy of solutions called to operate in different environments and with various types of users; possibility of reconfiguration; resilience and long-term sustainability, in order to reduce complexity as much as possible.
Pollmann & Fronemann, [57] transferred a need-based design approach to the HRI domain, resulting in the *UXellence® Framework*. Their aim is to define interaction strategies for the acceptability of social robots by integrating user research methods in order to identify relevant needs early in the design process. The framework consists of ten psychological users' needs: safety; priorities; self-expression; feeling close to those who are important; being popular and appreciated by others; being in positive competition with others; maintaining one's own well-being; feeling able to master challenges, which includes autonomy; accomplishing something in one's environment and with others; stimulation, curiosity, and exploration of new things.
The contribution of design and its approaches and methodologies is aimed at the development of truly human-centered technologies, which are built with respect for fundamental human rights and which can be adaptive according to different beliefs, expectations and desires of individual users, supporting their independence and assisting them in improving their well-being and quality of life.
A *good design* also involves another meaning of the word *good*: that is, *fair*, *ethical*. This implies a deep reflection by designers that have to develop new technologies: they should reflect on the consequences of the development and of the use by people of a product/system/environment. Moreover, the relationship between users and designers is based on extreme *trust*: every time people use a product, they trust that the designer has carried out his work in an ethical manner. Therefore, it is up to the designer to become aware of this tacit agreement and to respect it [58]. The HCD approach can provide for a design that takes into account the values and human rights common to all people, as well as general and specific psycho-social contexts, to use them as reference points throughout the iterative process of development and validation.
The Ergonomics for Design and the HCD approach has been successfully applied within the CloudIA research program (Fig. 1) aimed at developing and testing innovative Cloud solutions, including a robot, two wearable devices and a sensor system into a smart environment, in order to improve the quality of life of older people and support the caregivers' activities [59]. The CloudIA research program includes a partnership made of five social cooperatives of the Tuscan territory and two Research Organizations: the Laboratory of Ergonomics and Design (LED) of the Department of Architecture of the University of Florence and the Department of Biorobotics of the Scuola Universitaria Superiore S. Anna of Pisa.

5. Discussion and conclusion

This paper shows the contribution of design in relation to new technologies for *ageing in place*, in order to support the development of technologies based on effective and intuitive interaction, absence of stigma, reliability and safety and able to ensure a positive user experience from both a hedonic and functional point of view. In fact, in addition to factors related only to use, aesthetics and functionality, there is also a strong emotional component in the way people interact with products [43], especially in the case of those with a strong social and interactive component such as assistive and social robots and new technologies in general. The emotional factor of interaction with social and assistive



Fig. 1: The robot, wearable devices and the sensor system developed within the CloudIA research project.

technologies, together with the pleasure of use, is the intrinsic motivation that drives people to use systems, products or services.
Research in these areas includes studies covering a variety of contexts of use, activities, different kinds of wearables, robotic systems and smart environments which can offer different types of interaction for a wide range of users. However, the scientific literature points to the need not to replace but to integrate existing systems of care and assistance with new digital technologies [60].
The challenges for designers of new technologies concern both technical and psychological, ethical and social aspects, since the ultimate goal of these technological products/systems is to make human care more efficient, enriching the interaction between people.
In this perspective, the Human-Centred Design (HCD), Ergonomics for Design and Design for Health can offer its contribution in terms of: identification and analysis of users' needs and expectations in order to create people-centered products; development of assistive technologies in relation to shared human values, since the ethical beliefs of society are reflected within the technologies that, in turn, transmit them to people [12, 43]. In addition, there is a natural extension of the skills needed to design assistive technologies which makes it necessary for various professionals, such as psychologists, sociologists, designers, etc., to collaborate. On this basis, the designer becomes a catalyst for the different professional skills involved in the project, providing the contribution to innovation and competitiveness that has been recognized by the European Union in the Commission Staff Working Document, which looks at "Design as a driver of user-centred innovation" [61].
Finally, the contribution of design concerns both the project strategies and the *research through design*: designers are professionals able to identify people's needs and translate them into tangible solutions but they are also responsible, from an ethical and social point of view, for the use and dissemination of technologies designed to support and not replace human work.

Paper contributions

Francesca Tosi, Claudia Becchimanzi and Mattia Pistolesi have equally contributed to the drafting of this paper.

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What future for disused villages after the pandemic? Some examples of distributed hospitality in southern Italy

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Abstract
The essay, in a moment characterized by the pandemic, highlights the southern Italy villages, silent for abandonment, reinterpreting them as a possible way to new residentiality a renewed hospitality and cultural offer.
The test, in order to preserve and at the same time enhance the values of the historical units, proposes the knowledge of the significant characters and their unexpressed potential, intended as a flywheel to activate integrated revitalization actions, The focus is on some virtuous initiatives that aim to redesign the villages in their complexity: social, economic, cultural and the recovery of values, like all forms of distributed hospitality ((Paese Albergo, Villaggio Albergo, Albergo Diffuso, ecc.);a phenomenon that has been in existence for some time but which could now be deployed to repopulate the villages and offer the community a more agile and attractive form of life far from the cities. This process allows for the maintenance of identity characteristics despite the relaunch the settlements with attention to the typological and architectural characteristics of the building fabric. Finally, the essay focuses on some horizontal structures present in various southern villages with a reflection on existing signs revitalized in their characters and functions, so as to represent economic assets capable of initiating persistent redevelopment actions and bringing back a network of services and functions to the marginal areas to design new centralities.

Keywords: village, conservation, redevelopment, albergo diffuso

1. The villages during Pandemic
In a difficult moment marked by the pandemic, the essay intends to focus on the villages of southern Italy, extensively affected by depopulation and abandonment, to lend them once more the attractors for a regenerated way of living and a renewed cultural and touristic offer.
Because of their several architectural, typological, and material declinations, the internal centers of southern Italy become the testament of a multilayered history engraved in the territory, settlements, and buildings. They represent the palimpsests that need to be passed on to the future and at once to be adapted to the requirements contemporary life.
They appear as small urban centers, fortifications along the Apennine chain, with recurring characters. They diffusively show a pyramid shaped structure with the fortress placed at the peak and the rest of the constructions eased down on sloping grounds, marked by narrow streets placed along level drops. From a typological point of view, the built fabric is based on the accumulation of different types that give rise to a compact urban plot, in which the basic cell is derived from the terraced house in its several layouts. There are houses with rural characters, with a minimal formal and functional composition, often made of just one or two overlapping rooms connected by indoor stairs, sided by houses with architectural value, so called *case palaziate*, defense towers, and a dense plot of streets interrupted by small open spaces [1]. Fig.1



Fig. 1: Some villages of southern Italy: Morano Calabro (CS), Craco (MT), Rocca Imperiale (CS), Rotondella (MT), Badolato (CZ), Belvedere Marittimo (CS), Sangineto (CS), Maratea (PZ), Fiumefreddo Bruzio

Through time, these areas have been affected by a marginalization process (started soon after WW2) that translated into population decrease, employment fall, the diffuse decay of the buildings and the rural areas of the territory.
Despite the difficulties of the emergency, pandemic has induced reflections aiming at triggering renewal processes in these forgotten villages, which hang in the balance between fragility and opportunities. Exalting the potential of internal centers, through integrated conservation and requalification actions, could manage to re-up these areas in the network of social life, making them become once more a resource.
Within the scientific landscape, neglected villages in the South of Italy have several experimentations with stable outcomes to their credits, from which would be useful to restart evaluating concrete actions of regeneration and re-fruition. The first step has been the National Convention for the safeguard and rehabilitation of historic centers by ANCSA, held in Gubbio in 1960. Since then, this event has been giving birth to several scientific and normative initiatives, up until the law n.158 enacted on October 6th 2017 that highlights the strategic value of small Municipalities, *as long as it restores vitality and attractiveness to these territories, making them part of a development project* [2].
In this particular time, we are reconsidering the need of renewed strategies that could envision the joint participation of different procedures that consider an active sharing of the communities.
One of the priority objectives focuses on bringing back and/or keeping in habitants from leaving, to stop the phenomena of abandonment. To reach this goal, these contexts need to be provided of new accessibility, of a satisfactory mobility infrastructure, of new services for inhabitants and tourists, combined with political and economic initiatives that could enhance social and cultural functions, making these centers less marginal.
The aim is to strengthen smaller towns' attractiveness through a set of harmonize darrangements made of competent conservation, safeguard actions of the most significant values, a conscious re-fruition of urban spaces, the regeneration of built fabric, and a compatible use for the buildings with an architectural and historical value.

These topics were already effective on a national level long before the hit of the medical emergency. However, today they become the starting point of a possible restart for a new perspective of revitalization and resettlement of these centers.
These arguments become even more impactful if we turn to the need of society of a rhythm that is slower than the one of contemporary cities, of a way of living that is less dense and compact, of a deeper relationship with landscape. All of these assumptions become even more comforting in a moment marked by social distancing.
Ironically, the pandemic has turned a spotlight on the areas appreciated by slow tourists that usually choose uncrowded towns, far from the chaos of the city. With their temporary presence, slow tourists contribute to the repopulation of these centers, but also to the re-launching of these realities in this time of emergency, showing the possibility of triggering a tourism that is sustainable and integrated with the life of local communities.
It is now that we can re-think of actions of revitalization of our values in terms of alternative tourism and distributed hospitality, the recovery of ancient traditions, typical cultivations, environment, unique landscapes that can be a strength for local communities for a new way of living and of travelling.
This has brought us to focus on some virtuous experiences that have the objective to re-design these towns in their social, economic, and cultural complexity through the recovery of their values. Although operational from a long ago, all the forms of distributed hospitality can today become useful to repopulate the villages and offer a smarter way of living to communities.
These actions allow to preserve the identity features of these towns and re-launch them with particular care to the typological and architectural characters of built fabric. They also have a natural consequence on economy and employment, transforming cultural value in economic value, able to trigger lasting requalification actions and restore these forgotten areas in the network of services and functions, planning new centralities.

1.2 Distributed hospitality and the villages

The concept of Ospitalità Diffusa and its different forms, meets the model of a horizontal reception able to revitalize ancient villages through a set of actions that can take them away from their condition of ghost towns.
The creation of Paesi Albergo, Villaggi Albergo, Alberghi Diffusi*,* run by local communities, promote an innovative and sustainable hospitality, far from traditional inclinations.
This defines a new culture of reception, one that renews the concept of the tourist offer, enhancing the quality of cultural, landscape, and environmental heritage [3].
The initiative of distributed hospitality represents a valid model of sustainable development, able to evaluate endangered towns through the recovery and re-employment of existing buildings, avoiding the construction of new buildings and the consumption of land, by re-using existing built heritage.
As the father of the Albergo Diffuso and president of the Association of Alberghi Diffusi, Gianfranco Dall'Ara highlights the tourist of our generation has the desire to immerse himself in the culture of a place, to be considered not a visitor nor a consumer, but to be an inhabitant, *albeit just temporarily* [4].
In a nutshell, the base principles of distributed hospitality are: employing existing buildings by changing their uses with one that is compatible with the identity of the building, connection of the reception structure with the territory, intended as a system of growth for local values, enhancement of the tangible and intangible resources, integration of local culture, authenticity of the experience, presence of a hosting community.
In the existing practises of distributed hospitality, a network connects the historic housing units, placed not much apart, that become the rooms of a structure able to offer all the services of a traditional hotel, included common spaces and refreshment stands, where sociality takes place. According to this type, virtuous actions take place to build a touristic offer that can become a new model of sustainable development for the territory, in compliance with all the actions for the promotion of the enhancement of internal areas, recommended by the European Union.
In one of his interviews, Dall'Ara highlights that the village accommodating a horizontal reception structure is characterized also by the presence of its inhabitants, willing to establish a connection with tourists. Hence, the visitor feels part of that specific community, part of a neighbourhood, of a temporary society, therefore tending towards communitarian relationships.
The different types of distributed hospitality (Paese Albergo, Borgo Albergo, Albergo Diffuso, Case Albergo) are called hospitable places, because they are deeply rooted in a territory and its culture, and can be characterized by many management formulas, all aiming at pursuing the ideas of authenticity, experience, relationships and the development of local resources.
The intervention strategies keep trace of the architectural, artistic and environmental heritage and intersect social implications, with the productive and economic dimension, foreseeing and proposing answers to take away small towns form marginalization from the principal circuits of development, while exalting the distinguishing features derived from the distance and the slowness of these settings[5].

The most noteworthy aspect of this process is having identified, in these small centers, areas able to propose sustainable touristic development models, in which the quality of the territory, historic-cultural construction, slowness itself, acquire (mostly in COVID emergency) a fundamental significance becoming attractive and characterizing factors.

1.3 Experiences of distributed hospitality in the South of Italy

The Albergo Diffuso model was born after the earthquake in the Friuli Region in 1976, with the scope of reorganizing houses and small deserted towns, restored after the earthquake, with a touristic purpose.

At the beginning of the Eighties, the first of these projects was established in Comeglians, on the Carnic Alps, born from the collaboration between a cooperative of privates, the town management, the Friuli Venezia Giulia Region and the consultation with Gianfranco Dall'Ara. This project had the aim of regenerating and repopulating the historic centre without further construction, by re-using abandoned existing buildings, proposed for touristic scopes.

This operation was conceived as an actual environmental management system that could have the momentum to trigger a new balance, as a model for a better quality of life of the communities[6].

This first practice gave birth to many other projects that will improve the reception model (from the experiences in Carnia, to the project in San Leo, to the one in Bosa in 1995), demonstrating how feasible and compatible this model was with the settlements and their territory.

This hospitality formula, from the first experimentations, will be perfected not only for the incisive presence of valuable architectural and cultural characters of the territory, but also for the initiatives lead by Italian and foreign entrepreneurs. The first regulation of the Albergo Diffuso will be the Regional Law of Sardinia n. 9/1998. The Sardinian practice will become the reference for the other regions that will consider this reception type strategic for a sustainable development.

Later on, among the most representative examples in the Italian landscape, there is Santo Stefano di Sessanio, in the Abruzzo Region. This historic center, almost completely depopulated at the beginning of the Nineties, with the 75% of abandoned buildings, was bought by a Swedish entrepreneur with the aim of converting the historical houses into accommodations for tourists, on the model of the Albergo Diffuso [7].

Since then, the attention devoted to the model of horizontal reception has extended to an international landscape, counting numerous experiences, gatherings, and conferences that confirm that this hospitality type as a model of network development, which is exportable and a tangible contribution against the depopulation of small villages.

Currently, there are several Albergo Diffuso in Italy, all placed in settlements of unique significance, yet fragile and silent. In particular, the Regions of Central and Southern Italy have good regulations in terms of distributed hospitality. Regions such as Marche, Molise, Abruzzo, Campania, Puglia, Basilicata, Calabria, Sicilia and Sardegna, are all provided of specific rules concerning the Albergo Diffuso [8]. In the current context, among the most virtuous municipalities of the South of Italy there is Matera, with a project of sustainable distributed hospitality, which considers the identity and testimonial characters of the buildings of interest and its territory, making these goods and these traces transmittable to contemporary humanity Fig.2.



Fig. 2: glimpse of Matera

The Albergo Diffuso of Sextantio Le Grotte della Civita, is located in the most ancient part of the Sassi, in the Castelvecchio district, where the remains of the fortifications and towers of the settlement are still visible. The distributed structure, made of rooms carved in the lime and sandstone, is provided with a collective space hosted in a cave church from the thirteenth century, the rarely beautiful Cripta della Civita, made of a wide main body with the remains of ancient frescos. The project has been planned respecting the authenticity of the place and preserving integrally the relevant traces.
This complex comes from an entrepreneurial, architectural and socio-cultural project that promotes economic wellbeing and human progress, contributing to the definition of a sustainable city of which the Sassi become example and laboratory [9].
Another important example in southern Italy is the Borgo Ospitale (hospitable village) in the medieval village of Rotonda (PZ), approved by the Association of Alberghi Diffusi. This centre, topped by the ruins of the Sanseverino castle, is characterized by a pyramidal stone structure made of mixed rural buildings and quality architectures provided of moulded portals made of local grey stone. The village is located in the Pollino National Park. The distributed hospitality project, still in the making with the recovery of the buildings, aims at redeveloping the historic centre and its historical identity Fig. 3.



Fig. 3 : glimpse of Rotonda and the ruins of the castle

In the region of Calabria, the small town of Buonvicino has been the target of a regeneration action through the establishment of the Albergo Diffuso Borgo dei Greci, placed in the medieval settlement, raised on the stone spur called Montea, between the Pollino National Park and the Riviera dei Cedri. The center was afflicted by depopulation with a demographic evolution presenting a negative trend (data from the 2013 PSA count 2.418 in habitants in 2007).
The ancient center, rich of historical evidence, shows building units leaning against each other and often connected through arches and buttresses, and a labyrinth-like road plan. The reception of the Albergo Diffuso is placed in the *casa palaziata* once belonged to the Cauteruccio family, related to a series of rooms deployed in the entire settlement. Fig. 4
This village of rural tradition preserves even now its local customs, an indigenous culture and a unique natural landscape, cliff-studded, stones smoothened by the water, grottoes and a dense vegetation. The reception structure, with its presence in the territory, contributes to the knowledge of the village and to its socio-cultural, architectural, artistic and environmental regeneration.
Belmonte Calabro is located on the Tyrrhenian Coast, with its silent village that is now heading away from depopulation and abandonment thanks to a horizontal receptive structure, Ecobelmonte. The village, one of the most significant of the coast, is placed on top of a hill of tuff, between the centres of Amantea and Longobardi, and exhibits even now the signs of its defensive network, the ancient gates, the castle and its original plot.



Fig. 4 : view of Buonvicino and glimpse of its landscape

In the medieval village, after long years of silence and decay, a group of private entrepreneurs have started planning a type of horizontal reception based on sustainable development. It started from the refurbishment, according to the principles of bio architecture, of two abandoned houses intended for tourists. Afterwards, fourteen other empty residences were recovered, rising the interest of the inhabitants who will start refurbishing, at their own expenses, their abandoned houses as well, involving local workers, used to the manufacturing of the places' traditional materials Fig.5.



Fig. 5 : view of Belmonte and glimpse of the historic center where the Albergo Diffuso is located

Furthermore, to solve the problem of accessibility, the project planned two car parks to help pedestrianize the entire village, with its narrow streets and stairways to overcome the many level drops, one of the invariant characters of all the villages of Calabria. Also the built fabric shows repeatable characters in the entire Region, presenting several unified built units, mixed to stately homes. The action of regeneration has allowed the re-opening of many economic activities producing and selling typical products, cultural activities such as the foundation of a museum and different proposed naturalistic itineraries in the surrounding landscape.
Not far from Belmonte Calabro, is the stunning medieval settlement of Fiumefreddo Bruzio, included in the list of the most beautiful villages of Italy. The centre is overlooked by the ruins of the Norman swabian castle, built on a terraced stone stretched out over the sea. The historic centre is characterized by architectural and artistic elements (the frescos by Salvatore Fiume), counting several examples of *casa palaziata* of historical and architectural interest, some belonging to the typical lexicon of Southern Renaissance (Palazzo Pitellia, Palazzo Pignatelli) Fig. 6.



Fig. 6: view of Fiumefreddo Bruzio and glimpse of the historic center

Also for Fiumefreddo the revitalizing process of the village starts with a project of Albergo Diffuso. The hospitality structure called Borgofiume, has the tourist reception in a historical casa palaziata and the accommodations located in other buildings, related to a series of artisan shops, restaurants, cultural and naturalistic activities. The final structure manages to achieve both development and preservative recovery of the place, based mainly on the enhancement of the identity features of the village, of the surrounding territory and its traditions

The story of Pentadattilo is unique. Set in the district of Melito Porto Salvo, Pentadattilo is a ghost village grabbed to the cliff of Mount Calvario and stretched over the valley, located in the Grecanica area of Calabria, a territory of extraordinary beauty. Deserted for several decades and in a state of deep decay, during the Nineties a group of young people started some recovery actions. To the date the project of redevelopment is in progress, some of the abandoned houses have become accommodations of distributed hospitality and some others host artisans shops, a distributed museum of folk traditions, a women's and legality library, teaching laboratories, and other cultural initiatives like the International Festival of Short-films, the music festival and other literary events.

Among the actions brought forward to regenerate the towns of the Grecanica area (coming from institutions, associations, cooperatives and citizens), the most virtuous is the participatory project conducted by the area's in solid villages, a project born in 2010 to foster a sustainable territorial growth, through the involvement of different local realities active in developing good practices of regeneration Fig.7

This initiative sees the Pro Pentadattilo ONLUS Association, engaging over seventy-five realities of Calabria, applying a networking strategy for a territory that has always been characterized by depopulation and abandonment [10].

There are several other reception structures in the South of Italy: Morano on the Pollino massif with the Nibbio Albergo Diffuso, the villages of Civita, Cariati, Scicli in Sicily, Monopoli and Locorotondo in Puglia and many others.

For a long time, all these villages have been affected by a deafening silence, by migrations for employment matters, by abandonment for the lack of primary services. With the introduction of activities of distributed hospitality and of relation with the territory, these same villages become virtuous examples of a development strategy, obtained by the conscious re-use of the resources of the territory. In doing so, they can stop the abandonment phenomena, repopulate the village, create employment and economy, enhance the tangible and intangible resources and convince people to stay.

Currently, these small revitalized villages could be seen as a resource for the society afflicted by Pandemia. The different types of distributed hospitality, such as Paese Albergo, country side Albergo Diffuso, Borgo Albergo, and others, can become a shelter for our community longing for a slower lifestyle in places that are rural but connected. Indeed, we have discovered that we can live in whatever environment as long as we can continue our activities in remote.

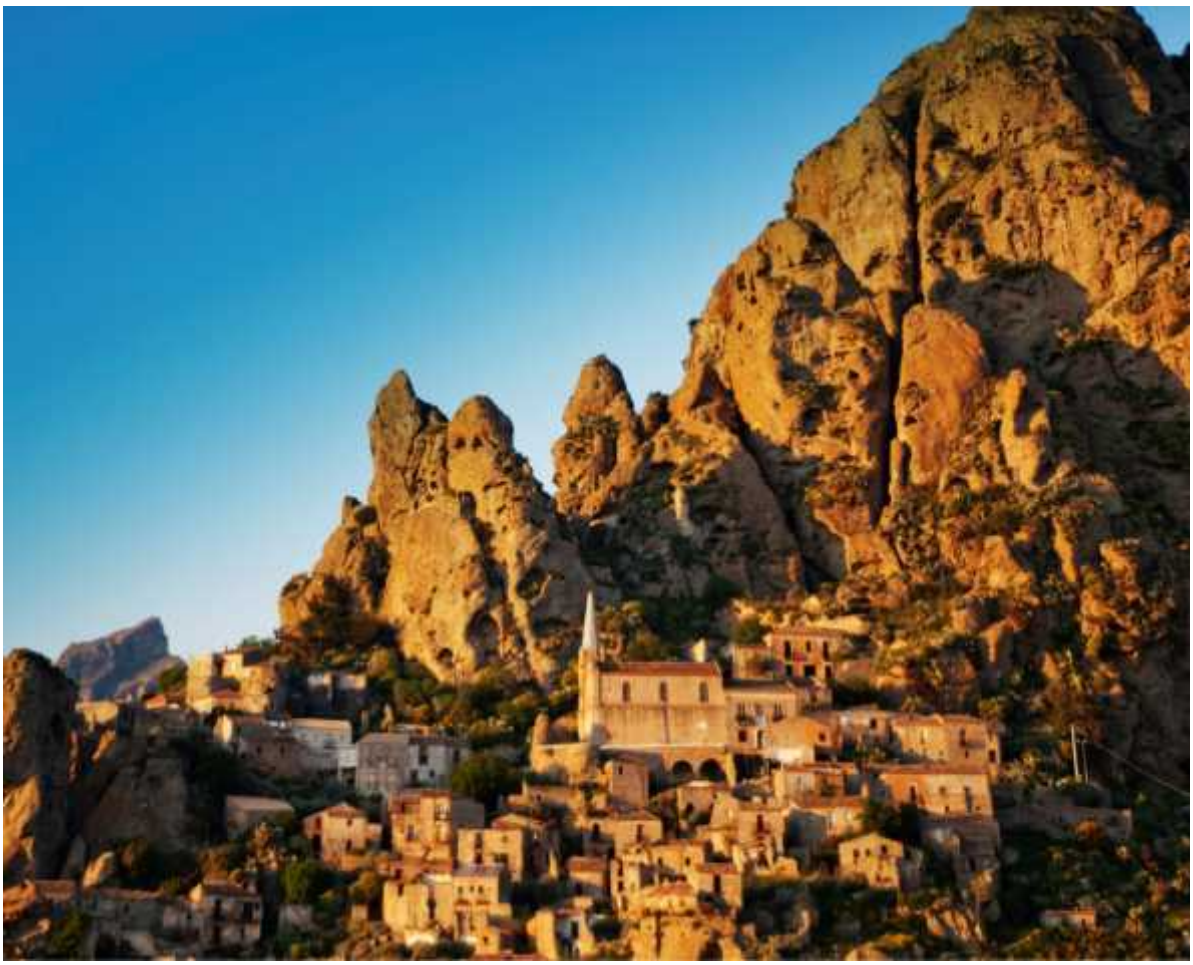

Fig. 7: view of the village of Pentadattilo

Marginal territories become the places in which to seek shelter in times of Coronavirus, in which to create new lifestyles, by giving to these centres a new centrality in politics, in public actions and in tourism.
Without a doubt, the pandemic has directed a spotlight on the small centres against the complex life of big cities. A village offers low population and production density, a notable availability of space and resources, territorial quality, all of this becomes an important attraction in times of social distance. Nevertheless, Dall'Ara has highlighted that small settlements could be the cure to all the wounds inflicted by Coronavirus.

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Architecture as a care to Health: the case of Paimio Sanatorium

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Abstract
The emergency situation that we are now facing as a result of pandemic Covid-19 is turning our life upside down and changing the way of relating to the space that surrounds us. Many questions have been posed about the best use of spaces and the correct management of the flows, but not enough attention has been paid to the comfort of these environments. The humanization of places and strategies designed to make these spaces more responsive to the psychological and emotional needs of the people who come into contact with them are, in fact, absolutely fundamental in healthcare architectural design. It is clear that understanding an adequate development of the hospital space can favor the psycho-physical well-being of the people who live and work there, especially in historical periods characterized by pandemics. A virtuous example of architecture created in response to a pandemic situation is the Paimio Sanatorium, designed by the spouses Aalto, which was built following the program promoted by the Finnish government in response to the spread of tuberculosis in Europe in the early 1900s. The article intends to develop a reflection starting from the example of this organic architecture "tailor-made" for tuberculosis patients and on the possible design perspectives needed to address the pandemic we are experiencing.

Keywords: Healthcare, Architecture, Alvar Aalto, Covid-19.

1. Introduction
Covid-19 pandemic is changing daily life as we know it and revolutionizing the way of living, conceiving and designing space. The pandemic focuses attention on infection control and on the way architecture and organization of spaces can respond to and limit the spread of the virus through a list of best practices for designing spaces for prevention, mitigation and control of epidemiological diseases. In general, the objectives are design in order to guarantee social distance but not the isolation of people, to evaluate a correct selection of materials and the treatment of surfaces and provide for ample spaces. In fact, even the space around us can only contribute to the prevention and control of infectious diseases if proper retrofit or careful planning is carried out. Every design consideration is essential, the type of flooring, choice of materials, the correct air circulation, etc. [4].
This study aims to underline the strong impact that Covid-19 pandemic has on all the design of public works, with specific focus on hospital structures [13].
The design of hospitals must consider not only functional aspects but also those often overlooked aspects related to the comfort of patients and the health of operators and doctors, who have to fight the pandemic [3]. The architecture of hospitals has evolved from time to time to adapt to the needs of the healing process, and this is because there is a long-recognized relationship between health and architecture [2]. The relevance of a suitable building in the healing process is well known to both medical and architectural professionals.
The aim of this paper is to analyse one of the most successful examples of hospital architecture: the Paimio Sanatorium, designed by Alvar and Aino Aalto (fig.1).



Fig. 1: Paimio Sanatorium.

2. Alvar Aalto and the "human-friendly" architecture

Alvar Aalto is the most famous Finnish architect and one of the most important figures in modern architecture along with Le Corbusier, Mies van der Rohe and Wright. More precisely, the works of this architect are also associated with the term Nordic Classicism. It was a style of architecture that briefly flourished in the Nordic countries – Sweden, Denmark, Norway and Finland – between 1910 and 1930. This style was born as a combination a combination of direct and indirect influences from Nordic, Italian and German vernacular architecture and Neoclassicism, but also the early hints of Modernism of the Deutscher Werkbund. Unlike other architects of the same period, Aalto favored a more human kind of modernism. For Aalto, architecture should be "in harmony with the human being".

Thanks to his extraordinary sense of scale, the architect managed to liberate modernism from its tendency towards the abstract, hyper-conceptualization and disproportion [10]. Furthermore, Aalto experimented with a large number of theses on ergonomics and comfortable environments, investigated not so much through the study of a generic modern man, standardized in proportions according to a model such as Le Corbusier's modulor, but more of the end user for whom the architecture and design were intended, with his actual needs. The objective of Aalto also included the promotion of a modern culture of living, which would be accomplished through lectures, exhibitions and other educational means.

3. Paimio Sanatorium: an architecture designed for patients

Between the mid-nineteenth century and the early twentieth century, tuberculosis had a peak in the countries of northern Europe, where the climate, urbanization and precarious hygiene conditions of the time made its impact particularly strong. At the beginning of the twentieth century, in Finland, this disease was the first leading cause of death in the country, as Covid-19 is today for the whole world.

The Finnish government responded with a program to build new sanatoriums across the country and, in 1929, launched an architectural competition to design a sanatorium in the heart of a pine forest in Paimio, a town not far from Turku, in the Southwestern Finland. The competition for the Paimio Sanatorium project closed at the end of January 1929 and the jury awarded Aalto's project but suggested several additions and corrections. The original drawings show that a series of requirements related to the treatment of illness had been taken into consideration, such as the presence of large terraces and balconies to promote exposure to the sun.

In contrast to the Vyborg Library, designed in the same period on the basis of classical models, Paimio's project is firmly based on a new architecture. The basic functions were distributed in a single body of the building, so that each wing constitutes a separate unit (fig. 2).

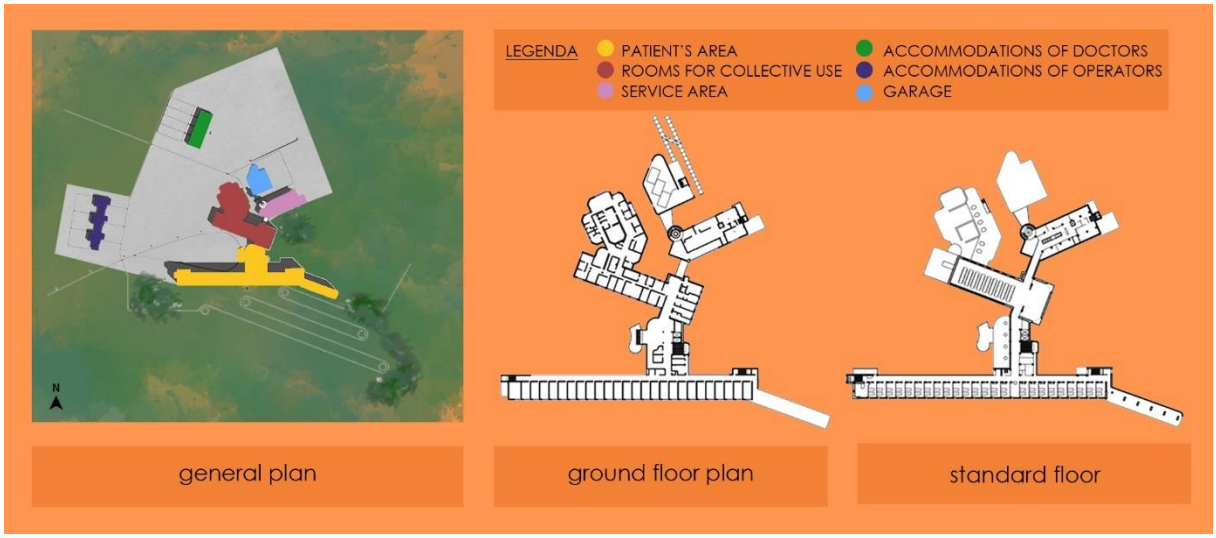

Fig. 2: Internal spatial organization.

Wing A is reserved for about 290 patients (6 floors high and facing south-east) (yellow in fig. 2); wing B contains the common areas (treatment rooms, dining room, library and common rooms) (red in fig. 2); wing C includes kitchens, laundry and other facilities (pink in fig. 2); wing D contains the garage (light blue in fig. 2). The accommodation for doctors and paramedics is located in another building (green in fig. 2), as well as the accommodation for operators (purple in fig. 2).
The patience area (wing A – yellow in fig. 2) has a concrete structure: a unique case for Finland in the 1930s, both from a structural and architectural point of view. Six floors of terraces are mounted on an asymmetrical concrete structure, which narrows towards the top of the building. Although Paimio Sanatorium can be described as functionalist, there is a sort of duplicity in this hospital.
On the one hand, there is the influence of tradition, while on the other hand there is a strong capacity of creative innovation. The composition of the sanatorium is both symmetrical and asymmetrical; a symmetrical internal courtyard is located in front of the main entrance, while the masses of the buildings are distributed asymmetrically as if they were elements of the natural landscape. Abundant natural light and fresh air were two of the central themes of rationalist construction and architecture. Precisely for these reasons, the sanatorium was located in a terrain among pine trees which fulfil the functional requirements of isolation of the hospital.
To maximize access to natural light and solar gain for patients, the main building was placed on the top of a hill and oriented in the north-south direction.
A large roof terrace with wide views of the surrounding landscape was built and a south-facing sun balcony was added at the end of each floor for patients.



Fig. 4: External view and balcony of the Paimio Sanatorium.

Furthermore, to highlight the importance of ventilation in hospitals, a natural gravity ventilation system was installed. The importance of ventilation and clean air for health was emphasized in many medical publications of the early decades of the twentieth century.
The height of the building resulted in a difference in air pressure between the lower and upper floors, which allowed the gravity system to work efficiently.
Moreover, today, the risk of Covid-19 infection is particularly high in hospitals and nursing homes because infected and healthy people stay in the same room for long periods of time and the virus can be transmitted via invisible aerosol particles in the air, even over distances of several meters.
For this reason, it is necessary to design spaces and systems that guarantee correct ventilation.
A great deal of attention was paid to the design of patients' rooms (fig. 4, fig. 5).

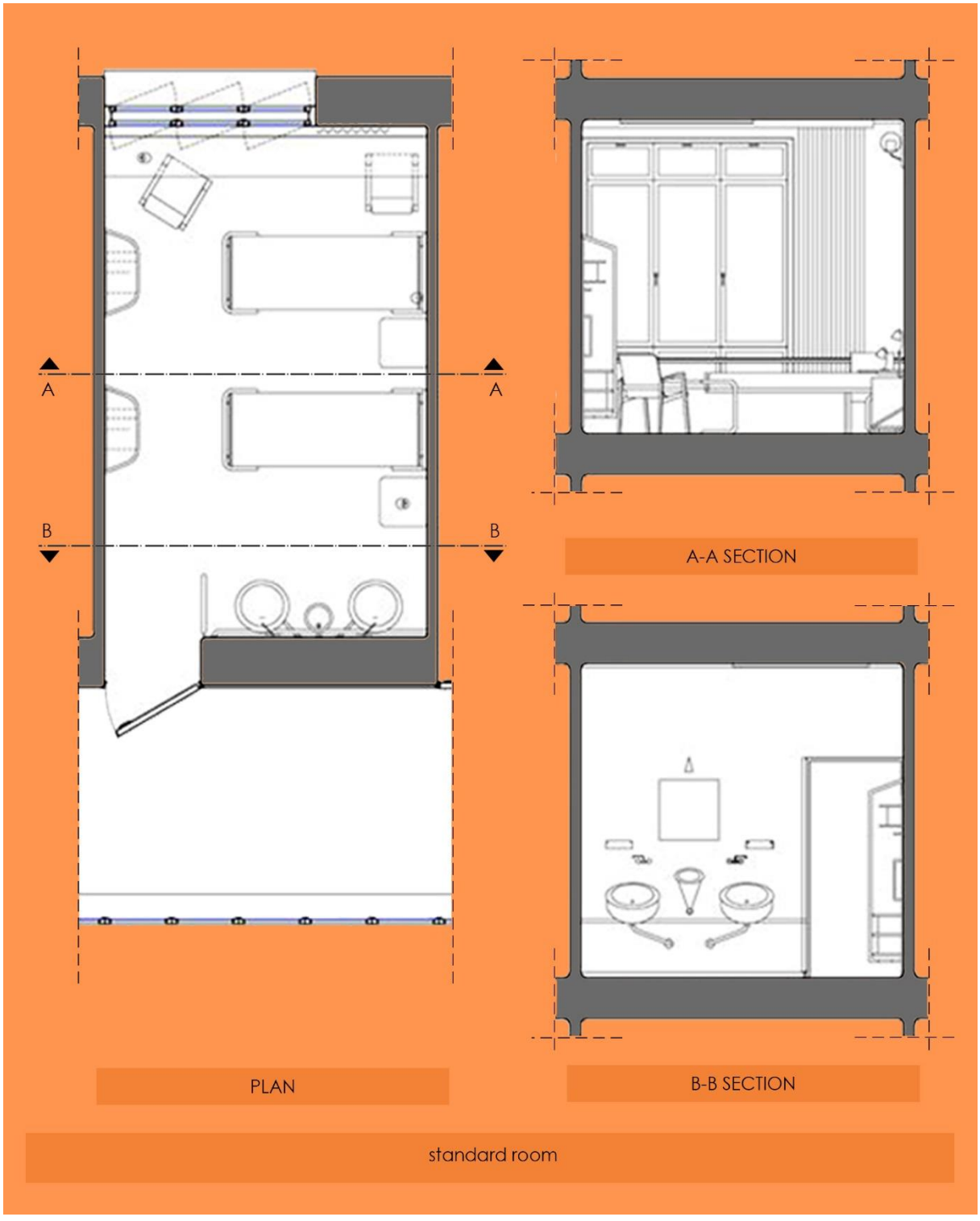

Fig. 3: Plans and sections of patients' room.



Fig. 4: Photographs of patients' room.

The rooms can accommodate two patients and are designed down to the smallest detail to offer the greatest possible comfort.
The patients' rooms are arranged on one side only, so the corridor is fully illuminated by natural light, and they face south/south-east to favor sunlight.
In addition, Aalto studied the use of sunlight in combination with the heating system and also established that the colors in the rooms should be concentrated on the ceiling, as patients might also spend a lot of time lying in bed.
As proof of the great attention the architect also paid to the patients' psyche, the architect wrote about the colors in the patients' rooms: *"The walls are light and the ceilings darker. This makes the general tone more peaceful from the perspective of a lying-down patient. The general lighting point of the room is above the patient's head at the interface of the wall and ceiling, which means that it is outside the angle of vision of a lying-down patient."*
As tuberculosis is transmitted by bacteria, it was important that all the surfaces were easy to clean. No sharp edges, unnecessary ornaments, or shelves gathering dust were used. The materials used for the interior surfaces were durable and resistant to wear and washing, rubber flooring, linoleum, ceramic slates and glossy painted surfaces [9].
The patients' rooms were entirely designed by the architect, who also took care of the furniture (from washbasins to wardrobes), according to a strong idea of humanizing architecture.



Fig. 5: Custom-made furniture.

All the furniture was designed by Alvar Aalto and his wife Aino with extreme attention to the patient. For example, the armchairs are relatively low and long, so that the sitting position is close to reclining, and the bent-wood and plywood frame provides a level of pliability for long periods of sitting in the sun or fresh air [11].
Aalto chose wood as the material for the chairs because it was lighter than anything comparable using tubular steel. He chose wood because the chairs could be turned easily to be angled towards the sun and were not upholstered to reduce contamination.
This passion for details is also evident in the common areas, from the dining rooms to the conference room, which was furnished with the wooden chairs which later became known as the “Paimio chair”.
In the service wing, too, functionality and efficiency are combined with a love of details.
The color palette chosen for the public spaces is typical of the neoplastic art of those years - blue, yellow, gray and white - and creates a fresh, cheerful and peaceful atmosphere. Each chromatic element was carefully chosen [12].
The yellow color in the furniture in the reception area, the yellow rubber flooring in the central wing staircase and in the corridors created an additional feeling of brightness and sunlight.
Indeed, psychologically, yellow is often characterized as making people happy or invigorated and can emphasize these notions for inhabitants when used in a building [5].



Fig. 6: Reception area and the yellow rubber flooring.

Inside the sanatorium colored details are everywhere: green ceilings, red columns, red pipes, blue staircase. Some of these colors were used as way-finding, patients identifying their wards by their color, a careful design choice for a large building (fig. 7).
Other colors, such as the previously mentioned green of the ceilings, were intended to play a more medical role, influencing the way patients felt [8].
It is clear that for spouses Alvar and Aino, architecture should be a social art serving the primary human needs . Medical needs and perceptive suggestions combined to obtain a project tailored to the patient. Colors, light intensity, ventilation and contact with nature have a fundamental influence on a person’s state of mind, especially in those affected by illness.



Fig. 7: Coloring of interior space.

4. Conclusion

The architecture of Alvar Aalto demonstrates how the study of spaces and accurate design choices are absolutely fundamental for the psychological and physical well-being of people who live in or interact with the building, especially for those categories of patients who live for months on end in these hospitals. Not considering the human aspect during the design could lead to psychophysical pathologies that influence and aggravate an already difficult medical condition [1].

The issue of the relationship between space and individual's mental state is addressed transversally at a global level, and today more than ever there is a need to build or reconvert spaces with care to perceptual aspects [7].

National health emergency plans have struggled to cope with the impact of Covid-19 around the world, with health facilities and critical care systems buckling under the extraordinary pressure. Faced with a huge influx of long-term intensive care patients, overburdened hospitals have often had to place patients in spaces that are far from "psychologically comfortable".

The pandemic is leading to a complete rethink about the way hospitals are designed, and to do this we must keep in mind the lesson of the Finnish master.

New laws and regulations are needed in order to manage the creation of spaces according to the well-being of the individual. It is not only the space studied by the designer but also choices such as furniture or the choice of color that are of substantial importance [6].

The Covid-19 pandemic marks a moment that will change the way we consider the design and construction of the spaces we need in the next year. Architecture has often been relegated to the background, but if it is deployed as an active agent in the fight against the Covid-19 pandemic, we can regain confidence in public spaces and improve the conditions for all those involved in this process, i.e. operators, doctors, patients and their families.

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Culture of the digital project as the culture of others: the digitization of the Pompeo Hall at Palazzo Spada in Rome

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Abstract
In order to regenerate the cultural sites, nowadays, different levels of accessibility have to be guaranteed.The architectural heritage of Italy because of the layering of its materials, of its structures and of its use it is the outcome of different cultural inclinations, and asks to be promoted with all the tool that tecnology can offer.
Accessibility means both the physical fruition and in a broader sense socio-cultural access.The paper explains part of a project, still progressing, of the digitalization process of an historical site of Rome, Palazzo Spada. This project concerns Salone di Pompeo, the place where the quadraturistic pantings of Agostino Mitelli e Vincenzo Colonna are located. The authors choose this site and this theme because they point out the important subsequent issues: physical accessibility to the hall, the fruition tied to its historical use that guarantees its preservation, and the possibility to inspire thought experiments related to the art of the perspective illusion.

Keywords: Digital culture, Digital Heritage, Inclusion, Palazzo Spada, Digitization, Roma

1. Introduction
The digital project for cultural heritage, specifically in the field of architecture is not just about the process of acquisition of objects, of the collections and of the building themselves, but also the different ways to reproduce what was previously acquired.
Indeed we know several ways to define the digital content of the digital project in order to give back the primary source.
All digitalitazion process must not face only its technical aspect of creating numeric data/information from the physical reality, but it must be led by strategies and purposes legitimizing this digitalization and empowering its value while reviving the social function of art.
Boris Groys states "*According to Walter Benjamin, the original is simply another name for the presence of the present – for something that happens here and now. Thus, analyzing our different modes of reproducing the original means analyzing our different modes of experiencing presence, contemporaneity, of being co-present with the flow of time, with the original event of time and in time, and the techniques that we use to produce this co-presence* [1].
That is, according to Walter Benjamin, the original embodies the physical presence of the present, so involving observation and perception in a precise place and time (here and now). As a consequence to experience the different ways of turning back the primary source corresponds to experience the original given back; to analyze and choose the ways of giving back implies to experiment new kinds of presences in terms of observation and fruition. Time's flowing implies to experiment the contemporary age. The original is in this way tied to the physical present in which it is perceived, in determined place; the original's replica (and so the way of giving it back) means a multiple presence (co-presence) tied to the technologies employed to give back, and naturally to the time.

For this reason the product of the digital project should be considered as an original content of a process of digital turning back of the primary source, involving the co-presence, that is the possibility to have both a sensorial and a psychological experience of the source.
Adding to this, the authors suggest the digital project process may become the place of the *other's culture* where cultural and physical diversities coexist.
Indeed, there are several approaches making a digital project and giving access to the cultural heritage for a broad public, a public that may feel as being *part* of a cultural process but also *other,* because it can experience it according to its needs and condition, allowing personal growth in the process of interpretation. In this place it is possible to experiment fantasy through the languages of the arts [2,3]. It is highlighted that the concept of co-presence make possible the broadening of cultural contents with respect to the original source, and that the virtual place where the digital product will be experienced, is the place of inclusion and emotional involvement.
The authors have experimented what has been said about palazzo Spada, unique case study abiding in itself the art, the science, the jurisprudence and the institutions. We point out in fact that is the seat of the State Counsel (Consiglio di Stato) since 1889.
The project has involved the processing of digital products concerning the whole building, but that in this occasion highlights the illusionistic representations present at Salone di Pompeo. This space presenting the shape of a parallelepiped, is characterized by trompe l'œil dating back to 1635, painted by Agostino Mitelli and Vincenzo Colonna, of the school of Bologna, appointed in Rome by the cardinal Bernardino Spada.
The theme of the illusionary architecture allows to explore the relativeness of appearance and to place the viewer/user in a state of reflection with respect to the multiple points of view. This exercise breaks down the cultural superstructures and sets the individual into a debate between the self and the other.
The case study shows the theorical process and the deep meaning of the operation of digital copy, so that this may be an aware process and where the real setting, the virtual one (paintings) and the digital one, can all find in their tight relationship a righteous outcome.
The digitalization process was characterized by subsequent phases and was based on the original project which determined the making of the paintings in that place and for that place, as we will present.
The elaboration of digital content allows access to everybody, overcoming all present physical obstacles. The theoretical consideration and the process adopted are explained in the following paragraphs: the works and their accessibility, the digital project of the illusionistic paintings, and finally the conclusions.

2. The object of the studies and its accessibility

The space, the *sala grande*, is part of the sixteenth century nucleus of the building erected by Girolamo Capodiferro, and is one of the spaces that were transformed by Bernardino Spada in the seventeenth, in order to give shape to a uniform idea of project while expanding the spaces themselves [4,5] (Fig.1).



Fig.1 (a) Pompeo's Hall, (b) Paintings in the secret garden, (c) Borromini's Gallery. Illusionistic objects at palazzo Spada in Rome.

Salone di Pompeo is set at the first floor of the building, accessible through the main stairway, and having on the NW side the inner court, on SE the big garden and adjacent to the Sala delle Stagioni and with the Galleria dell'Astrolabio, that in the 15th century was a corridor granting access to the Hall (Fig.2). Since 1889 palazzo Spada is the seat of the Consiglio di stato and Salone di Pompeo is one of the rooms where the activity of the Counsel is exercised, used as courtroom with its seats, and backbenches.
Despite the daily consultative and jurisdictional activities , the State Counsil allows access to citizens for the fruition of this cultural site and for researchers wanting to deepen the knowledge about it.
From the archive drawings and the bibliographical sources we can date the transformation of the landing of the main staircase allowing a new entrance to the Hall, and determining a new visual alignment. The project that Bernardino Spada had in mind when he bought the palace in 1631, is emblematic of the merging of art and science, materialized through the use of a series of architectural expedients, paintings and decorations, through the use of visual lines, visual cones and alignments of concepts that allow to overcome the real partitioning of the space and the physical boundaries of the building.

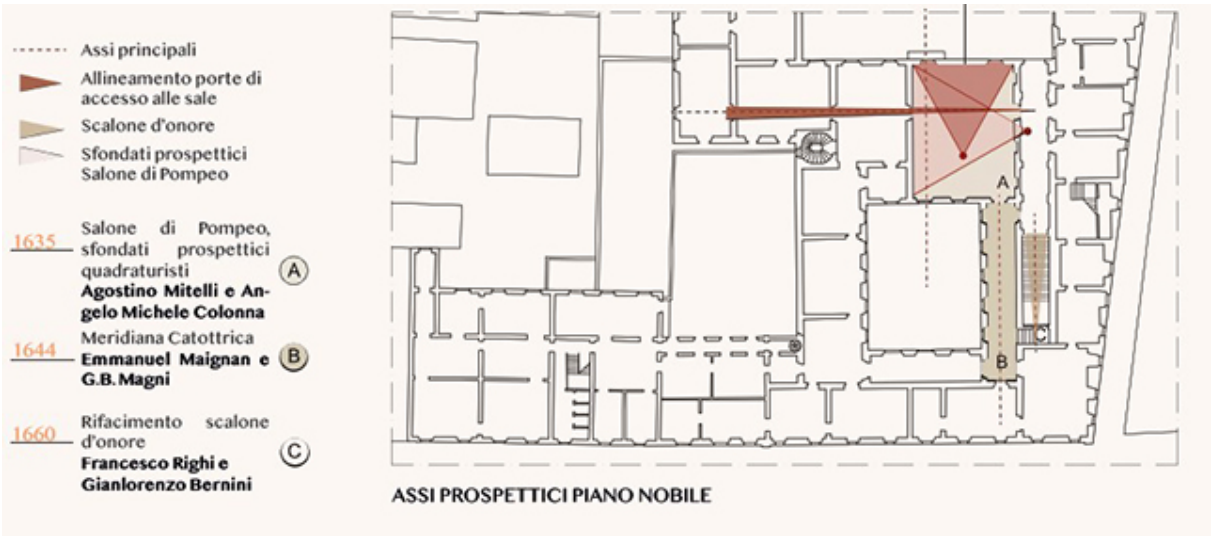

Fig.2 The plane of the noble floor, palazzo Spada (Graphic D. Zangrilli).

The architecture of the Hall was modified, through demolition of the ceiling, realizing spaces of doubled height with two orders of windows on the sides facing the exterior; and through various changes about the entrances and windows that took place at different times. But the main reworkings that were carried on, were about paintings.
It is important to remind that Bernardino Spada was pontifical legate in Bologna before moving to Rome, where he acquired his taste for the illusionistic architecture of the quadraturistica school of Bologna, and there as well, as reported by Virgilio Spada,
"*rivoltò sottosopra il palazzo dei legati e l'ornò con pitture e prospettive eccellenti. Dal primo giorno che entrò nel Gran Palazzo destinato ai legati principiò ad abbellirlo con ricontri di porte, finestre e prospettive, e simili cose, che lo fece comparire il doppio"* [4].
Quadraturistic painting allowed him the virtual broadening of the palace spaces, whenever it was impossible to modify the architecture, building up new configurations of the space, sometimes symbolical, containg architectural allegories, able to go beyond the physical reality through one's stare (Fig.3). The works for the decoration of the hall with the quadraturistic paintings of Angelo Michele Colonna and Agostino Mitelli, from the School of Bologna, started in 1635.
The whole Salone di Pompeo cycle of paintings celebrate the temporal power in honor of Pope Urbano VIII Barberini, by means of many elements, characters, scenes and object refering to the discoveries during the Scientific Revolution, to the New World and to a sequence of internal and external spaces coming one after another and developing on different levels, also with reference to the surrounding urban set. The four walls (Fig.4) are painted with one point perspective drawings on vertical picture plane, having each one a single point of view. In the project by Bernardino Spada, appliance of quadraturistic painting allowed to influence on the real fruition of the architectural project, giving rise to an articulated configuration of the spaces themselves and on their relationship on two levels: a real one and a virtual one.
The Hall's paintings had the scope to entertain the guests visually also during the mass, celebrated in the adjacent chapel which was connected to the Hall through a small window.
More to it: the visual axis pointing to sala delle Stagioni opened towards the cardinal's rooms at south and east. The survey integrating several techniques and technologies of the architectural elements

and of the paintings led to analyze and reinterpret the accessibility of this place and of the pictorial heritage, through the production of digital contents.
It was envisaged a digital project which would allow intertwining between different areas, barrier-free accessibility, opening to citizenry, the knowledge and the meaning of the role of illusionistic painting in the Rome of the seventeenth century.

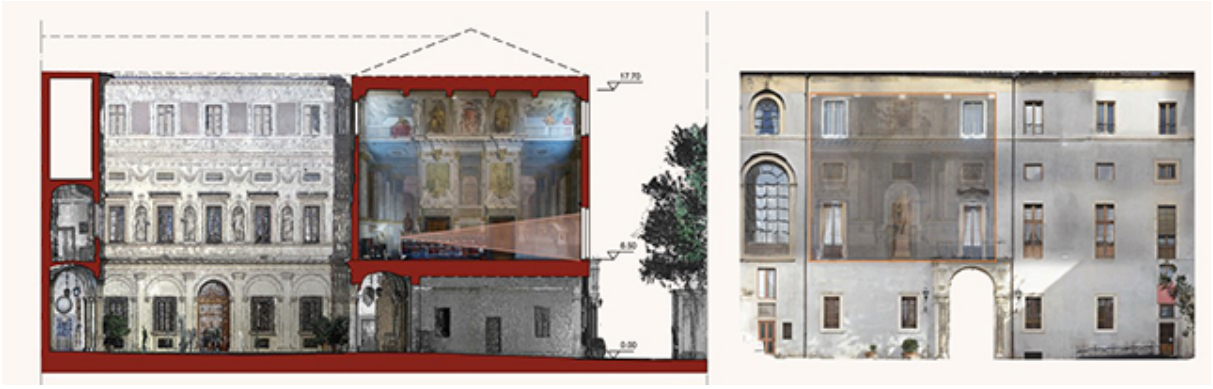

Fig.3 Section of the palace and the front towards the major garden (Graphic C. Settimi)



Fig.4 Ortophoto of the four walls of the Hall (Graphic D. Zangrilli).

3. The digital project of the illusionistic paintings

The case study first of all focuses on the research and the individuation on a method of analysis, that might define the digital project (Fig.5). The acquisition of geometrical data and of architectural elements carried on through survey is the first operative face of the process of digitalization, gives back the raw data that defines a number of critical reasonings that may develop on levels and around different themes. The scans made by the use of a laser scanner are put together with the photogrammetric survey data, as to obtain points clouds, later used to check the architectonical space; the high quality orthophotos for reading of the perspective.
The products obtained are different in the sense of the fruition of the fictional space: a. ortopthoto for a view similar to that in the Hall where the reality represented is the same as the original one (Fig.4); b. 3d model depicting the articulation of the painted spatial configuration, sort of an augmented reality (Fig.5-9); c. 3d model animation in order to give an immersive experience of the space (Fig.10). The adopted methodology is the following:
for the walls of Salone di Pompeo the image reading was set and carried on with the purpose to understand the project of the architectural space of the series of trompe l'œil, in reference to the building's spaces, both internal and external, and to the urban surrounding.
Thus, it is possible to determine the transformations in Salone di Pompeo, to visualize the painted spaces and to define the culture of Bernardino Spada's project.
Graphic analysis of the four walls in Salone di Pompeo confirmed how the painted system of Colonna and Mitelli is an example of the most diffused design schemes of quadraturism: the simmetry of the walls, with the addition of fake doors, the mix of real elements and painted ones, a space set on two levels, marked by two galleries.
In the painting celebrating the temporal power in honor of the Pope Urbano VIII Barberini there are some emblematic characters. Painting in the frescos characters living at court and animals was a recurrent habit. Here there is also a man with a telescope, reference to science and astronomical observation; a parrot in a golden cage symbol of the discovery of the new continent from which both the parrot and the gold come and a peacock symbol of vanity.
For what concerns the architecture, are manifest both typical schemes for the pespective in the open-air scenes and typical architectural elements of quadraturism: the perspective scenes present whether series of arches or walls. In the kind with arches only one part of the wall is involved and fictionally obliterated by the painting. This scheme well employs the scenographic value of the arch itself and its ability to mediate between spaces, in this case between real space and painted one. Under the arch

other spaces, other architecture, often bold angular views, are present, such as in the case of the wall with the statue of Pompeo (Fig.4).

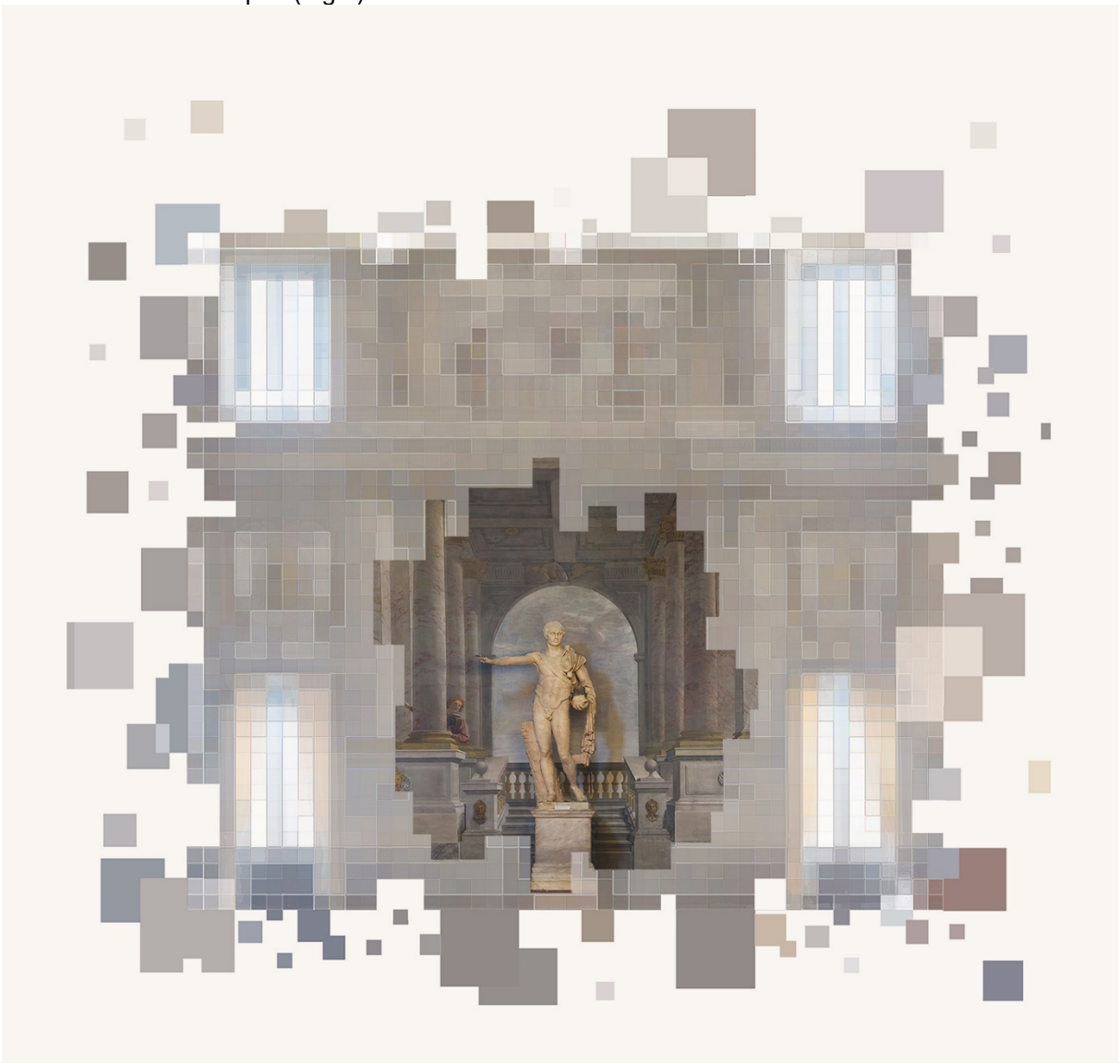

Fig.5 The digital project poster (by D. Zangrilli).

In the scheme with walls, the entire building structure is obliterated, it is involved in the illusion, appearing majestic, due to a more complex project, as in the case of the wall adjacent with Sala delle stagioni.
A lot of compositive elements cane be found: a. colonnades, such as arcades, pavillons and courts; b. the basement, developed around the hall in order to create a mediation between the reality and painting; c. recesses or niches to protract the line of view into the wall; the structural framework made by different elements used to represent one unity of space more or less complex.
The real floor of the Hall measures 12,10 meters x 15,10 meters, with two short walls presenting a double order of windows. Under a geometrical point of view the four walls are of two kinds: two of them are 12,10 meters x 11,20 meters of height and the two others 15,10 x 11,20 meters of height. This analysis allowed to account for the elements and for the spaces that could undergo modeling in order to see them or to better unveil the complex spatial articulation.
After the study of the historical transformations of Salone di Pompeo, the attention shifted on two walls in particular, one for each kind: the wall with frescos towards the major garden, the only wall giving on a broad open space, and the wall adjacent with Sala dele stagioni, the only wall depicting an open space giving on a closed one, notwithstanding.
The wall adjacent Sala dell stagioni presents multiple perspective planes with compared with the other walls. SW wall, in front of which is the statue of Pompeo, that gives on the garden, allowed to analyze the relationship between the town and the palace, unveiling important alignments as the one between the palace and the fountain of Acqua Paola, located on the Gianicolo and commissioned to Giovanni Fontana by pope Paolo V in 1611-12.

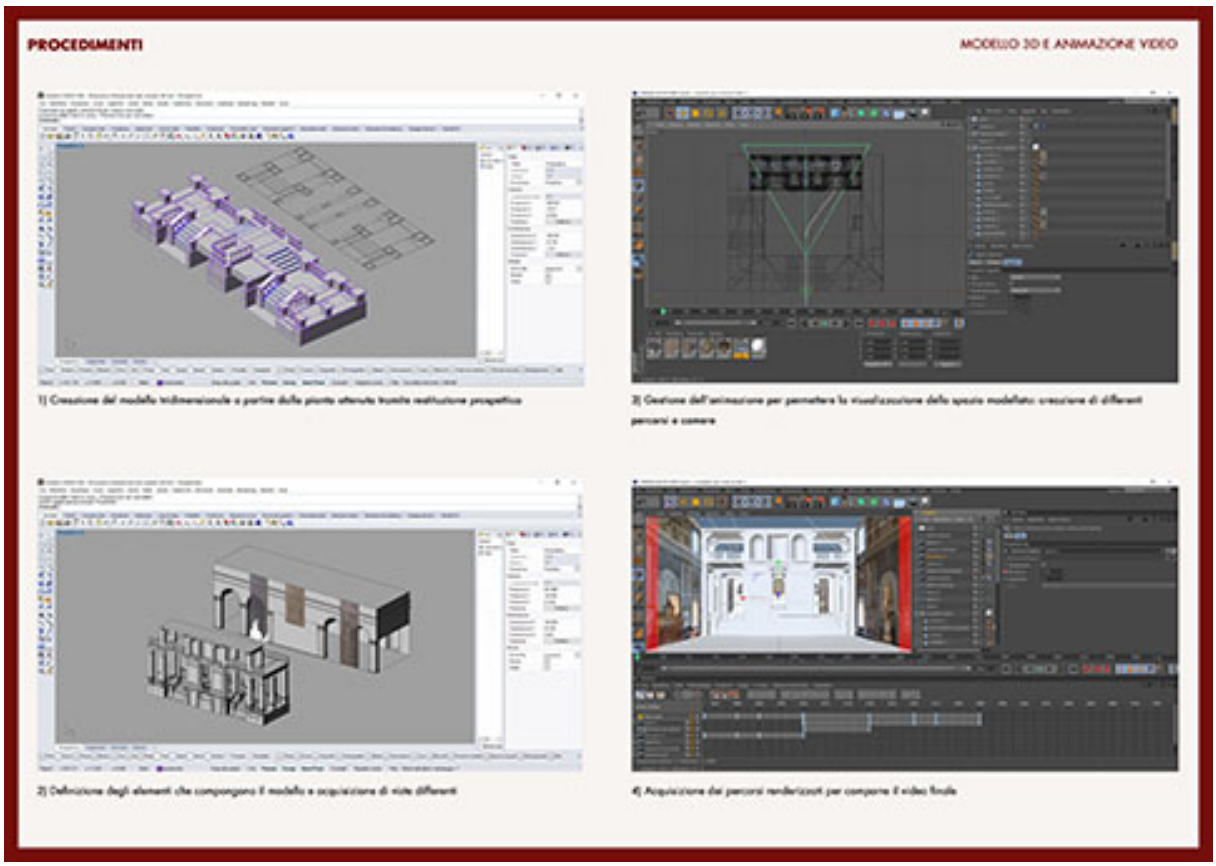

Fig.6 Procedures for modelling 3D (D. Zangrilli)



Fig.7 View of the 3D model integrated with photogrammetry (C. Settimi)



Fig. 8 View of the 3D model integrated with photogrammetry (C. Settimi)



Fig. 9 View of the 3D model integrated with photogrammetry (D. Zangrilli)

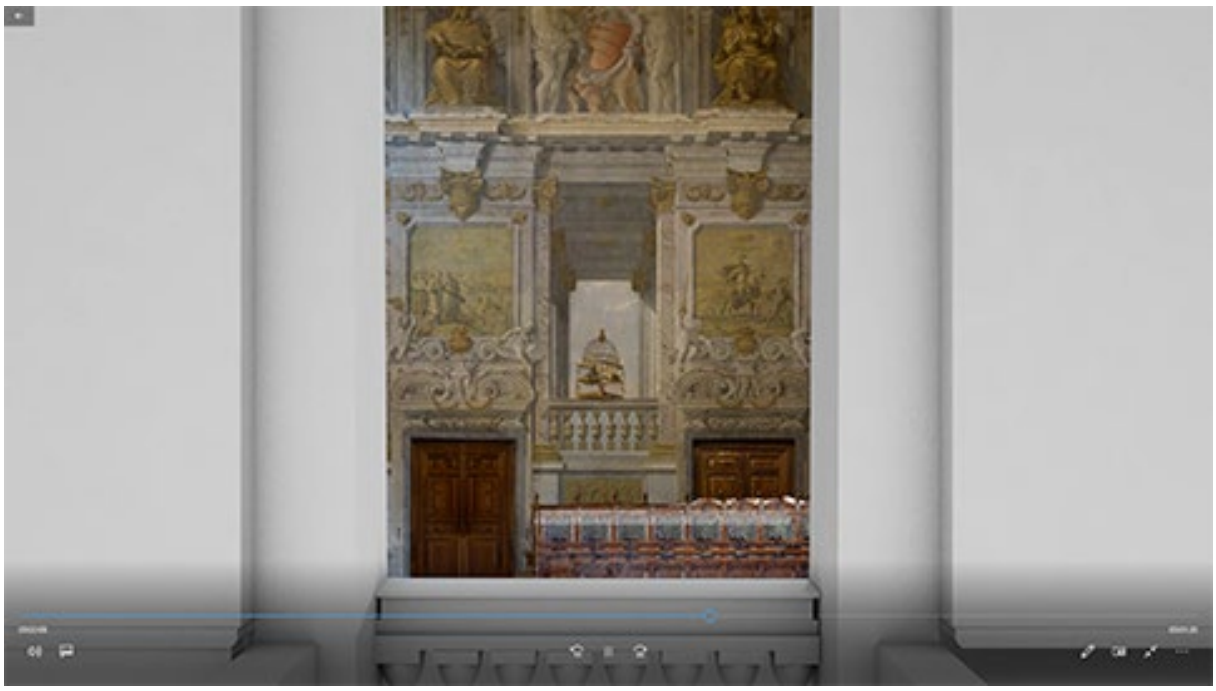
Fig. 10 Frame of animation (D. Zangrilli)

This demonstrates the coherence between painting and reality, indeed the fresco in Salone di Pompeo shows an arch giving on a big open space .
Following the reading of the image and of the composition of the painted space the perspective restitution was obtained. From this was possible to derive the true shape of the painted space, to understand the geometry of the fictional spaces, their dimensions and distances and to make comparisons about the two points of view, between the short and the long wall.
The restitution process gives back the plan, both in the perspective drawing and in orthogonal projection and on these premises was possible to build up a digital model in 3D of the fictional spaces.
The phases of the perspective restitution are in their turn a method into the method, they have specific criteria and sequentiality. The aim is to obtain the true shape in all orthogonal views of the painted architectures to then build the spatial configuration in three dimensions and to jump from one visual plane of information to the other; from the two-dimensional one of the paintings to the three-dimensional of the geometrical model. These data, acquired and elaborated in a scientific way, represent the digital contents on which to build up a number of products that make accessible both the place and its original contents. 3D modeling allowed to understand the spaces desired by Bernardino and depicted by the painters, thus, the relationship with the preexisting space.
The fictional space presents characteristics valid for all walls. The basement, which divides the real floor from the perspective, surrounds the hall producing a walk way along which are set elements of vertical connections, such as stairs, which in their turn connect the inferior level of the real floor, with an upper fictional plane.
This superior space is 6,30 meters deep for the long wall and 4,90 meters for the short one.
In the long wall, as it was already pointed out, the perspective space developes on various planes of depth: along the upper walkway is a space working as a filter, measuring 14,30 meters in depth, which divides the first space (internal) from an external portico (porch?) 28,85 meters broad, with arches and decorative elements on the facade.
Such a complex space is only present on these wall, the articulation of the space embeds both existing elements and painted ones: an exterior gallery allowing an ideal view from an upper level, towards the Hall.
The short wall, overlooking the major garden, has a central stairway linking the plane of the gallery.
The hypothesis of a walkway allowing to reach and connect all the painted spaces, makes manifest the spatial conformities of all paintings.
Modeling the space allowed to interpretate the whole design depicted on the trompe l'œils, giving a real perception of the imaginary and imagined space.
This hypothetical space was included in an animation in order to simulate the experience to walk corridors, stairways, galleries, and to stop in correspondence of the panoramas, and to enjoy the view suggested by the painted space.

4. Conclusion

The digital project of Salone di Pompeo is a work-in-progress experience, but some observation were processed. For what concerns the cultural heritage managing it was possible to start planning the safeguard and the control of both the architectural heritage and the *intangible* one and the citizen's knowledge of the places where State functions are carried on.
In a scientific perspective, this project meant an interdisciplinar connection between knowledge and skills that led to the original project. This aspect made possible the reinterpretation of the traditional ways and practices of the architectural project and the authors considered how was the fruition of that space. The elaboration of the different phases gave life to new cataloguing processes and it made possible the actualization of the heritage in several ways. For example, the model of the geometrical restitution of the real shape of the virtual illusionistic space made possible the geometrical setting in chosen for the paintings and their main features. In this way the beholder/observer can have visual references to be oriented in the visual immersion. The user can also build knowledge of multiple views of the space, living the deception, and the disillusionment, too. This make possible to acquire new and different points of view and the ability to approach the diversity. Both the remote visualization, and the local one using applications changes the accessibility of the physical spaces.
In conclusion, the digitalized survey data can be the foundation for starting new researches, developing on different levels of interpretation and with different aims.
Thus, the technological developement of the communication creates a new medial ambient, that is the hearth of the "citizenship" topic in its social and cultural meaning, where the involvement is important. The citizenship has a meaning that goes further than the political aspect, it is a cultural fact, linked and crossed to the identity dimension. To *feel part of* and to *feel other from* are the fundaments of the identification and diversity processes.
This idea, in the disciplinary field of cultural heritage, gives space to new meanings and interpretations, redefining the public space and the knowledge itself.
For this reason we have to guarantee not only the scientific nature of the informations, but also to propose new ways of interpretation, in order to build a mixed social and cultural identity in which we can understand what happens now and to open a window toward the future.
The investigation for the applications is still in progress.

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Pavilion's Hospital typology: an outdated solution or an opportunity for tomorrow?

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Abstract
In Italy, during the Thirties of the last century the type of monobloc was established as a hospital building. This typology, in the intentions, had to replace that of the pavilion's hospitals, conceived as enormous complexes of isolated buildings. But nevertheless, the citadels for care continued to be imagined, conceived, built, modifying the face of entire urban areas, or often leading the way for the urbanization of areas that had hitherto been isolated, also marking the start of vast programs of public utility, often completed after the Second World War. The cases of the Niguarda area with the new Ospedale Maggiore in Milan, or of the hill between Arenella and the Camaldoli in Naples with the new modern hospital XIII Marzo later dedicated to Antonio Cardarelli, as well as the Policlinico of Pavia are significant.
The contribution aims to analyze and compare the history of some emblematic cases of hospitals, to understand what lessons we can learn, and which can be consistent with the needs and paradigms of our contemporaneity. We have already experienced some needs, due to the pandemic emergency, in the last year, in the form of social distancing, domestic segregation and the forced suspension of a large area of social and economic, private and collective activities. In this perspective, some thoughts about the actual role and validity, of the hospital building system with pavilions will be proposed.

Keywords: Pavilions hospital, Cultural heritage, Architecture for medical health

1. The pavilion hospital typology: a model between medicine and architecture
In the Age of Enlightenment, alongside architectural experiments based on scientific studies and thanks to the typological researches of architectural schools in France [1], [2], hospitals with different pavilions depending on the disease, which occupied large parts of the city [3], [4], spread almost everywhere. The first pavilion hospitals were initially organized in a single building characterized by the typological invariant of the sequence of combs connected to each other by a distribution connective. However, they were functionally independent so as to ensure the separation of patients by class of pathology. These complexes became progressively larger until they assumed the most recent conformation of building systems divided into several morphologically similar buildings, and usually arranged on regular and ordered alignments. In the latter case, the choice of location – as brought about by modern medical provisions – fell on the occupation of areas on the margins, as it was believed that the circulation of air and sunshine were hindered by the existing buildings in the city, waste sewage in the *intra moenia* areas could infiltrate the ground, especially in the absence of rational sewage systems. Thus, in the pre-industrial phase, the relationship between city and care was measured by the adaptations of care complexes in the context of wider urban transformations, so much so that the "hospital" entity – especially in recent years' studies – has become a prism of elements through which it is possible to interpret the history of many cities [5], [6]. The first implementations concerned psychiatric asylums. Some solutions were also deemed effective for general hospitals. Especially in France, there were experiments on the theme of panoptism, useful both for prisons and especially for hospitals. The story of Hôtel-Dieu is emblematic [7].

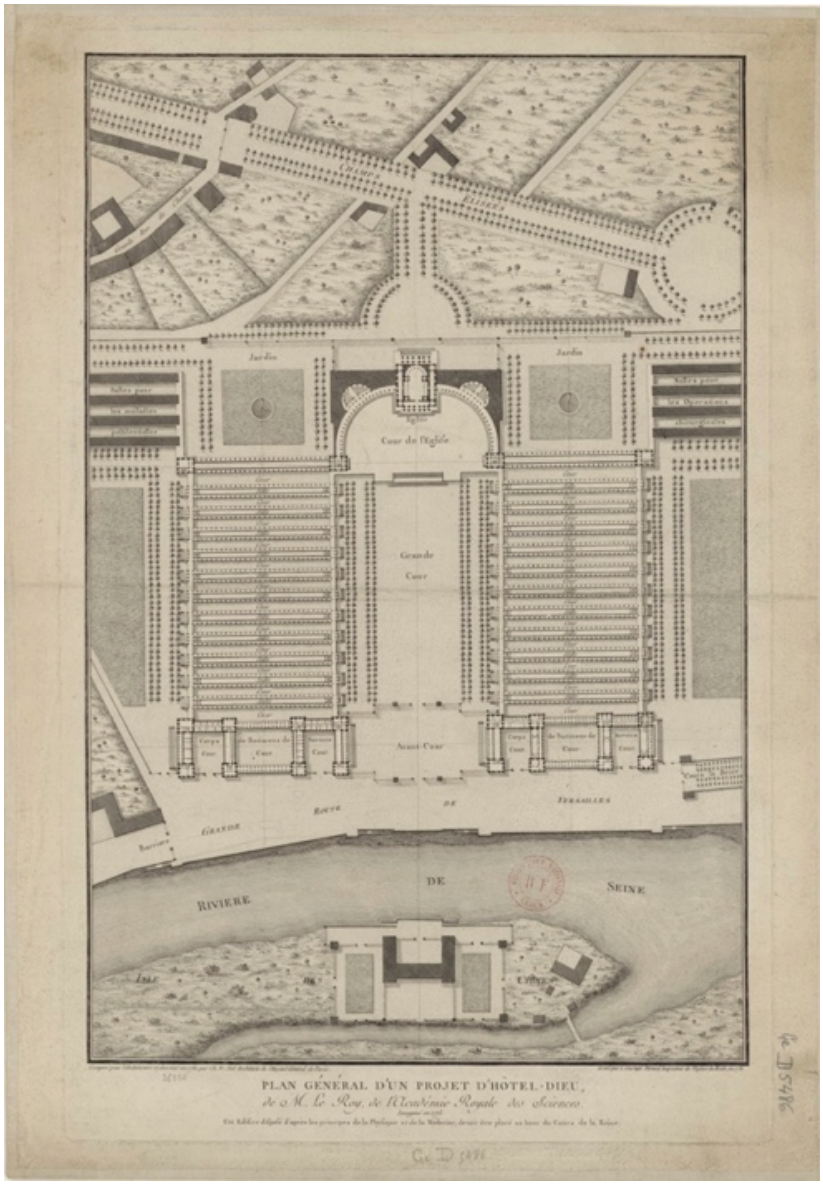

Fig. 1: Plan général d'un projet d'Hôtel-Dieu de M. Le Roy, de l'Académie royale des Sciences imaginé en 1773. Cet édifice... devait être placé au bout du Cours de la Reine / Composé pour l'architecture et dessiné en 1780 par Ch.-Fr. Viel.... 1781.

Since the Napoleonic era, public services in continental Europe became completely secular. Hygienists, health engineers and architects became the actors of a debate that would have profoundly affected the places of care set up in cities to resist or adapt to health crises such as those due to epidemics. In the mid-nineteenth century, in Italy the contributions of scientists, such as Giuseppe Sormani, illustrious professor of Hygiene at the University of Pavia, who in his *Geografia nosologica* listed the characteristics of modern hospitals followed one another more and more [8]. After the serious epidemic in Italy of 1884-85, the proposals of hygienic engineers led in addition to the enactment of legislative measures [9], to the ad hoc conception of hospital citadels, based on the distribution to isolated pavilions connected with tunnels (underground, elevated, closed or open). The birth of the many hospital citadels was dictated by the fact that the already existing places of care were no longer sufficient and adequate, mostly obtained in the many suppressed monasteries. The reuse of the conventual structures that took place after the Italian Unification was suitable for ministries, university buildings and barracks, but not for hospitals. With the progress of medicine and the specificity of clinics, the monasteries show all the limits in relation to modern functional needs. In particular, epidemiological advances confirmed the traditional techniques of collective prophylaxis and the principle of isolation, which were crucial in defining the relationship between treatment centers and urban cores [10]. Born with the American Civil War (the Mower Hospital in Philadelphia is well known), the pavilion system was widely used in the Germanic wars of 1866 and 1870-71 [11].

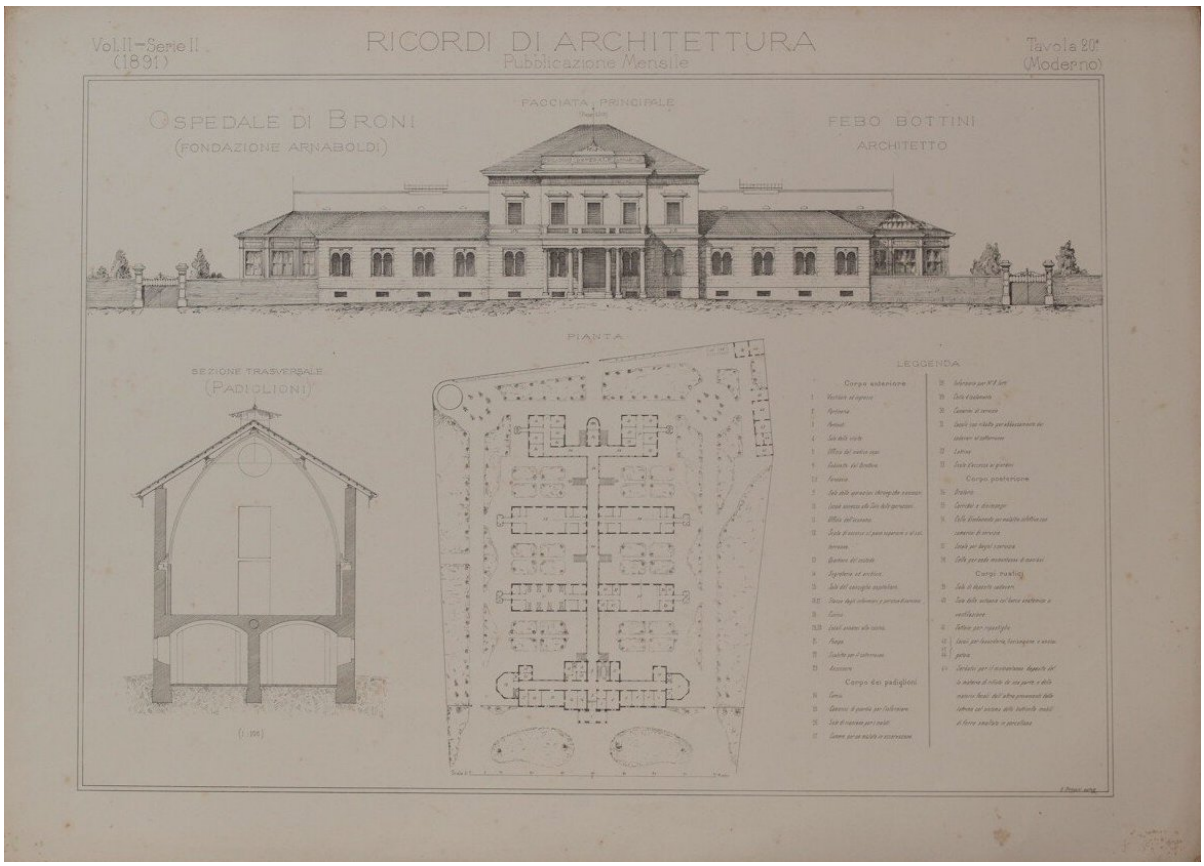

Fig. 2: F. Bottini, *Ospedale di Broni*, 1885 (from *Ricordi di architettura*, vol. II, s. II, 1891, tav. 20).

In Italy, the Sant'Andrea of Genova (1877-84) built by Cesare Parodi, thanks to the funds made available by the Duchess of Galliera, was among the first large hospitals to be conceived with the layout of the pavilions. Since there, everywhere, works were undertaken for the construction from scratch of health establishments with the new arrangement, from Mauriziano Umberto I of Turin (1882-85), built on the conception of the engineer Ambrogio Perincioli and of the doctor Giovanni Spantigati [12], up to the Policlinico Umberto I in Rome, designed by Giulio Podesti (1883-96) [13], to Broni hospital (1885-90) built on a design by the engineer Febo Bottini [14], and to Umberto I hospital of Monza (1890-96), made by Ercole Balossi Merlo [15]. The best choice seemed to be that of the pavilions, because they guaranteed insulation, ventilation and lighting, all that was considered "hygienic". Rather, the discussions concerned how to articulate and locate the different pavilions, both within a large area and with respect to the city center. At the beginning of the twentieth century, the construction of modern polyclinics, authentic cities within cities, experienced an unprecedented acceleration, just as the historical structures were modified and expanded with the construction of isolated pavilions, to the point that they assumed a decisive role in the definition of entire sectors urban, as in the case of the Ospedale Maggiore in Milan which extended with the many pavilions beyond the *naviglio* [16], [17], or the Policlinico of Pavia [18].
The layout in pavilions implied the occupation of large areas, which for small-medium-sized cities (as happened for example in Broni, Legnano, Novara, Forlì, Cremona, Udine, Padua) meant rethinking the strategic role of these hospitals (civil, military, or psychiatric), in relation both to the consolidated historical contexts and to the future development that they wanted to give to general urban planning. During Fascism, the places of healthcare, like the other public buildings that were redesigning the face of entire urban parts, began to be built with the most up-to-date provisions, the most effective materials, the most functional distribution schemes, and in specific case with the fruitful and effective collaborations between architects and doctors. Within the consolidated urban meshes, the pavilion hospital system had proved to be the best up to that time. Even if it had soon revealed all the defects related to the large areas occupied and the costs of operation, transport and surveillance. In the requests of the many competitions (Ravenna, Padua, Pescara, etc.) launched between the two wars, the type of hospital with pavilions gave way to that of the monobloc, more rational and better suited to modern needs, as emerged in the reports presented in the crowded congresses of hospital architecture. The theories of functionalism and hygiene of the early twentieth century introduced new paradigms of space. Natural light, air, the sun become fundamental factors.



Fig. 3: A. Gardella, L. Martini, *Policlinico di Pavia*, 1913-1932 (postcard).

The new block type also responded to the hygienic requirements of exploiting the orientations of the buildings according to the heliothermic axes. For this reason, the theme of the modern hospital continually stimulated the experiments of many architects, who collaborated more and more with medical directors. Numerous medical conferences were organized, and the international association of hospitals was founded to discuss the new architectural typology. The principles of clarity, economy, ordering of space, communications, use of the surface had convinced everyone to abandon the model of the pavilions. For the new construction of buildings, as well as for the extensions of existing hospitals, the solution of the mono-block type was preferred. The rationalization of the distribution elements in a single building and the centralization of general services were the cause and consequence of the improved efficiency of the services and a low operating cost. The abandonment of the pavilion type was also motivated by the desire to no longer consider the pleasant aspects of tree-lined avenues and flower beds, because the belief spread that the sicks were interested only in timely, wise and caring assistance from doctors and nurses.

2. The permanence of health clusters within urban morphology

In Italy, during the 1930s, therefore, the type of monobloc was established as a hospital building. But nevertheless, the citadels for care continued to be imagined, conceived, built, modifying the face of entire urban sectors, or often leading the way for the urbanization of areas that had hitherto been isolated, also marking the start of vast programs of public utility, carried out even after the Second World War. The cases of the Niguarda area with the new Maggiore hospital in Milan, or of the hill between Arenella and the Camaldoli in Naples with the new modern hospital “XIII Marzo” later dedicated to Antonio Cardarelli in 1943, as well as the Policlinico of Pavia are significant.

The construction of the Pavia hospital determines a moment of great growth in the city, both from an urban, social and economic point of view. Promoted since 1902 by Camillo Golgi (Nobel Prize in 1906) [19], an illustrious professor and scientist of international standing, the hospital complex of Pavia was conceived in 1913 by the engineers Arnaldo Gardella and Luigi Martini and completed in 1932. Already at its appearance it presented the most advanced technological solutions, with a typology now well proven of the blocks. In the following years, other pavilions were built, whose construction was allowed by the layout of the entire complex. The hospital was the result of a synthesis. In the initial discussions, the possibility of creating two hospitals side by side was discussed, one for research entrusted to the university, the other for the clinic, dependent on the *Consiglio ospitaliero per la cura*. The general clinical hospital was thus created, with a comb scheme. The original project was revised by the engineers Giuseppe Mariani and Leonardo Sala of Genio Civile.

The Policlinico gradually expands to the north, in accordance with the same initial forecasts, with a series of successive buildings that follow one another after the war and in the following years. In particular, it should be noted that a series of buildings immediately external to the original boundary of the area are built by the University, with a substantial morphological and typological consistency with respect to the pre-existing ones, but – by virtue of the different implementing body – triggering some constraints on the mutual traversability of the area.
The building structure of the complex changes again at the beginning of the new century, with the provision of a new building, developed according to the typological “plate and towers” scheme. A sort of typological hybridization then happens, due to the inclusion a new building, morphologically and typologically very different within a pavilion hospital. Since then, it was definitely unchanged, although had progressively welcomed new architectures, each referable by compositional lexicon to specific construction seasons, but intimately coherent, as far as the planovolumetric profile is concerned. With its outline of 80 by 160 meters in plan and with a height of about 50 meters and a "W" shape, the new building stands out as a new landmark in the context not only of the hospital complex, but more generally in the city skyline. It is worth underlining here that the rationale of the new project was to concentrate in a new high-tech building a huge amount of the beds distributed in the historic pavilions, now inadequate in terms of systems, services and accommodation standards, leaving these volumes free for further re-functionalization. This medium-term perspective has then been implemented over time, so much so that the conversion of one of the first two pavilions, that of medicine, into the new headquarters of the University’s medical faculty is currently underway, with the creation of classrooms, departmental spaces and library.
The complex of the New modern hospital of Naples was begun in 1928 on a project by the architect Alessandro Rimini and ended in 1934. To create the citadel of care, the architect did not arrange the many pavilions on the slope of the hill but had the area (over 300,000 square meters) transformed into an esplanade [20]. As in Pavia, several specialist pavilions were later built. Articulated with more than twenty pavilions, connected to each other by a road network and underground paths, the Neapolitan hospital was a colossal work, extending over about 28 hectares [21]. The hospital was conceived to carry out the tasks of health care for the sick, but also those of disease prevention and post-hospital care. For this reason, the pavilions were intended for specialties (for the chronic, for maternity, for the infectious, etc.).
The new hospital of Perdono, later Niguarda, was born instead to replace the old Ospedale Maggiore [22]. It was designed by the engineer Giulio Marcovigi, assisted by Enrico Ronzani for the medical part, and by the architect Giulio Ulisse Arata, for the architectural part. The works began in 1933 and ended in 1939. The type of hospital pavilion still seemed the only feasible one, but following some American models, it was thought that vertical hospitals were the most responsive to modern solutions. The events that led to the construction of the hospital have been extensively reconstructed [23], [24]. In the course of the discussions there was no turning towards the monobloc type, but rather the application of a mixed solution. Beyond the final outcome, the story demonstrated the non-current nature of the pavilion type. The cost of the areas within the cities, the advancement of construction techniques and hospital technologies, as well as the need to rationalize everything and above all the conviction of being able to “control” the contagion of diseases, have gradually led to abandoning the choice of typology of the pavilions. Many pavilion hospitals were enlarged and renovated, such as in the case of the Umberto I hospital in Monza. Built in 1896, in 1943 the hospital underwent a radical rethinking, with the elimination of the pavilions, in favor of the construction of a single building block [25].
With the tragedy of the Second World War and the post-war reconstruction, the relationship between city and care measured itself against the theme of social well-being as an inclusive sphere, and not linked only to assistance to the sick. Strongly marked by the bombings, the cities were rethought, as well as rebuilt, by the technicians as a whole. However, with few exceptions, the relationship of the city with the places of care crystallized on architectural models of the past. No longer charitable but secular and scientific, care in the city in the second half of the twentieth century was increasingly based on a system of services based on the principle, called by the Anglo-Saxons patient-centered care, the one for which assistance was focused on the person and no longer exclusively on an old-style hospital and care facility network. The end of the twentieth century marked the heyday of modern hospital architecture, so much so that it saw the definitive upheaval of numerous hospitals built in the nineteenth century. So much so that in some cases it was necessary to safeguard the value of some hospital complexes. As Cor Wagenaar argued, it is also necessary to keep in mind the changing ideas of health and care when evaluating the historical value of pavilion hospitals, considered obsolete everywhere [26]. The lesson from typological history of the pavilion hospital can help us understand whether the typological choice of the pavilions is still valid today, especially if analyzed with the needs and paradigms of our contemporaneity. The pavilions system still allows to give optimal answers, both for a small or a large hospital. Each pavilion can be considered autonomous, and at the same time connected with the other departments. As in the past, the isolation of the building – especially for general hospitals – becomes essential in the event of epidemics, which are expected to increase in the future.



Fig. 6: G. Marcovigi, E. Ronzani, G. U. Arata, *Nuovo Ospedale Maggiore Milano*, 1933-39 (postcard).

3. Conclusions: does the pavillion-based typology belong to cultural heritage or may suggest possible strategies for the future?

As Hans-Bertram Lewicki wrote in 1964, even for an expert the task of establishing a hospital program is always difficult, also, because the conception of a hospital starts from the situation of the moment and from the forecast of the near future needs [27]. The issues concerning emergency interventions, diagnostic medicine, rehabilitation and convalescence, since the 1960s, have been questioned, perfecting and adapting the hospital to the medical needs, depending by the geographical context. This is not the place to discuss the choices on the usefulness of one type or another, on the destination or on the functioning of the pavilions. Rather, we are interested in understanding how the pavilion system pluri-block can be taken into consideration again, given its heterogeneity. During the second half of the twentieth century, up to the present day, a hospital is increasingly used for outpatient care. For this it requires a dimensioning, a set of different structures, which can interact with the research institutes and with the buildings where the therapies take place. The prospect therefore arises of reopening an articulated debate on the prevailing hospital settlement strategies. As is well known, the paradigm of the verticality of the hospital structure has already been refuted by the affirmation of structures with horizontal development.

It is a question of re-discussing the guidelines in the organization of hospitals. The crowding of the sick and the staff is no longer conceivable. One of the problems of the pavilion system were the connections, which were replaced by vertical ones – with lifts, stretcher lifts, dumbwaiters, hoists – considered at time cheaper, more effective, faster [28]. Into a mono-block, each floor was a closed unit in itself, which could connect to the others if necessary. This typological organization showed its limits when the same problems due to the epidemics of the past occurred. The disadvantages of the pavilion scheme encountered at the time are now overcome. The questions posed by contemporaneity about our microbiome are broad. The human being can be understood as a mobile ecology, which forms an infinite flow of different species of germs, bacteria, viruses. Columina and Wigley questioned the role of architecture – hospital or otherwise – which must host the human organism [29].

The social and health impact of the pandemic, which is still underway, will prompt a significant rethinking of approach, including in the health sector. Even regardless of the individual emergency solutions, which the various hospitals have resorted to in emergency conditions, it is believed that it may be appropriate to develop a reflection on newly built, modular, streamlined, highly prefabricated and industrialized structures to be set up in relatively short times, characterized by high degrees of internal distributive flexibility, which can be dedicated to hosting specific and potentially infectious categories of patients.



Fig. 7: 3d model of the new building of the San Matteo hospital, emergency department, surgical plate and recovery towers 2012.

This is not the place to discuss in detail the peculiarities of these structures from a specific distribution and technological point of view, but it remains clear that they will be pavilions, of variable dimensions depending on the degree of specific functional complexity (eg. hospitalization only, or only intensive or sub-intensive care units, or all of these). With the aim also of reviewing the man-made rules to protect the community health during unexpected disease outbreaks or epidemics [30], the generating principle of the type of hospital with pavilions, based precisely on the paradigm of physical separation and mono-functionality of the building, will therefore return to affirm itself in the debate, obviously reinterpreted in a hybrid perspective and made consistent with its cohabitation with structures existing hospital and exercise. Beyond some theoretical and philosophical considerations, the attention to a typology of the past – such as the pavilion type – also makes us reflect on the theme of health citadels that still exist and that can be considered, not only as a cultural heritage to be safeguarded but also as a still optimal solution against the spread of viruses.

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WORLD HERITAGE and DESIGN for HEALTH
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The importance of an interdisciplinary approach for the study and conservation of the architectural heritage and its cultural characters

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Abstract
Today we are constantly talking about interdisciplinarity between archaeological methods, architecture and restoration especially when we approach to historical architectures. The buildings of any period, investigated for research or restoration, in most cases, do not appear as they were at the moment of their construction, indeed they present themselves as a stratified and heterogeneous system of several elements, which hide the culture's choices made following the logics of its time. Therefore, during the restoration, it is essential to apply accurate methods and to achieve the best lecture of these transformations, through a methodology that analyses every trace, material and constructive character. The purpose of this article is to explain, through examples, the application of an interdisciplinary matrix of study, that combines both archaeological and restoration approaches. The aim is to reduce the deletion of traces due to superficial knowledge. This methodology, applicable for any building-type, combines: the stratigraphic analysis, the study of materials and building techniques, the analysis of the construction site sequence and, finally the study of the state of conservation. The integrated practice of these different approaches may guarantee a functional buildings investigation both for the archaeologist who studies the cultural characters of the building, and for the planner, who must carry out the restoration, in a real interdisciplinary action.

Keywords: Archaeology of Architecture, stratification, material culture, restoration, interdisciplinary

1. Introduction
Architectures are complex systems: the result of ongoing processes of additions, deletions and modifications of parts and materials made by their users.
Therefore, every part or "element of architecture", even the smallest or individual - as the granule of mortar or the block of stone - to the macro elements -as the method of composition and laying of blocks and parts- testifies the choices and actions of its creators, thus representing a unique insight into the culture of their time and a precious source information. Briefly: it constitutes material culture.
This awareness has been fully raised in the disciplinary fields of architecture, restoration and archaeology, and translated in a more 'interdisciplinary' and comprehensive approach in the study of buildings and structures: a word and a concept, interdisciplinarity, which resonates increasingly among professional and scholars, underlining the desire for a closer collaboration and the integration of studies on buildings and monuments in order to create a common, wider knowledge base; a "framework of knowledge", made up of different disciplinary perspectives, that deepens, relates and compares all the various aspects of architecture, ready to be used by historians and archaeologists, but as well as by planners (architects and engineers) and restorers.

2. Interdisciplinary study methodology of a building
The Archaeology of Architecture is disciplinary field that for years has been dealing with the topics and issues of an approach to architecture according to the archaeological methods and techniques [1- 2].
It is a relatively newborn, "hybrid" field (late 20th century), that involves both architects approaching the study of buildings in an archaeological perspective for the purpose of intervention and restoration, and

archaeologists studying the buildings (both above ground and excavated) for the purpose of cultural investigation and historical reconstruction [3]: the overall application of the methods of Archaeology of Architecture leads to the study not only of the different material stratifications of the buildings, but also to their connection into “stratifications”. The major aim of this article is to showcase the different methodologies of the Archaeology of Architecture that could be useful to be applied in any architectural context to create a multipurpose wider knowledge framework. As a side-consequence those methods should be carried out individually but then integrated with each other according to a single methodological approach [4].
The object of the analysis could be buildings of any form and from any historical period (bare ruins, simple buildings with few remaining rooms, complex buildings with several levels and areas) but it is overall important to approach them without biases, following a methodology that first evaluates the individual parts and then associates them on the basis of the collected data.
The overall aim is to consider and study the architecture as a system but also as an element composed by a multiplicity of systems through different approaches. This helps to understand how the structure has stratified (its history), its constructive and architectural characteristics (the culture behind the structure and its choices), its state of conservation, thus, gathering, together with the previously mentioned elements, the necessary information for guiding the choices for restoration and intervention. Collecting such a comprehensive knowledge is made possible by the integration of several analyses which, although apparently separate, constitute a single interdisciplinary methodology that can be articulated into two macro-phases: one indirect and the subsequent one of direct research as shown in figure 1 (Fig.1).

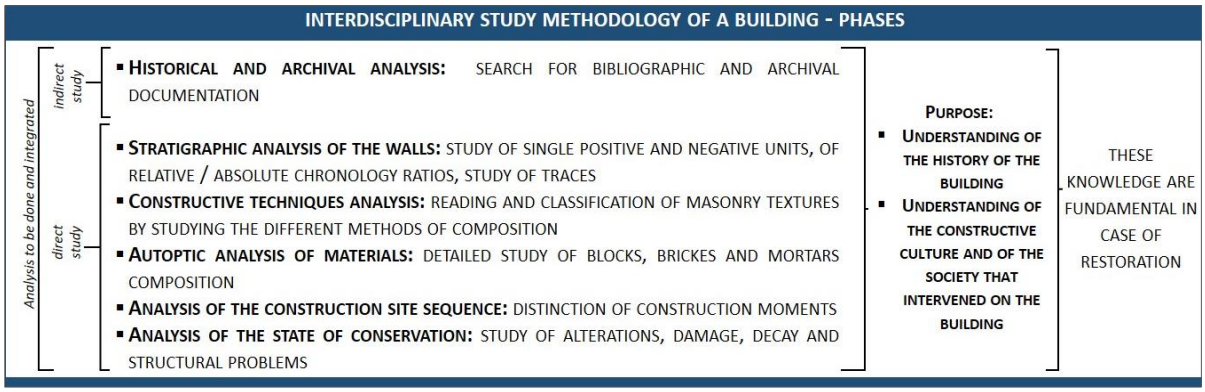

Fig. 1: Summary outline of interdisciplinary study methodology of a building (phases).

3. Indirect study phase: historical and archival analysis

This phase represents the first approach, less direct but yet fundamental: it entails both a bibliographic and archival research on the monument or building, using keywords (such as its name and the people related to its history, as planners and owners).
The major aim is to gather general information on the building and/or on events related to it and to outline the history of restoration and interventions that were inevitably made on any building that has come to our time: the history of restorations serves for a better understanding of the stratification of the older parts, by tracing back “the elements” which were tampered, rebuilt and modified, and which are not always clearly distinguishable by direct study only [5].
To deepen the research on the interventions it is also important to outline the history of the protection of the historical and monumental heritage of the place where the case study is located, since a fundamental source of information can be found in the documentation (letters, surveys, project tables, reports, etc.) produced by the local administrative authorities accountable for the protection of the building; it is therefore advisable to extend the research by examining the documentation provided by their local state and historical archives.
Two examples of this historical researches can be found in the studies for the Roman Amphitheatre of Catania and the building complex of the Convitto Nazionale of Aquila: two chronologically and architecturally different case studies, but that nonetheless testify the importance of the use of different documentary sources.
The Amphitheatre offers a very particular example of urban stratification: the Roman ruins are now incorporated into the urban stratification (later than 18th century), restored after an important earthquake dating back to the end of 17th century, and which is causing serious preservation issues to the Roman building; to understand the root causes of those problems, the ancient documents produced by the local

and regional administrative bodies responsible of the protection of the building have been examined in detail, and more specifically, the letters proving the state of conservation during the 19th century.
Thanks to the information provided (Fig.2 a-b), it was possible to trace back the development of the conservation problems that affected the Amphitheatre during the centuries, and to identify the major issues. Specifically, in this case, the infiltrations coming from the top and adjoining buildings. Moreover, it has been possible to distinguish which parts of the Amphitheatre were the most damaged and which restorations were made in the past to solve its problems. Briefly, understanding the causes of degradation and tracing a history of restorations are both essential procedures necessary to have a clear understanding of the current condition of the building and to determine the right interventions needed for its conservation.
The Convitto Nazionale of Aquila represents another interesting example of a building complex with a long history of stratification (starting from 13th century up to present): born as a Franciscan monastery with two important churches, it underwent several functional and structural changes. Due to the recent seismic events (in 2009) in the area, it suffered severe structural damages whose mechanisms were cleared and identified also thanks to the historical research: by analysing the historical maps preserved in various archives, including the state archives of L'Aquila, it was possible to carry out a comparison and overlapping plan that depicted the evolution of the complex over time, highlighting its modifications and verifying how these parts were those which suffered the greatest damage from the seismic events (Fig.2 c-d-e).

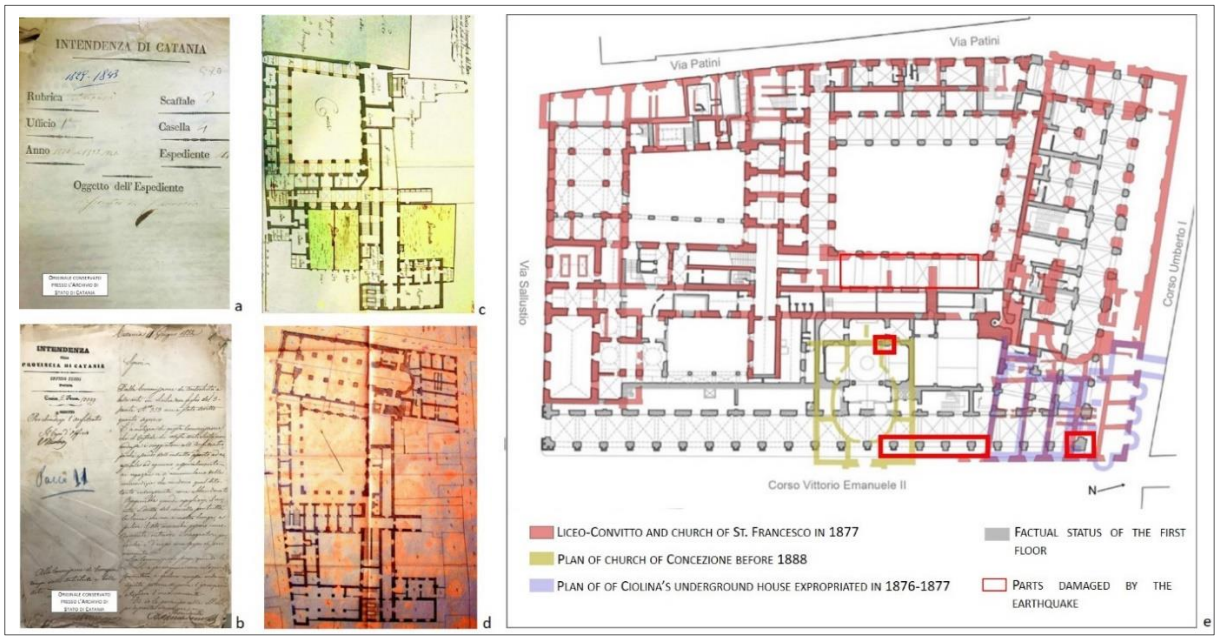

Fig. 2: a-b: archival documents from State Archive of Catania; c-d: historical plants of building complex of Aquila, from various archives; e: stratifications of the different phases of the building complex of Aquila.

4. Direct study phase analysis

After the preliminary study phase based on documentation, the direct study of the building is a substantial part. This phase must include different types of analysis which first should be performed separately but then cross-referenced, to create a broad framework of knowledge.

4.1 Stratigraphic analysis of the walls

When we approach a historical monument, ruin or intact, we must consider that it is in its "last state" that does not coincide with the original state but is the result of the sum of several actions materially "overlapping" over time.
These actions are revealed by the architectural parts are classifiable as positive actions of addition (e.g. construction of a wall, coating, infill of an opening, reconstructions, etc.); as negative actions of material subtraction or destruction (e.g. removal of plaster, breaking of masonry to create new openings, collapses, etc.), and as transformation actions (e.g. alterations, degradation and structural problems). All these actions are conventionally called stratigraphic units (US) and added or subtracted to the building, both vertically and horizontally, modifying its native state, create a real architectural palimpsest.

The objective of the stratigraphic analysis is to identify, to distinguish, to document these stratigraphic units and to understand their stratigraphic relationship, their relative chronological (contemporaneity, posteriority and anteriority) so it is possible to reconstruct the evolutionary sequence of the structure, also exploiting the chronological dating elements [6].
The analysis of the relationship between the parts is done by analysing the key points, i.e. contact points, between them. In the example (Fig. 3), we can see some points of the facade of the southern transept of the church of St. Simpliciano in Milan, subjected to stratigraphic analysis.
The keys points represent "interfaces" and occur in the form of edges and surfaces [7]. Instead, for units not in direct contact a way to understand the stratigraphic and chronological relationship is the comparison of materials and construction techniques (see subsection 4.2 and 4.3).



Fig. 3: a-b-c: Milan, church of St. Simpliciano (transept, south elevation) detailed photos with stratigraphy analysis.

The stratigraphic analysis of the walls applies to the structures, with the appropriate modifications, the stratigraphic analysis method belonging to the archaeological field; this type of analysis should be carried out at both macro and micro levels (e.g. the study of the entire wall and/or of the layers of the coating plaster), and briefly, it provides:

- Direct vision of wall (both sides);
- Distinction, classification, and documentation of the different units positive (generic US or coating USR) and negative also choosing the appropriate graphical representation methods (for documentation it could be very useful to use reference tabs such as US tabs used in the archaeological field) [8];
- Mapping of the stratigraphic units (US) identified in the graphical architectural surveys of the wall elevations and in the photos;
- Definition of the stratigraphic relationship between the USs and their indication on elevation surveys by a graphic system (e.g. using arrows or symbols).

At the end of these operations, it is important to graphically convert the stratigraphic sequence, creating what in the archaeological field is called "stratigraphic diagram" or “matrix of Herris” [9-10].
Fig. 4 and 5 show some examples, relating to two different contexts: one from the Roman era (the Terme Achilliane in Catania) and another from the 19th century (church of St. Michele Arcangelo, in Bergamo). Following the pre-established graphic choices indicating the ratios, the diagram shows all the units, in chronological order and according to the sequence of realization. It is a very useful tool to have a clear vision of the stratification. Accordingly to the stratigraphic analysis, a good result would be then the distinction of the various phases that marked the life of the structure, their understanding and association to the various parts.

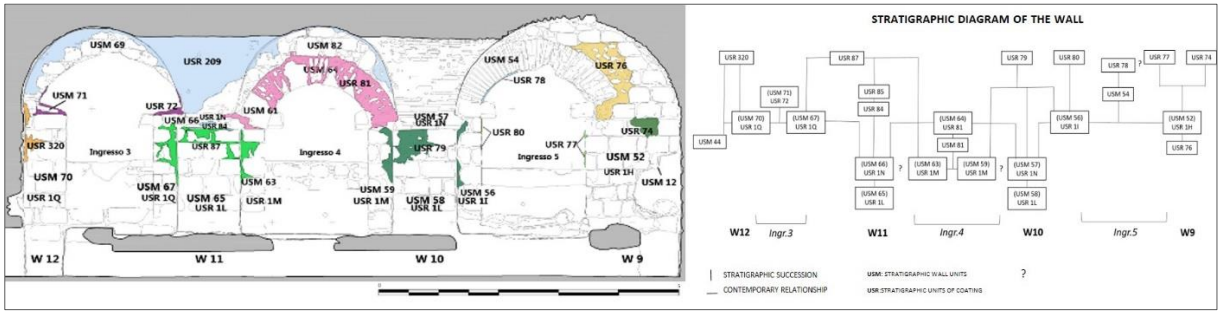

Fig. 4: Catania, western wall of the roman Terme Achilliane, mapping of units and related stratigraphic diagram.

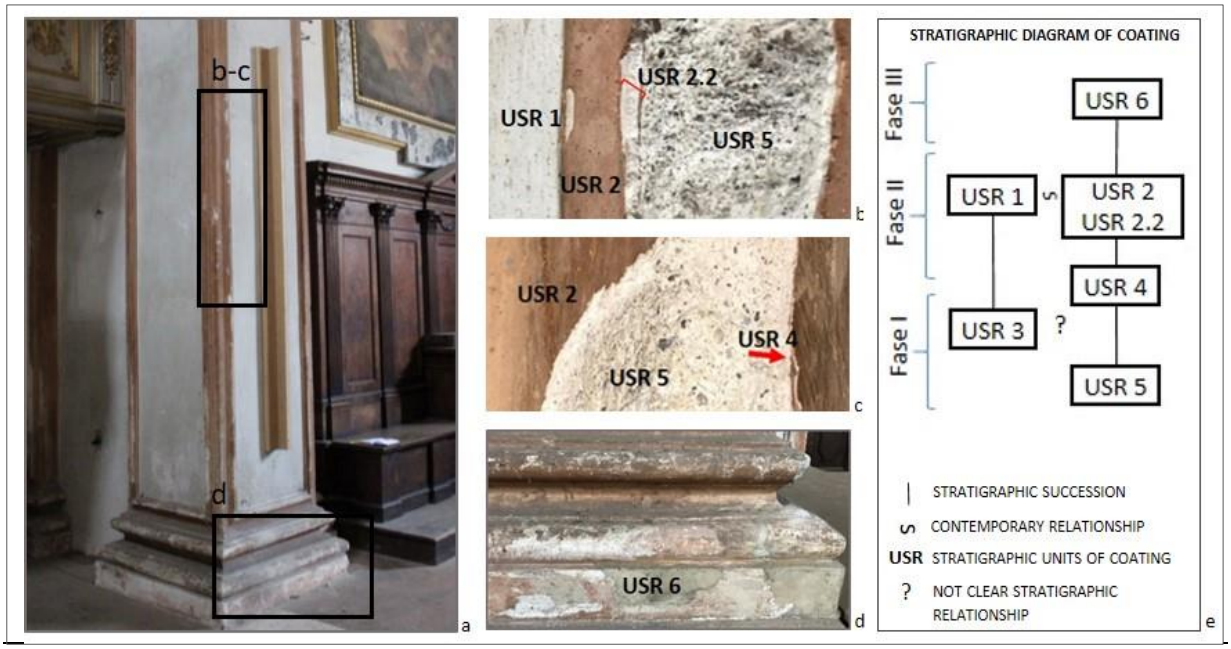

Fig. 5: a-b-c-d: Bergamo, church of St. Michele Arcangelo, stratigraphic analysis of the coating of the choir pillar; e: stratigraphic diagram**.**

4.2 Constructive techniques analysis

The documentation of the constructive techniques is the next fundamental phase that must be connected to the previous; it consists in the identification and distinction of the types of the wall facades, present in a building or even in the same wall.

The different materials that constitute the wall (lithic ashlars of bricks) can be assembled in a different way creating real “plots”. Studying the construction technique means distinguishing and cataloguing all various plots and understanding what logics these follow.

Figure 6 shows the case of a sector of the Roman Amphitheatre of Catania of which the various types of walls have been identified, indicated in the plan, and associated with the different phases of life of the structure (phases I and II), through comparison with stratigraphic studies.

The distinction of construction techniques is very useful for both restoration and historical investigation purposes. It can also guide the understanding of the evolutionary phases of the structure: different construction techniques often correspond to different historical phases.

However, in order to be valid "indicators", their study must be connected with other analyses (stratigraphic, autoptic and construction sequence). Besides, studying in detail the construction techniques allow us to trace constructive details that can provide useful clues to understand the local construction traditions, the artisan construction process, and also to date the techniques and, consequently, the structure phases [11].

The careful observation of the wall is the first -apparently simple- operation to perform: the beginning is the analysis of the shape of the blocks and their method of positioning that, even if apparently disordered, follows indeed a very precise logic (Fig. 7). For example, the more square-shaped blocks can be used as cantonal, diatons or “floor markers” to discharge vertically the forces; others can be used as infill elements. In any case, each masonry has and follows its compositional logic which responds to precise needs (economic, static, seismic, etc.).

Analysing the course of the rows, the alternation of the joints, the shape of the blocks and their positioning, we must try to deduce this logic and that necessarily implies the understanding of the culture behind the structure. In this phase of the study, useful tools are: the photographic documentation, the relief and drawing of the parts and the use of tabs with pre-established voices.

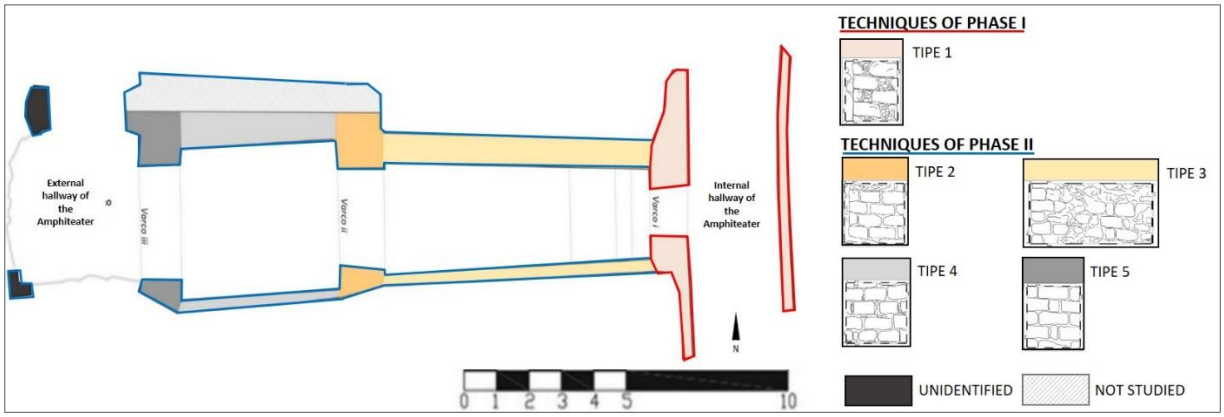

Fig. 6: Catania, the Roman Amphitheatre, sector XXXVI, identification of constructive techniques.

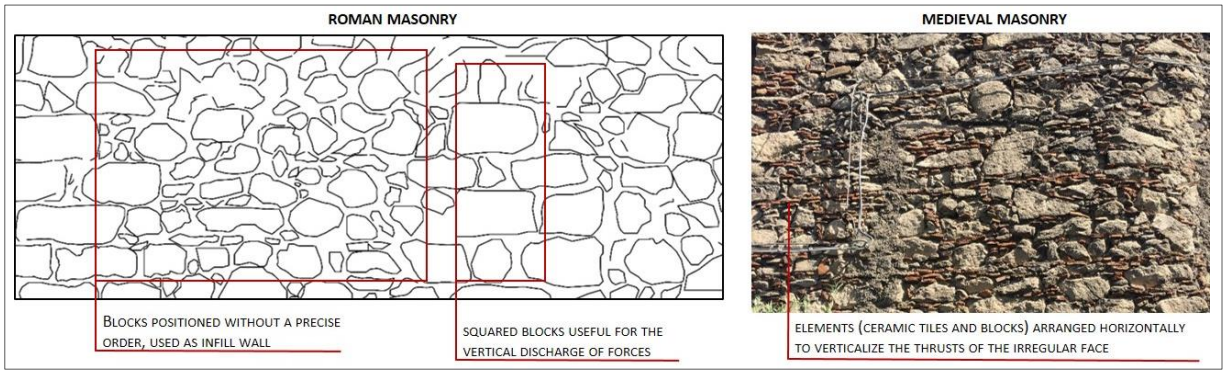

Fig. 7: Examples of wall textures from various buildings.

4.3 Autoptic analysis of materials

Another fundamental analysis for the study of the building is the autoptic analysis of the materials: blocks, bricks but above all the mortars.
The latter are divided into two categories according to their use: bedding mortars and coating mortars.
The formers are fundamental in the masonry structure because solidifying through the carbonation process, they hold the blocks together and contribute to stability.
For this reason, they are related to the construction of the wall and are very useful guiding elements during the studies of masonry stratification.
The coating mortars, instead, are not always coeval with the construction of the walls, they may have been affixed at a later date. However, can be very useful guiding elements to study the changes and stages of use of environments.
Anyway, without prejudice to the use, mortars consist mainly into two groups of elements: limes and aggregates. The latter characterize and distinguish the mortar according to their mineralogical type and their granulometric assortment (size and quantity). Being identifiable, they allow to distinguish or associate mortars even if they are located in distant parts of the same structure whose stratigraphic relationship is not known [12-13]. Often, during restorations the mortars are the first materials to be removed, covered with new restoration materials without careful preliminary studies, causing a strong cognitive damage: it is therefore important to carry out preliminary study and documentation operations in order to draw from these materials all the possible historical information on the building that they witness [14].
Another fundamental theme concerns the use of the mortars: in the restoration of historical monuments are employed mortars with resins or cement totally incompatible with the original ancient ones, that are totally natural-based. Knowing the composition of the mortars allows to propose the most appropriate materials avoiding the degradation resulting either from incompatibilities with the original materials and from the salts contained in the cements, better ensuring the survival of the artefact.
For what concerns the approach of studies to follow, the careful microstratigraphic analysis of the mortars is the first operation to complete; it is important, in this phase, to understand well their position and stratification in each portion of the wall, recognizing also the various layers (recoil, finishing, etc.), then documenting and mapping them in the various elevations graphic survey.

Once the stratification is clear, sampling shall be carried out at different depths to make autoptic and possibly archaometric analysis. Both of them are two phases of consecutive analyses. The first involves a visual inspection of the sample "with the naked eye": the mortar is sieved, its hardness is verified and it is broken down to calculate the percentages of the various parts, the apparent density (MVA) and to study the granulometric assortment (Fig. 8).
In this way a first knowledge of the composition of the mortar is obtained, and if necessary, it can be deepened by laboratory analysis (microscopic analysis; X-ray diffractometry; X-ray fluorescence) to observe in detail the mineralogical and chemical components. This information, often used to date the mortar, exploit the comparisons with mortars with the same characteristics or with other types of investigation still being tested [15-16-17].
Briefly, the study and analysis of mortars is useful for several reasons such as:

- Deepening and clarifying the construction phases and uses of the building;
- Comparing parts of the building whose stratigraphic relationship is unknown;
- Date.

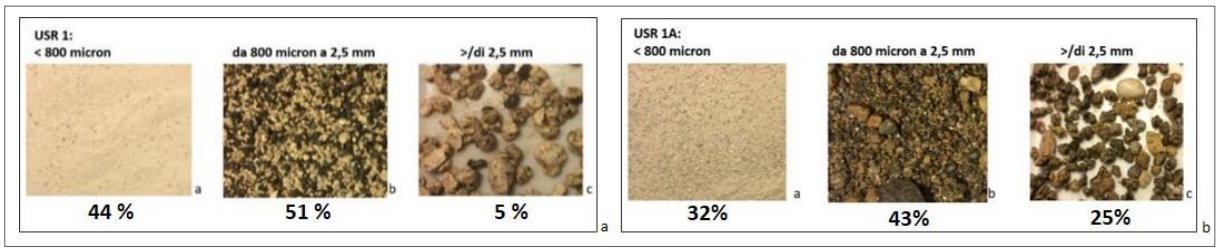

Fig. 8: Catania, Terme Achilliane, two different examples of sifted mortars in three different parts and relative percentages, a: USR1 coating mortar; b: USR1A bedding mortar.

4.4 Analysis of the construction site sequence

The analysis of the construction site sequence constitutes the reconstruction of the sequence of the moments of realization of the single parts of the masonry and of the buildings. This analysis is very similar to the stratigraphic analysis of the walls, but aims to reconstruct the practical actions of the yard and understand their chronological succession.
This analysis is based on: a. the study of the wall ratios, of the alignment of the rows walls and of the support surface of the vaults, b. the study of the construction methods that can be deduced from the comparison between the different parts of the walls; it also requires to have some basic knowledge on the static function of the architectural portions because it is necessary to distinguish which ones, for structural necessity, were made before (load-bearing parts or supports) and which were made after (carried parts) [18-19]. This stratigraphic reading must be done with a different view, not to trace the macro phases of life and change of the structure, but to identify the individual actions carried out during the construction site, “moments” that for logistic reasons have been carried out sequentially. This analysis aims to broaden the knowledge of the architecture and to make the general stratigraphic analysis more secure. Often, two contiguous stratigraphic parts are not related to different chronological moments but rather to two actions made in consecutive moments during the same yard. This kind of study clearly requires to acquire notions of statics and building sciences but also historical notions about the operativity of ancient yards: for this reason, this phase of the analysis should be ideally carried out by the archaeologist and the architect, together, combining their knowledge.
As a case study, the north wall of sector XXXVI of the Roman Amphitheatre of Catania can be considered. The analysis led to the recognition of 17 consecutive moments of construction (Fig.9); in order to understand how the construction of the masonry was made, the distinction of the load-bearing parts from the carried parts was the first operation carried out (stratigraphically and logically the former are laid out first): the recognition of all the structurally main parts, thus, is the first starting point. Proceeding in the ‘reading’ of the masonry entails answering some "guide questions" such as: “what was needed to make that part?”, “What had necessarily been made previously?”, “Could that part hold up statically without the other?” and so on. Besides, at this stage, key points can be the supporting points of vaults, (which can be interruptions between a moment of construction and the other) and the “site stops” (i.e. joints in the walls that mark the end of a day of work).

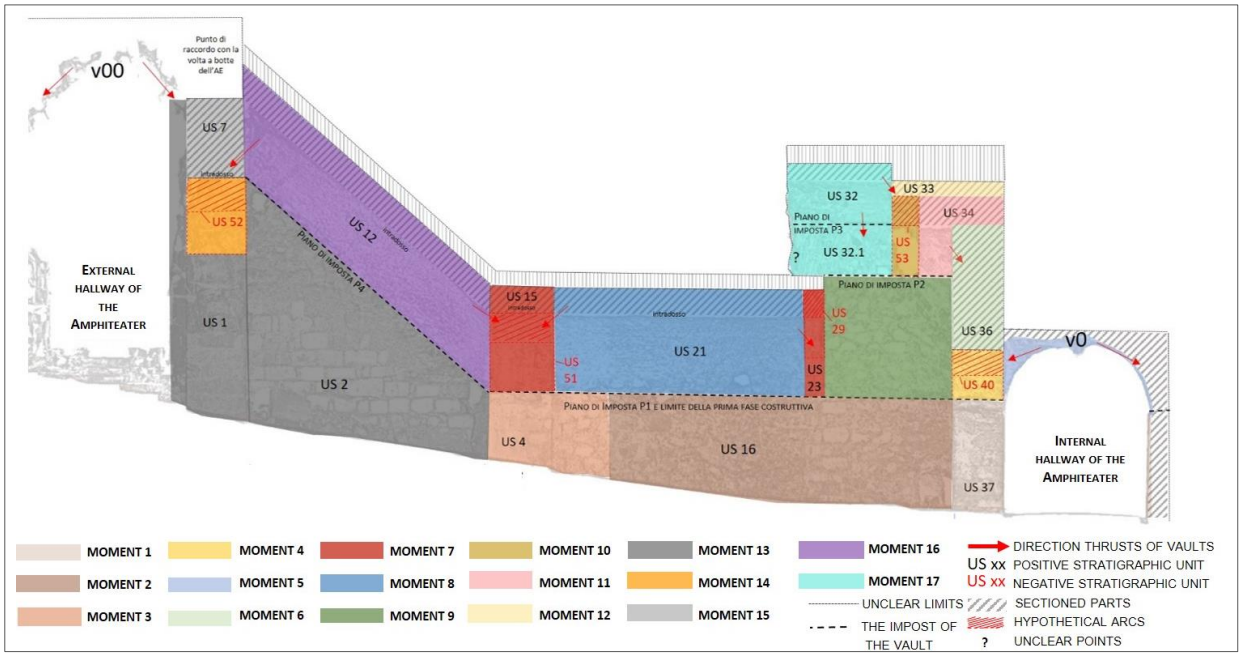

Fig. 9: Catania, the Roman Amphitheater, sector XXXVI, north wall with the indication of the different moments of construction.

4.5 Analysis of the state of conservation

When approaching the restoration of monuments, the analysis of alterations, damage, decay and disruption takes place in addition to the architectural and material relief.

The purpose of this analysis is to document the modifications, loss of value decline condition, quality of functional capacity, process of worse of the structure due to chemical, physical and mechanical process and to natural and anthropic causes. In particular, the *NORMAL UNI 1118*, 2006, and *The Illustrated glossary on stone deteriorrion patterns* (ICOMOS-ISCS), 2008, are two important normative references used to define alterations, detriment(s) and decay [20-21]. They constitute important tools for scientific discussion on decay phenomena and processes and are an excellent basis for tutorials on stone deterioration: by using these guides and observing the walls, various phenomena can be traced and documented. The major intent is to understand the mechanisms (physical, chemical or mechanical) that generate the deteriorations and most of all to trace their causes so as to solve them and block the process of decline and modification of the building, prolonging its conservation [22]. This phase of the analysis also includes a type of structural analysis - specifically of fracture cracking, splitting, collapses – that considers all the breaking mechanisms present in the structure (Fig.10).

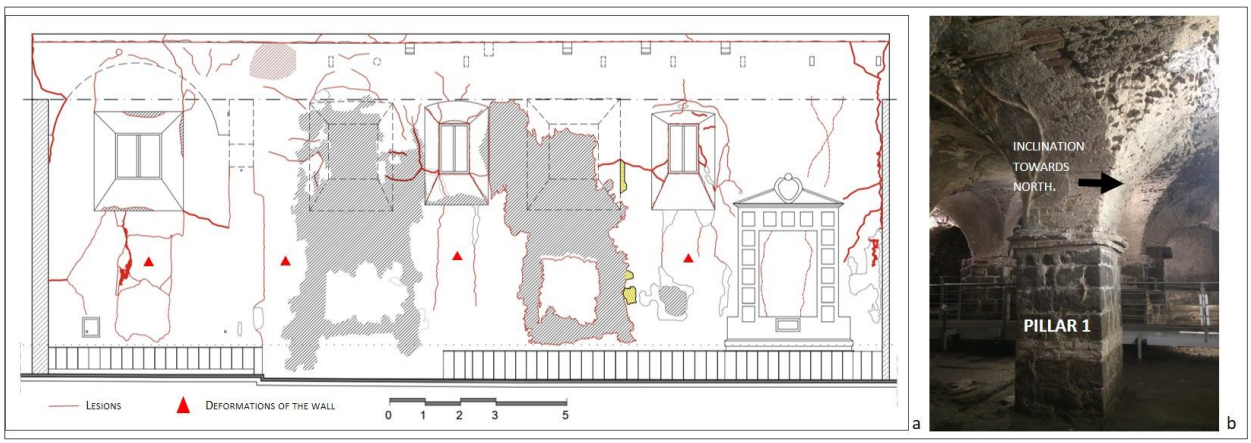

Fig. 10: a: Arquata del Tronto, church of St. Francesco, an example of mapping of lesions and deformations in the wall; b: Catania, Terme Achilliane, an example of deformation of the central pillar.

Similar to the analysis of the degradation, usually also this analysis is carried out by the architects and engineers in charge of the restoration of the building to understand the actual problems, to go back to their root causes and to propose interventions; however, these types of analysis are also important in terms of historical knowledge because injuries and breakdowns can be the result of several actions that have taken place over time and are therefore part of the history of the building. As underlined by the literature [23-24], for this reason they should be carried out also by archaeologists and specifically, by adopting the perspective of new archaeological fields concerned also with the analysis of the seismic damage (the archaeosismology) occurred historically in the structures [25].

5. Conclusions

Throughout the analysis of the different case studies presented in this paper, a major point should have been confirmed: despite their "unitary appearance", architectures are indeed very complex systems, products of stratifications, sums of continuously evolving single parts.

Consequently, their study entails an interdisciplinary approach, following different perspectives - technical, historical, archaeological - which could provide converging or conflicting views but whose intertwining can surely lead to a wider and deeper knowledge about the building or monument. The data collected through the various analysis must be thus cross correlated and compared in order to provide a correct interpretation. This kind of comprehensive, multidisciplinary knowledge has an outstanding importance. But while its significance is widely acknowledged among professionals – for both historical and cultural studies on the buildings/monuments, and for restoration – it is often practically neglected, leading to the irreversible omission or cancellation of precious information: all the analysis mentioned in this paper (historical and archival analysis, stratigraphic analysis of the walls, constructive techniques analysis, autoptic analysis, analysis of the construction site sequence and of the state of conservation) should be always carried out in a real interdisciplinary perspective, and this should imply the engagement and coordination of various professionals.

Up to now, this is the ideal scenario, not the routine: it is quite uncommon to observe archaeologists of architecture taking part in the activities in the restoration sites and, conversely, archaeologists consulting architects or engineers to gather a better understanding of the structural logic of the monument. Moreover, neglecting or carrying out only partially the analysis mentioned in this work could lead to interpretation biases, non-restorative interventions and the irreversible loss of data and cultural information – not only material ones. Downplaying the role of the evolution and time changes of the building would be as – in a parallel with the modern medicine – performing a surgery on a patient without a clear consideration of his/her physical characteristics, age, previous treatments and diseases.

Another major conclusion of this paper revolves around the necessity to adopt a multidisciplinary approach notwithstanding their age, construction period or structure: every building is the product of specific choices and, ultimately, of the culture and social context which created it and that must be reconstructed through the various stratigraphic analysis. Every part of the building is a source of information, as any other ancient evidence of the past: a picture, a pot, a statue, a book. Up to this point, for brevity, the perspective has been focused on the single building/monument considered as a multifaceted system, but a per se unit: but it is indeed fundamental and unforgettable to consider the building also as an element deeply intertwined with its context, urban space and landscape.

This connection is evident under many angles: geomorphological (in the choice of location according to its characteristics), planning (relating the building with the others in the area, or with natural elements), material, (the building connected to the materials available locally), aesthetical (the building respects the aesthetic canons of the context). But widening the spectrum of the analysis requires the effectively cooperation of different professionals and research approaches. Briefly, a interdisciplinary approach.

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WORLD HERITAGE and DESIGN for HEALTH
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ECONOMY|TERRITORIAL GOVERNANCE|ARCHEOLOGY|SURVEY|HERITAGE|e-LEARNING
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Structural design criteria for safety by monitoring of the architectural heritage damage: state of the art reviews

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Abstract
The events that mainly undermine structural safety are both earthquakes, ground subsidence, natural disasters (landslides, floods, hurricanes), both degradation, neglect and lack of maintenance, or even improper maintenance.
So, earthquakes aren't the only responsible for buildings collapsing: some structural failures, occurred in the city of Naples, are connected to the characteristics of its subsoil permeated by underground cavities that can turn into huge 'holes' swallowing the foundations of buildings. In 2015, in the centre of Naples, a historic building used as the Faculty of Veterinary Medicine of the Federico II University collapsed. Few premonitory signs (creaks during the night) preceded the disaster. Same fate for an important building, located on the Riviera di Chiaia, where it was said that the causes were to be found in the excavations of the adjacent underground.
At the light of most recent events too, as the collapse of part of a church façade in piazza Cavour (Naples, 20 January 2021), which seems to be attributable to the floor of an adjacent palace in Vico ai Miracoli, the work aims to explore the most suitable approach possibilities particularly refers to masonry structures classifiable as ancient buildings.
For many years now, the design has been adapting to earthquake criteria, but it has not yet adapted to 'other' events such as bursting a pipe or a terrorist attack or even a progressive simple leaching of the foundation soil.
So, it is important to initiate a discussion on issues about the correct approach to safe structural design for the historical heritage, respect to events of a different kind other than dynamic actions.

Keywords: historical heritage, safe structures, collapse, no-tension material, static actions.

1. Introduction to a different conception of structural model
The masonry architectural heritage is not suitable to be evaluated with the classical elastic theory: it needs to be considered in a different manner.
Very often, the scientists have tried to force the nature of masonry with their models, but finally Authors such as Di Pasquale, Benvenuto e Giuffrè in Italy [1, 2, 3], starting to the 80', and before that Heyman in U.K. [4], have shown that there are more logical theories to start to analyze masonry.
When one decides to use the so-called *Heyman model* to study masonry, he has to change his perspective completely and temporarily remove the words stress and strain from his vocabulary.
It has to going back to using rigid motions such as translations and rotations and few simple concepts about rigid blocks.
But in the end, the efforts will be rewarded because a model much closer to the real behavior will get out.
In fact, the elastic theory cannot be used for the study of an inelastic, inhomogeneous and traction not reagent material such as the masonry.
The natural events, in-fact, have demonstrated that masonry structures fracture, and then collapse. Or fracture, and then re-find a new equilibrium configuration. If they collapse, they mainly collapse as result of fractures due to ground subsidence, and not as result of fractures due to increased load or degradation.
Degradation in fact is a much-discussed phenomenon but not well codified.

What does it mean for a structure to be degraded? What are the parameters to define ‘degraded’ a structure?
There are masonry buildings that appear to be perfectly preserved, but then suddenly collapse, like the famous palace on the Riviera di Chiaia, in Naples, Italy (collapsed in March 2013, Fig. 1a) and there are buildings that appear to be dilapidated but retain intact their structural function.

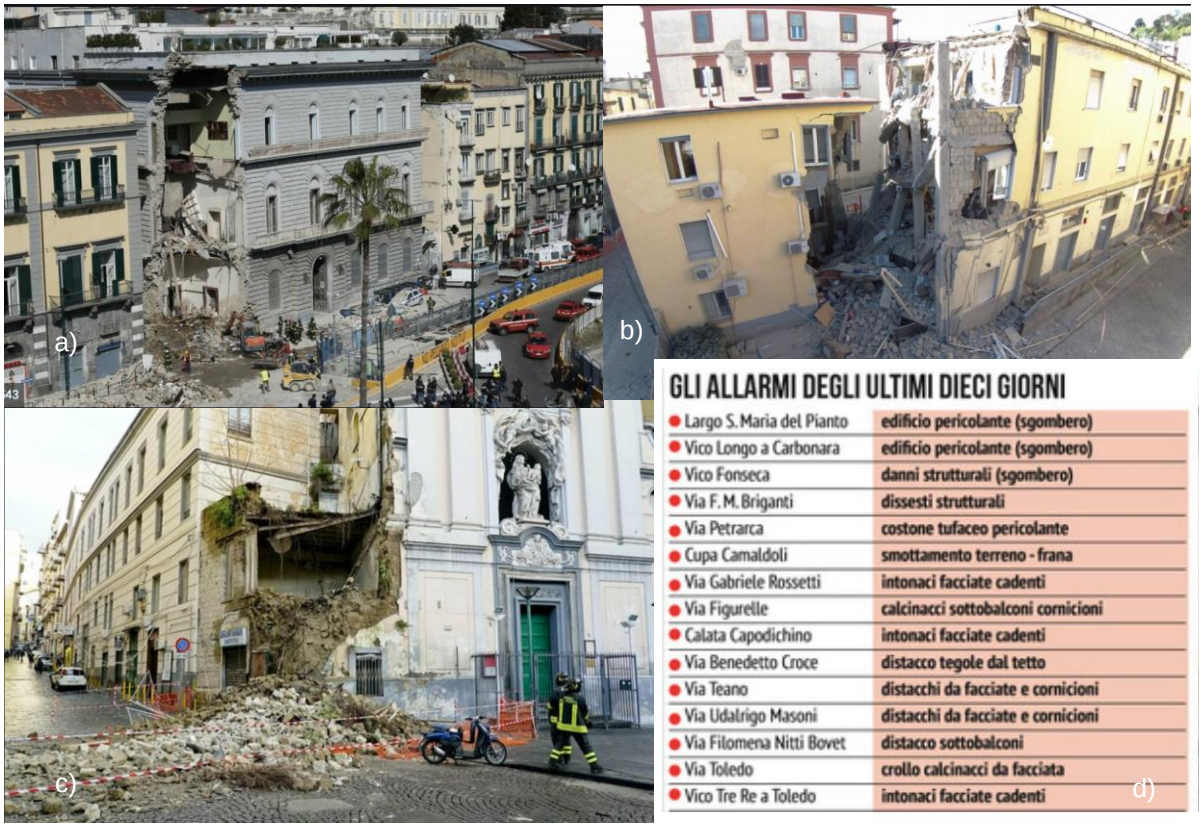


Fig. 1: a) Naples, 2013_ building collapse at the Riviera di Chiaia; b) Naples, 2015_ collapse of a part of the Veterinary Department (Federico II University) [5]; c) Naples, 2021_ collapse of part of the Chiesa del Rosariello alle Pigne façade in Piazza Cavour; d) alerts in the city of Naples from 1 to 11 February 2021, source: Il Mattino.

Each of these situations is caused by local failures which change the configuration of the structure and take the resultant of the loads out of the safe zone, thus causing the loss of equilibrium of the structure and the consequent collapse.
If this had been a strength problem, only the compromised element would have collapsed, but the collapse almost always extends to adjacent portions, so it is obviously a question of equilibrium.
The ancients did not have the technology to build daring elements from the shape point of view, but designed according to simple schemes, always using the same structural elements: the arch to cover large spans in the plane, the stone beam to cover small spans, the vault and the dome as a three-dimensional generation of the arch, the wall with voids and solids (the wall males i.e. the pillars), and the bell tower or the tower.
With these recurrent elements, and without any knowledge of elastic theory, the ancient architects built great monuments, whose preservation should today espouse the fundamental lines of Restoration: minimum intervention, potential reversibility, distinguishability, compatibility (Francesca Brancaccio, 5B s.r.l., post on Facebook, 12 April 2021), by adding only (from the computational mechanics point of view) the word 'safety'.
But safety is safeguarded when the structure is not forced to change its static behavior, when it is not misrepresented in the foundations of its conception. Therefore, safe often means *respect* and *knowledge*.
Masonry is a surprising material: the masonry texture is capable of transforming a disadvantage (e.g. a very heavy load) into an advantage, since more the wall is compressed, more loads stands, than greater is the cohesion between the blocks. But the masonry material main ally is precisely the *form*, in the sense of structure geometry. Working only with geometry, the ancients transformed dangerous vertical loads into an advantage for the structures: think of the masonry arch, whose shape makes it possible for the vertical force to be translated into two components, the tangential at the curve one, that providing the friction between the blocks, and the other, horizontal, pushing outwards, easily balanced by the 'masonry males' or the buttresses. “Arco non è altro che una fortezza causata da due debolezze, imperoché l'arco negli edifizi è composto di 2 parti di circulo, i quali quarti circuli, ciascuno debolissimo

per sé, desidera cadere, e opponendosi alla ruina l'uno dell'altro, le due debolezze si convertano in unica fortezza", that is a famous and *untranslatable* phrase in the ancient Vulgar of Leonardo da Vinci.

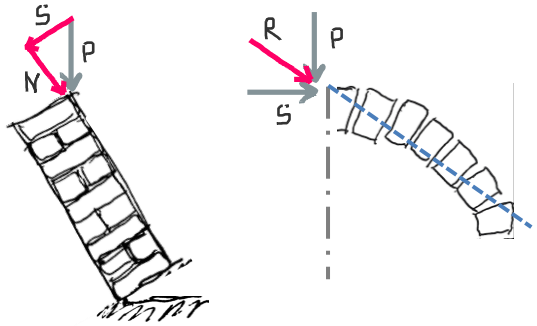


Fig. 2: Comparison between arch scheme and leaning wall.

Therefore, Leonardo realized that the strength of the arch lies in its symmetrical geometry (in Fig. 2, the thrust S represents the action of the arch suppressed part and P the vertical load). In fact, even a leaning tower, if it had its mirrored double to solve the problem of equilibrium, would have no other reason to collapse. So, it would seem that the concept of resistance can be dispensed with.
Today these ideas are taken up by scientists of over the world as Santiago Huerta, Philippe Block, Matthew De Jong, John Ochsendorf, Maurizio Angelillo, Mario Como and many more. [6, 7, 8, 9,10].
A few years later, in 2006, Santiago Huerta in its paper 'Galileo was wrong', writes:
Since antiquity master builders have always used simple geometrical rules for designing arches. Typically, for a certain form, the thickness is a fraction of the span. This is a proportional design independent of the scale: the same ratio thickness/span applies for spans of 10m or 100m. Rules of the same kind were also used for more complex problems, such as the design of a buttress for a cross-vault. Galileo attacked this kind of proportional design in his Dialogues. He stated the so-called square-cube law: internal stresses grow linearly with scale and therefore the elements of the structures must become thicker in proportion. This law has been accepted many times uncritically by historians of engineering, who have considered the traditional geometrical design as unscientific and incorrect.
In fact, Galileo's law applies only to strength problems. Stability problems, such as the masonry arch problem, are governed by geometry. Therefore, Galileo was wrong in applying his reasoning to masonry buildings.

2. The protagonists of the history of construction science and technique

Geometry, construction, stability are *the three aspects* that have to characterize the study of the ancient structures.
Geometry is the focus of the issue, because the form is capable to relocate the loads according to a predetermined position; construction in the sense of the history of the structure, in the sense of the knowledge of the manner in which the element is built and how the builders built at that time; stability understood as the aim of the study, taking into account a rigid-labile model that reaches an equilibrium configuration with assigned loads, concept that exclude the elastic theory developed around 1800s with Cauchy and Navier, and other great scientists.
In order to make actual sense of what has been said, we need to 'understand' two structural elements very significant in classical architecture, i.e. principally the curved structures, such as arches and domes [10, 11, 12, 13] that forms the most important monumental complexes of architectural heritage, and the isolated block, that can be considered the 'matrix' of slender structures such as towers and bell towers [14]; the last ones also suffer other types of collapse mechanisms, which are not only ground failures.
In this paper a chapter will be dedicated the historical Protagonists (recent or less) of studies 'without elasticity' about these elements.
The following picture shows the timeline according to the studies on arches are developed. As we can see, around the 19th century the concept of thrust line made its way out, but already Hooke, in 1675, understood that the shape of a rope that supports its weight in traction is the same as the shape of the ideal arch that supports its weight in compression. *The shape depends on the length of the rope and the distance between the shutters.*

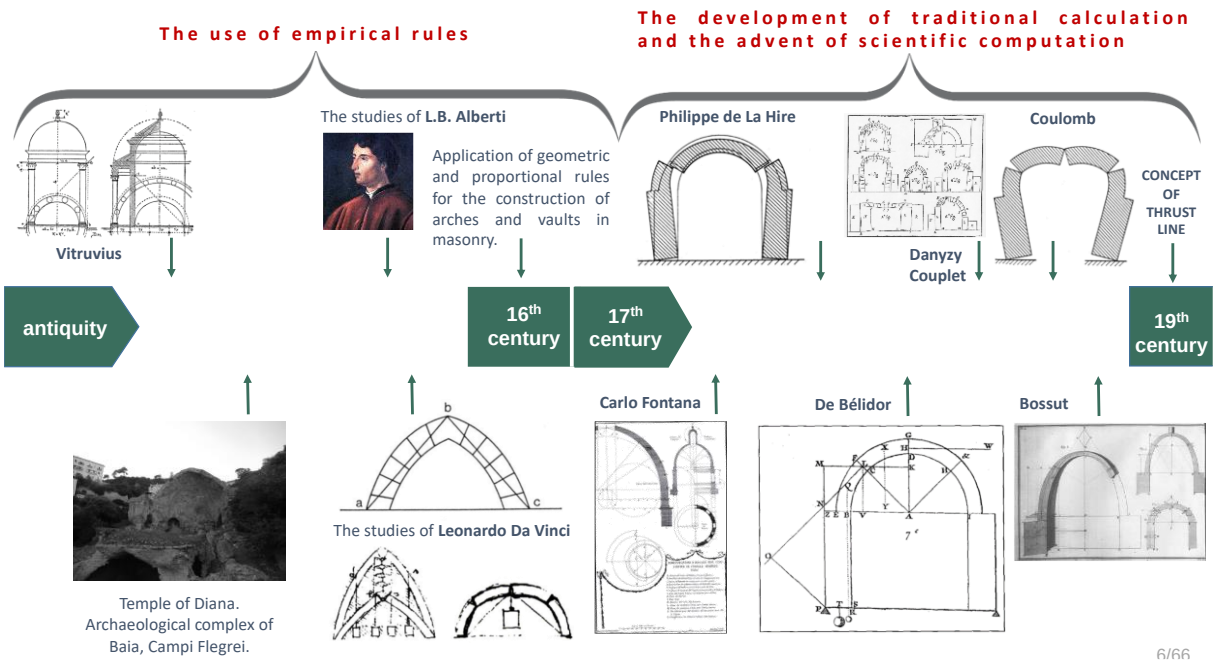
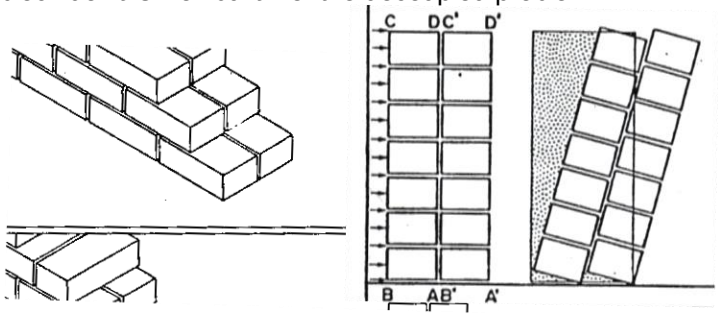


Fig. 3: La cupola di San Francesco di Paola, Geometria, costruzione e stabilità nel progetto di cupole nella prima metà del XIX secolo, Concetta Cusano, PhD Thesis, Università della Campania Luigi Vanvitelli, 2018.

In the early '90s some brilliant Italian professors such as Salvatore Di Pasquale, Edoardo Benvenuto, Antonino Giuffre et al, and international ones such as Jacques Heyman, began a path of research without regard to classical Construction Science and the Theory of De Saint Venant.
They resumed reading the ancient treatises and began to wonder why ancient structures were in such good health after millennia, having been built at a time when there was no knowledge of modern elastic theory.
And so, they began to doubt that the classic duality between force-displacement and stress-strain pairs was always valid, even in the case of materials with well-defined characteristics, such as non-tensile strength, sudden and brittle breakage, and absolute non-deformability.
Architectural heritage is **entirely** built with a material that corresponds to these characteristics: masonry. Masonry has a thousand typological aspects, and therefore it is indefinable by definition, but scholars managed to group together the salient and common characteristics in order to elaborate a theory.
Today many other researchers follow the path traced in the 90s, but the path is still difficult because sometimes someone falls into the temptation to talk about stress-strain...

2.1 The learnings from Antonino Giuffrè

For ancient structures, the problem can be summarized in the control of the actual condition they are in, and secondly in the vulnerability they show with respect to future events or the very duration of their life in optimal conditions.
One of the forerunners was Antonino Giuffrè (Messina 1933 - Roma 1997), professor of structure at the University of Rome, who understood that masonry structures can only be treated with solutions related to equilibrium and with concepts belonging to the kinematics of rigid blocks. In practice, in order to treat masonry material, we must ‘abandon’ the concepts of early 20th century construction science (the famous elastic theory) and rely on statics and kinematics.
Giuffrè’s studies on **masonry texture**, **the rule of art** and the **tilting of blocks**, are very popular. His drawings, almost all meticulously handmade, inspired a whole generation of restorers and structural engineers with a passion for ancient structures.
For example, the follow picture shows, in a simple but genial manner, the problem that can occur if the block don't is well built: i.e. the decoupled problem.



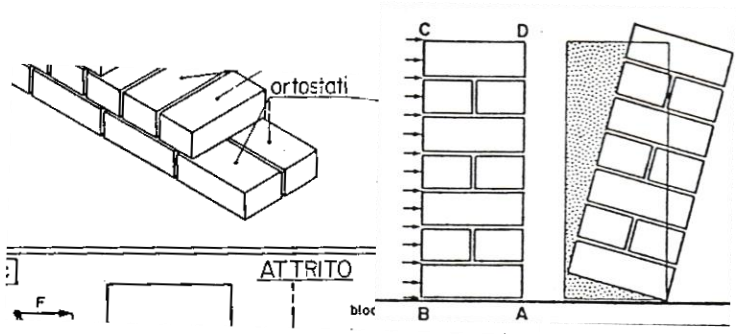


Fig. 4: Some basic concepts of Giuffrè's theory explained to his students in the teaching book Letture sulla Meccanica delle Murature Storiche, Edizioni Kappa, 1991.

This image shows how the boundary condition for tipping varies depending on whether the block can be considered a monolithic block (because it is professionally manufactured), or two individual blocks placed side by side (because it is poorly manufactured).

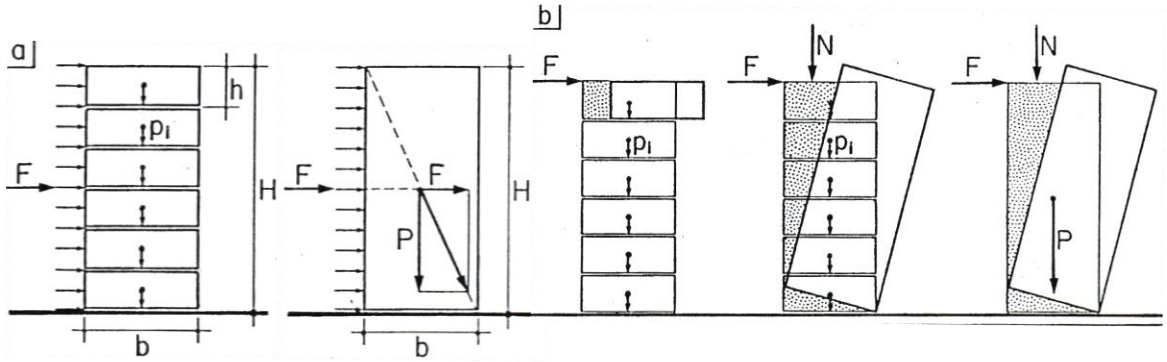
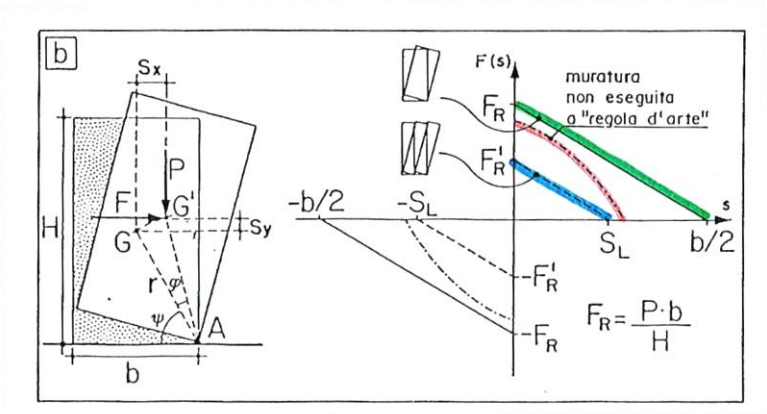


Fig. 5: Other fundamental concepts of Giuffrè's theory explained to his students in the teaching book Letture sulla Meccanica delle Murature Storiche, Edizioni Kappa, 1991.

Giuffrè was one of the first scientists to realize that the elastic theory was not suitable for the study of a non-homogeneous material such as masonry. He then took up the ancient studies of the treatise writers and supplemented them with his own twentieth century scholarship.
Here he shows as the axial force is, for the masonry, an advantage instead of a disadvantage (Fig. 5b).



$$F\frac{H}{2} = P\frac{b}{2};\ F = \frac{Pb}{H}$$

Boundary condition, from which the limit force F is deduced.

F represents the value of the force that overturns the block.

Fig. 6: More fundamental concepts of Giuffrè's theory explained to his students in the teaching book Letture sulla Meccanica delle Murature Storiche, Edizioni Kappa, 1991.

2.2 The learnings from Jacques Heyman

In the 1980s Jacques Heyman (United Kingdom, 1925), at the time Director of the Engineering Department of Cambridge University, wrote his book The Stone Skeleton, in which he formulated a theory that is as revolutionary as simple: for the hypothesis of compressive strength and no tensile strength of the material, the pressure curve must be entirely contained within the geometry of the structure.

The Heyman criterion tells: *If there exists a pressure line for the complete arch which is in equilibrium with the applied loads, including its own weight, and which is everywhere internal to the thickness of the arch at every point and at every section, then the arch may be considered to be in a safe condition*.
Heyman's model has as assumptions:

- ✓ The masonry has infinite compressive strength.
- ✓ The masonry has zero tensile strength.
- ✓ There is no creep rupture between two ashlars in a generic section => infinite creep resistance.

Thrust line theory makes it possible to verify the in-plane equilibrium of entire monumental complexes, using a simple method of graphical statics. The curve precisely indicates any areas of distress on the structure and *one of the possible* equilibrium configurations despite of the damage. The aim is to provide a historical account and a structural evaluation on the construction performing a simplified structural analysis that might be used for the evaluation of all the architectural heritage.
Heyman's 'followers' have produced an international and wide-ranging school of thought, taking up some of his concepts, as we will see in next pages.

2.2.1 Arches, vaults and domes
In Fig.7 the thrust line on the Arcade of Santa Maria Incoronata Church in Naples is showed. We can see that the structure is in equilibrium if we consider the upper arches, but it is in the limit condition for the opening of the plastic hinges if we consider the lower arches, as in the figure on the right (in fact, the pressure curve touches the intrados and extrados of the arch in two points). This means that the true skeleton of the church arcade, the true load-bearing structure, is located above the ogival arches [15].

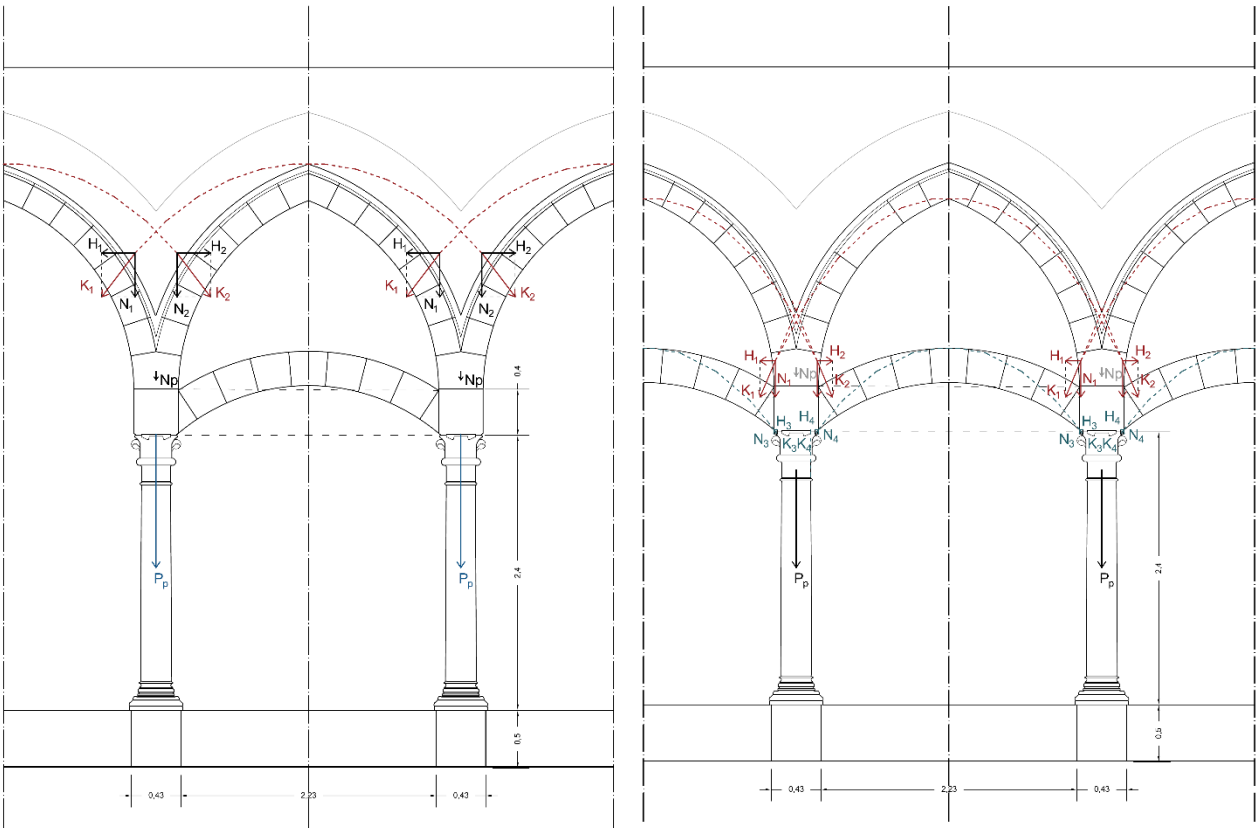


Fig. 7: Application of Static Analysis: the pressure curve calculated on the arcade of Santa Maria Incoronata Church in Naples (Italy).

In Fig.8 the computation of the minimum thrust from the kinematic point of view and the settlement mechanism of the slice is showed [16, 17].
Displacements are common in historic masonry structures due -for example- to consolidation of materials, imperfections in construction or differential settlements in foundations. To allow displacements, a rigid masonry structural element must generate cracks. The kinematic analysis does not aim to define the cause of the displacements, but rather seeks to understand their importance for

the stability of the construction. In this perspective, in addition to the static analysis, a kinematic analysis approach is necessary.

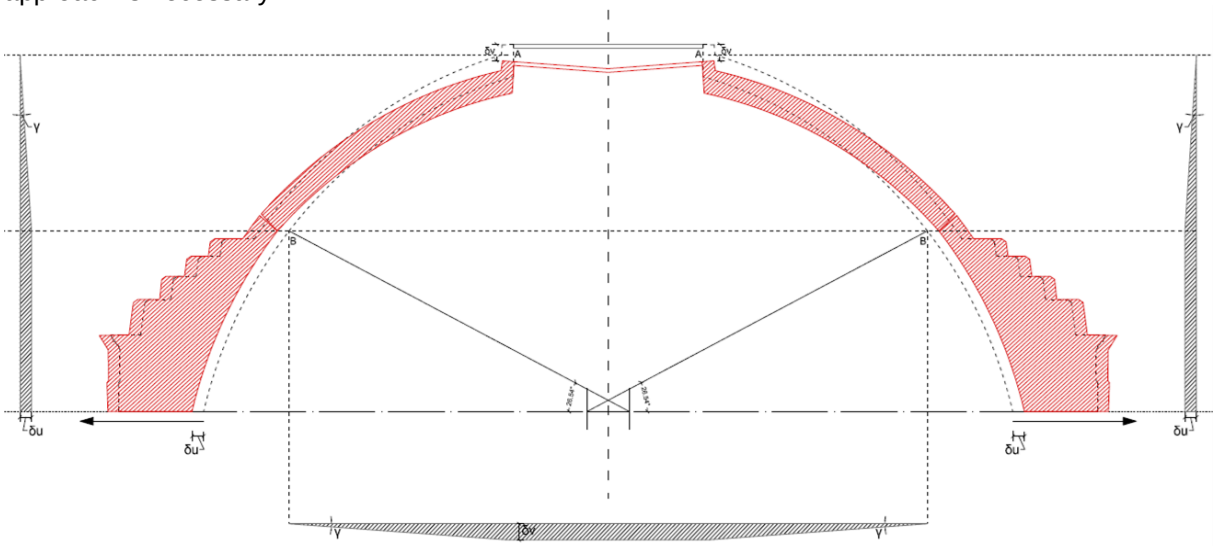


Fig. 8: Application of Kinematic Analysis: graphical valuation of the vertical (δv) and horizontal (δu) displacements on the Dome of San Francesco di Paola in Naples (Italy).

By combining kinematic and static approaches it is possible to comprehend the range of possible movements of the masonry structure and to evaluate its relative safety.
So, while **static analysis searches for one of the possible equilibrium configurations**, **kinematic analysis finds a range of possible displacement**s, assessing the relative stability of the structure.
The limit analysis (*static and kinematic*) bases on the geometry of architectural complex, starting from detailed surveys, from the knowledge of the history construction, to the comprehension of the entire building. The static limit analysis answers the question about the structure *equilibrium*, regardless of *resistance* issues.
The three-dimensional problem is solved by 'slicing method'. It consists in imagining the dome divided into a series of arches obtained by slicing the dome through meridian planes. Every two 'orange slices' form an arch; if it is possible to draw a line of thrust within this arch, then we have found a possible equilibrium state in compression and the dome is safe, it will not collapse [18].
The plane arch in which the calculation is carried out, is extrapolated from the vault by means of the slicing method (Fig. 9) [19].
So, the plane arch in which the calculation is carried out, as static as kinematic, is extrapolated from the vault by means of the slicing method.

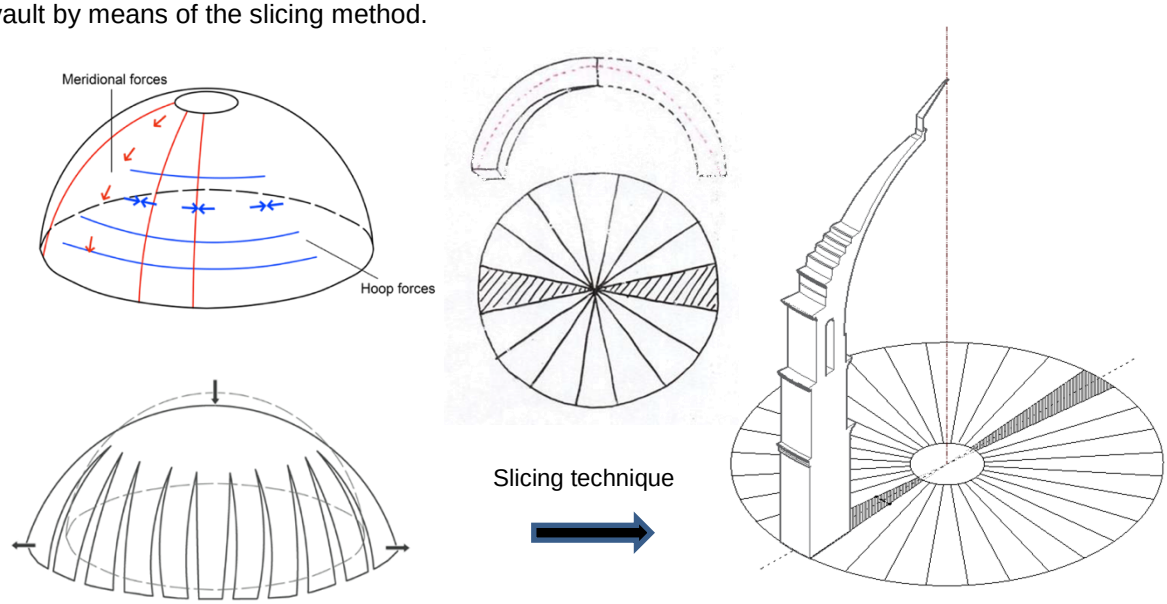


Fig. 9: Extension to 3D, the slicing technique.

In this manner one can obtain a unique methodology applied to three different structural elements (arch, vault and dome) or a whole structure, constituted of several elements of this type, analyzed by a unique

methodology that carries out suitable and direct results for the monumental Architectural Heritage. Of course, this is conceivable because arches, vaults and domes, arise from a single concept.

2.2.1 Bell towers and towers

But the Heyman's studies have had also towers and masonry walls like object, as well as Giuffrè has studied the arches too.

In a paper wrote in 1992 [20], Heyman, starting as ever from the observation of reality (the bell tower in Peter House, Cambridge, was collapsing due to a tree that was pushing against it) (Fig. 10), made a detailed description of the fractures in the towers, differentiating between hollow tower and solid section tower behaviour and developing the maximum inclination that may be regarded as safe for a masonry slender element. Finally, using an 1835 table that Robert Wills compiled on the dimensions of the main Italian campaniles, the Heyman's calculation is able to indicate the inclination values (the exact angle) for which the towers overturn or crack according to the ratio of height to base.

H/b	OVERTURN (°)		FIRST CRACK (°)	
	SOLID	HOLLOW	SOLID	HOLLOW
3	13,4	15,7	6,3	12,5
4	10,1	11,9	4,8	9,5
5	8,1	9,6	3,8	7,6
6	6,8	8,0	3,2	6,3
8	5,1	6,0	2,4	4,8
10	4,1	4,8	1,9	3,8
12	3,4	4,0	1,6	3,2

Table1: Value of inclination critical angle in towers for various di H/b ratio.

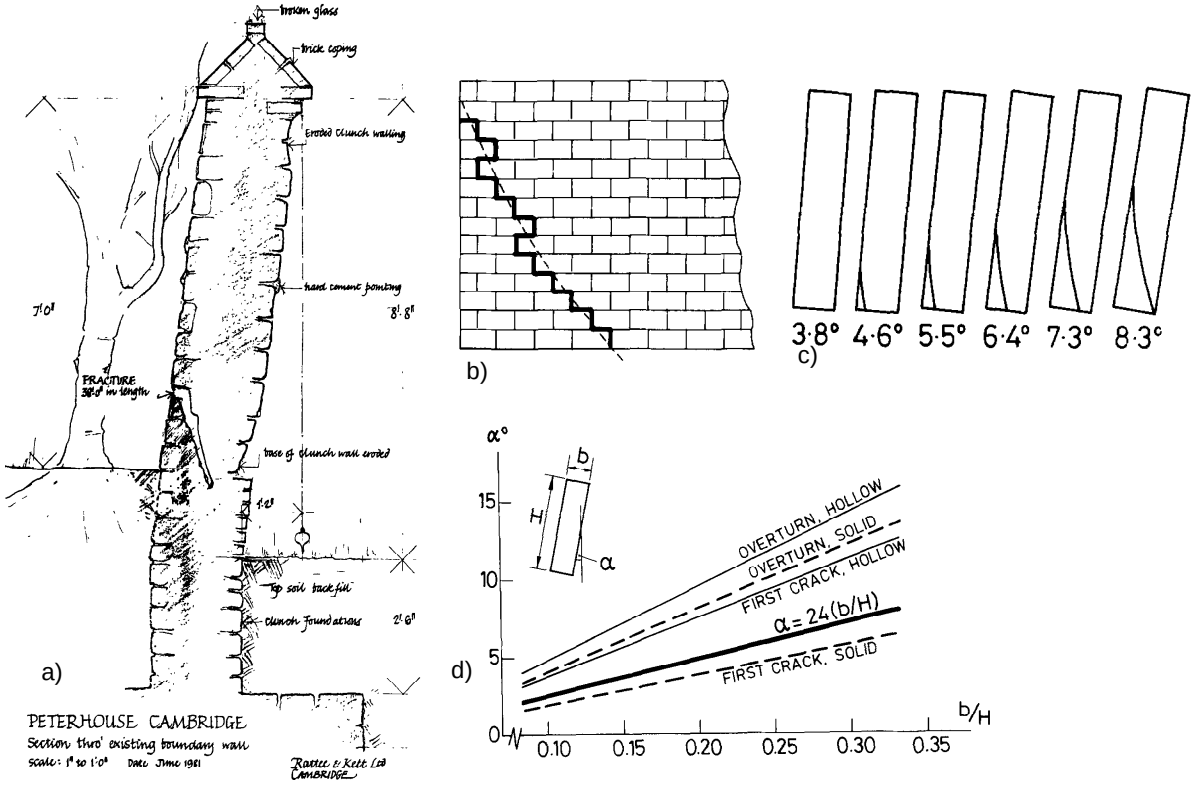


Fig. 10: a) Comparison between a real shape formed by natural causes; b) Representation of an actual fracture; c) Development of fracture as a wall is titled progressively (height/width ratio of 5); d) Critical angles of inclination for towers of various ratios of width to height.

3. More recent developments

Today we have many valid theories, developed in those years, all with the common denominator of abolishing the concept of resistance of the material, and considering an approach of equilibrium, that is to say reaching the resolution of the problem through the statics or the kinematics of rigid bodies.

At the end, the typologies of the past are composed by «classic» and repetitive elements: arches, vaults, domes, bell towers, so a good way to talk about masonry is through the macro-element theory [21].



Fig. 11: Principal structural components of ‘classical’ architecture.

New approaches are being tried out, that take these forerunner theories into account, for example the Piecewise Rigid Displacement (PRD) method. It is a kinematic-based approach useful to solve the boundary value problem finding a compatible displacement field satisfying prescribed boundary conditions. Adopting a displacement approach, the Kinematical Problem is solved through an energy criterion that is looking for the minimum of the Total Potential Energy [22, 23].
Another method, born out of the previous too, is the Modified Thrust Line Method (MTLM), that is a graphic static tool developed by Lau in 2006 [24] for the stability assessment of masonry domes. Similarly to TLA (Thrust Line Analysis), it allows assessing the state of axisymmetric masonry structures through the use of the thrust line. Differently from TLA, the line of thrust obtained through MTLM considers the contribution of the hoop forces.
The Membrane Equilibrium Analysis (MEA) is a complete analytical tool to assess the stability of a vault and find a possible state of stress under the restrictions of Rigid No-Tension (RNT) materials. The driving criterion is again the Safe Theorem of Limit analysis, particularized to three-dimensional structures.
Both these methods have been compared in [25].
So, what if instead of looking for a general theory to model the material, we tried to understand how each of these elements works? It would seem more appropriate to find a specific theory for each single element of the architectural heritage of the past: one theory for each element, and not all elements with one theory. That is exactly what the modern structural architects and engineers are beginning to do, and this means changing the perspective, without tears with the recent past, but in a radical way.
In fact, when studying the single typological element, it's possible disregard the texture of the material and its complexity, while always remembering that, among miscellaneous materials which are grouped under the generic name of masonry, among all the hundreds of different types of masonry, there is a common denominator, which is.... the in-deformability. Anyone has ever seen a masonry building that actually is deforming? **Masonry may break but it never bends!**
It is not daring to say that Heyman and Giuffrè's concepts are like poems: they have always been there, everyone intuits them, but if does not intervene the poet clarifying explanation, which puts they down on paper, they do not take on substance. So, how can everything said so far be carry into University studies? Well, it just has to introduce 'awareness'. In fact, we already have everything, we already have the tools for understanding and acting. It is only necessary to be careful in the passage from the real to the scheme, that the latter does not misrepresent the nature of the former.

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WORLD HERITAGE and DESIGN for HEALTH
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Post Covid19 city. New ideal scenario

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Abstract
The contemporary world has always been confronted with fears related to the new monsters of the present, forgetting the 'ancient' fears. The pre-pandemic condition had led us to question the relationship between the concrete in an absolute sense and green intended in relation to environmental problems. We discussed unfinished architecture and how the living cell could adapt to the processes of time and, without even realizing it, we found ourselves in a new dimension for human in the globalization and the Anthropocene era. Adriano Olivetti in his book "The city of man" that describing the now outclassed living conditions of the early twentieth century, wrotes that in the past "infectious diseases reaped young lives" considering that the possibility that this situation could repeat itself was now out of date; we never could have imagined that we would find ourselves fighting against a virus that would change our lives and that we would have experienced an alienating and claustrophobic condition, just like in a James Graham Ballard story. Through the analysis of pandemic living conditions, the objective of this study is to imagine a post-Covid space that will must consider the housing problems that have emerged by proposing new ideal scenarios.

Keywords: city, architecture, domestic, pandemic, scenarios

1. Introduction
"The house, in the life of man, goes beyond contingencies, multiplies its suggestions of continuity: if it was missing, man would be a missing human. It supports man who passes through the storms of heaven and the storms of life, it is body and soul, it is the first world of the human being ".[1]

James Graham Ballard in his 1974 book "Concrete Island" described the cemented city as a hell, an alienating and claustrophobic condition. His ability to trace reality in a visionary way consecrated him as an author who described desolate artificial landscapes, a mirror of man's relationship with a context that seemed alienating. This vision is not so far from the contemporary condition that it has always been confronted with fears related to the new monsters of the present, forgetting the "ancient" fears. The pre-pandemic condition, in fact, led us to question the relationship between concrete in an absolute sense and green in relation to environmental problems, unfinished architecture and how the living cell can adapt to the processes of time. *"It is a question of interpreting the needs of a habitat that is now completely different from the one in which we were born, which in many of its parts can no longer be defined according to the canons of city, countryside, nature that extends with hitherto unknown dimensions and speed. It is the city of the third millennium that begins, with the greatest phenomenon of urbanism ever known"* [2] Franco Zagari wrote describing the space and relationships of our time. The city, as we have known it, a mirror of both the criticality and the potential of the Anthropocene era [3], until the first months of 2020, continued to devour itself and to manifest more and more strongly that vision of globalization and the desire for equality which at times appear irreconcilable. With the arrival of the New Coronavirus in Italy on February 21, 2020, the paradigm of the cityspace changes and new objectives have been set for the relationship between man, domestic space and collective space.

2. Empty streets: prelude to a new idea of the city

"Nobody would give up on the new civilization, in this age of reinforced concrete, engines, antibiotics, radio and television. Nobody would go back, I don't mean centuries, but not even fifty years. There was no electric light, infectious diseases were reaping young lives, surgery and anesthetics were primitive, work in factories was much more painful than today, in short, the human condition was extremely harder than today" [4], with these words Adriano Olivetti shortly before his death described his time which, reread to the present day, sounds like a warning from a founding father. All that Olivetti mentions, analyzes and mythologizes are none other than the main themes of our time, the elements that to some extent enclose the city that I like to describe as Claude Levi-Strauss does in his famous book "Tristes Tropiques": *"Agglomeration of beings that enclose their biological history within its limits and shape it with all their intentions of thinking creatures, the city for its genesis and for its shape, results at the same time from biological procreation, from organic evolution and from the aesthetics of creation. It is, at the same time, an object of nature and a subject of culture; individual and group; lived and dreamed; human thing par excellence"* [5]. Agglomeration is an adjective that frightens us today, yet there is no city without a community that unites and confronts itself and, as Luca Bergamo writes with the pandemic "On the one hand, the loss of function, of meaning, of entire parts of the urban space, is striking, and questions about the future of the city. On the other hand, it makes visible the paradox of a model of life that immediately loses its meaning as soon as its need to frantically stimulate fantasies, consumer desires, no longer finds ears that listen to it or eyes that look at it" [6]. In fact, I believe that one of the major problems that emerged from this pandemic moment lies precisely in the loss of value of places and spaces that without the human element appear emptied. The memory of St. Peter's Square with Pope Francis walking alone in the center of world Christianity may appear as a timeless symbol of man's loss of the dominion of collective space. If, on the one hand, the city has emptied itself of its human component, on the other, the houses have become the palimpsest of a new history of living in and out.

3. The House seen from inside

"The Domestic project. The man's house: archetypes and prototypes "in 1986 curated by Mario Bellini and George Teyssot at the Milan Triennale is one of the exhibitions that tried to describe the domestic space through numerous languages. On that occasion Achille Castiglioni composed Six people for 72 cubic meters, a house that schematized and isolated the actions of everyday life in small pieces of domestic space. In that setting at the Triennale, with the works of Aldo Rossi, John Hejduk, Umberto Riva, Ettore Sottsass and many others, Castiglioni scene an unusual image, a cynical and ruthless reinterpretation of the house that can be an instrument of reflection in relation to the space inhabited at the time of the lockdown. To some extent, Castiglioni tried to describe spaces dedicated to precise - almost surgical - human actions by inserting it in a real cage. The choice to consider from an exhibition almost thirty-five years ago to analyze the domestic phenomenon of the Covid era derives from the need to start the reasoning on living from the primitive idea of "home" space which is closely linked to contemporary living. *"All the inhabitants of the city are in some ways confined to a sort of" invisible city "made from the interiors of the houses."* [7], Franco Purini writes in the book "The city for man at the time of Covid-19". "Streets and squares, in the center as in the more distant districts, are deserted, and this "metropolitan void" is radically changing, -hopefully only in this difficult period-the idea we have of the city. Public space has become a "forbidden space", supermarkets are besieged fortresses, houses are nuclei of resistance to the pandemic but also of "constricting places" that reveal previously unnoticed, inaccessible and ambiguous senses." [8]. From the idea of domestic space as a nucleus of resistance to constricting space, a new idea of Domesticity is born (sf [from the late lat. Domesticĭtas - atis]. - 1. no com. Familiarity, familiarity. 2. Condition of animals or plants. domestic or domesticated: pigeons living in d.; keeping a little monkey in d. [9] as a representation of a different way of belonging to the house but also of engulfing it. [10] The only space that has allowed the relationship with the other, the outside, are the windows, the balconies, new stories of a place called home. From the reading of the domestic phenomenon, the city has literally changed its face precisely because the living space has performed tasks hitherto unknown for their walls. The lodgings have turned into hybrid places where each member of the family has taken possession of a corner, transforming it into their own world. We have seen some actions staged as in a real performative space

Action I: disorientation
Action II: sharing
Action III: waiting
Action IV: anger
Action V: conditional surrender

The house becomes a place that obsessively sees itself from the inside and that tries to find its way out through the glazed space where *"Cities seem to have vaporized, they appear to us as a fixed scene from our windows or as postcards of monumental places, perfect in their silent spectrality"[*11]., many small ideal cities full of memories of what we have been in waiting to regain possession of the places of our human being. From this idea derives the project The House, an accommodation composed of spaces / monads where each room is an individual place that relates to the external space through a real glass case. This suggestion does not want to have the character of a prescription and has no typological and morphological voluptuousness, but the aim was to imagine a scenario that could be able to crystallize the actions that were at the basis of the time of the lockdown, spaces composed of places that remind us of the sensations experience, the sharing sought in every medium (online and offline) and they gave us the tools to understand how much the sense of unity is the true purpose of humanity. In the description of the space of the house, Gaston Bachelard's text "The poetics of space" can be considered as a predictor of the importance of the beneficial condition of the house as "shelter from reverie, protects the dreamer, allows us to dream in peace"[12]. Bachelard in 1957 could not have imagined how central the house would be in fighting the pandemic and how the city would be for months is framed by the window frame.

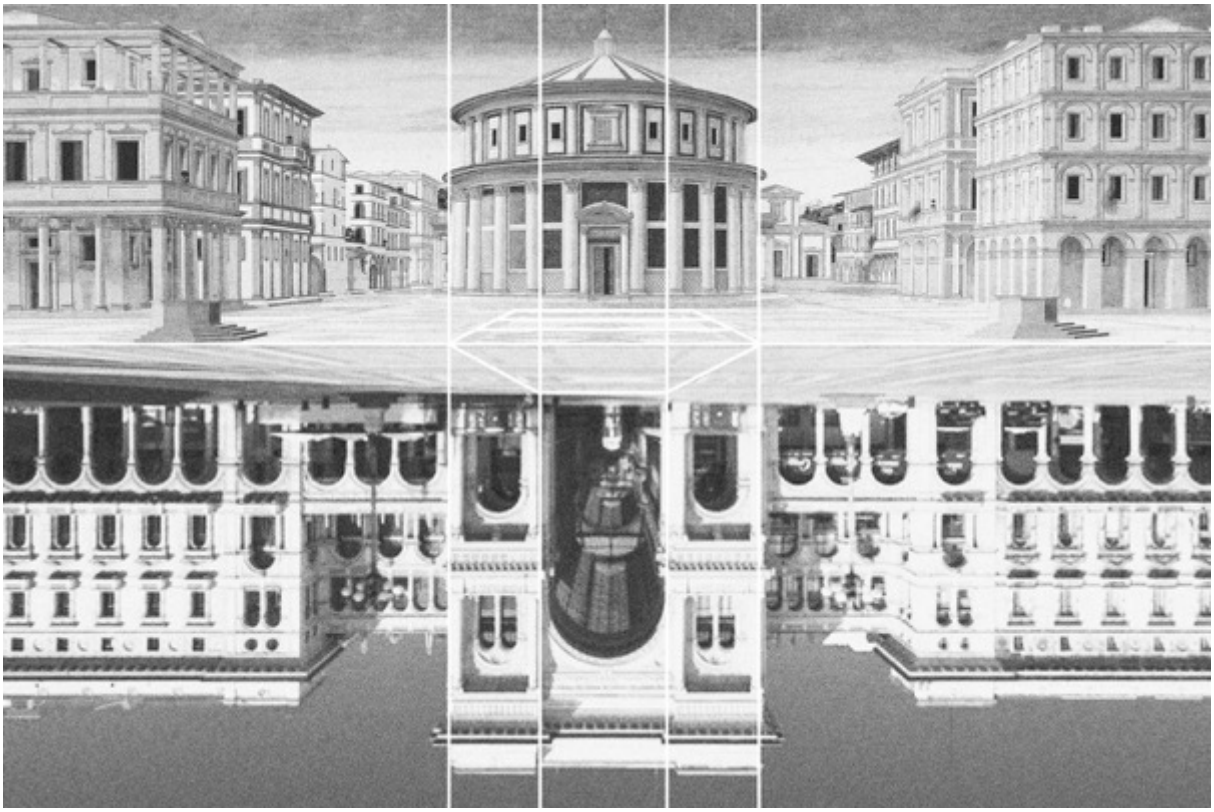

Fig. 1: The (not) Ideal City, Digital collage, Concetta Tavoletta, 2021

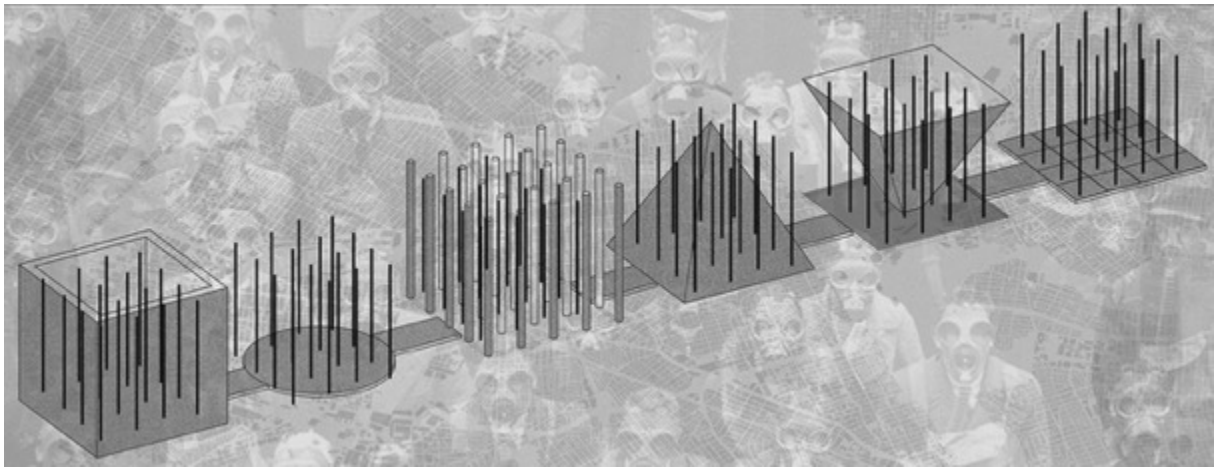

Fig. 2: Scenarios for physical distances, Digital drawing, Concetta Tavoletta, 2021

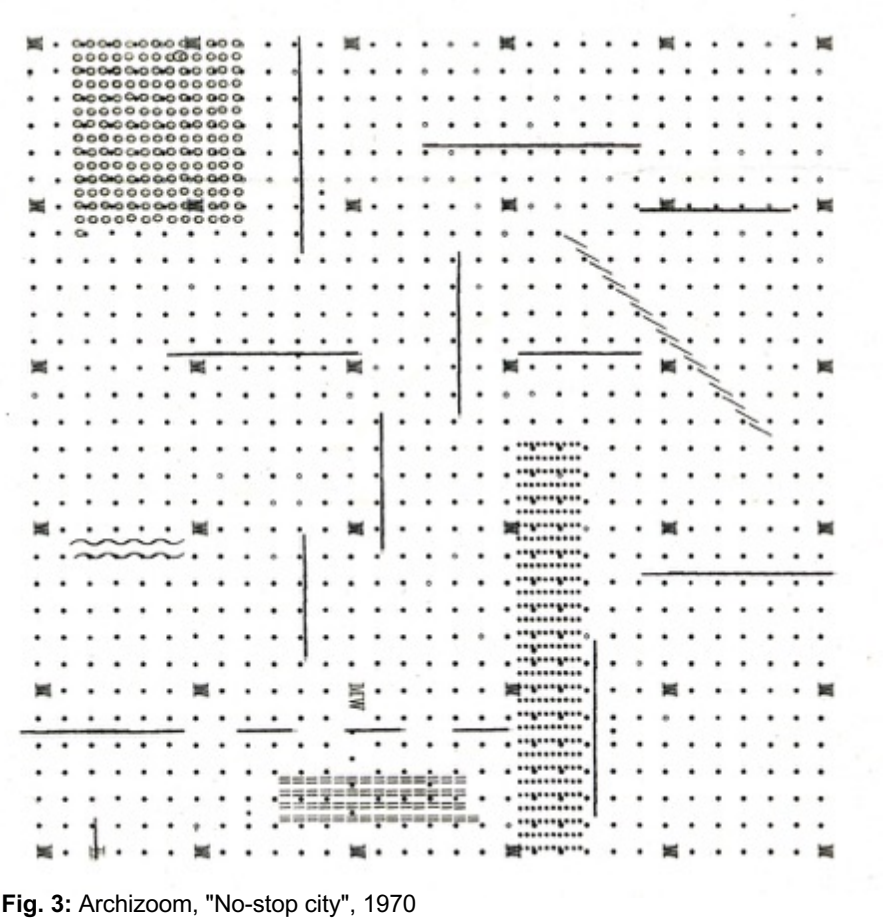

Fig. 3: Archizoom, "No-stop city", 1970

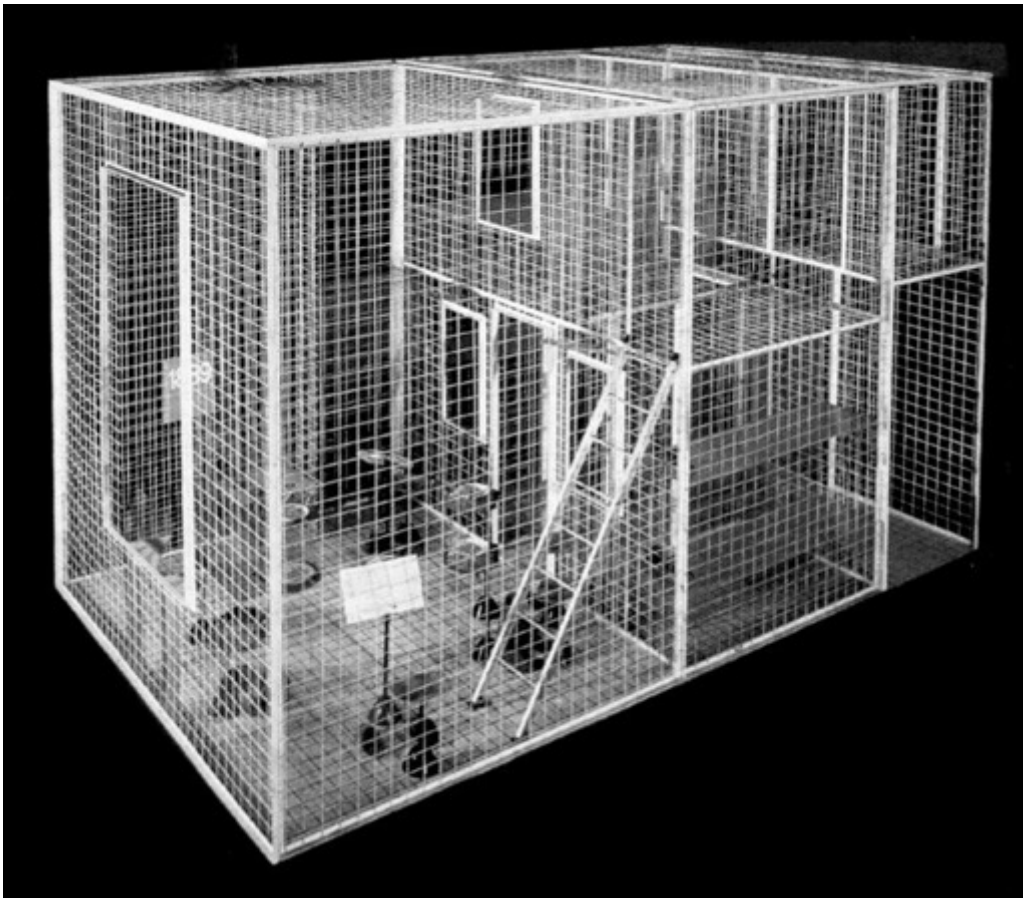

Fig. 4: Sei persone per 72 mq/ Six people for 72 square meters, Achille Castiglioni, XII Triennale di Milano, 1986

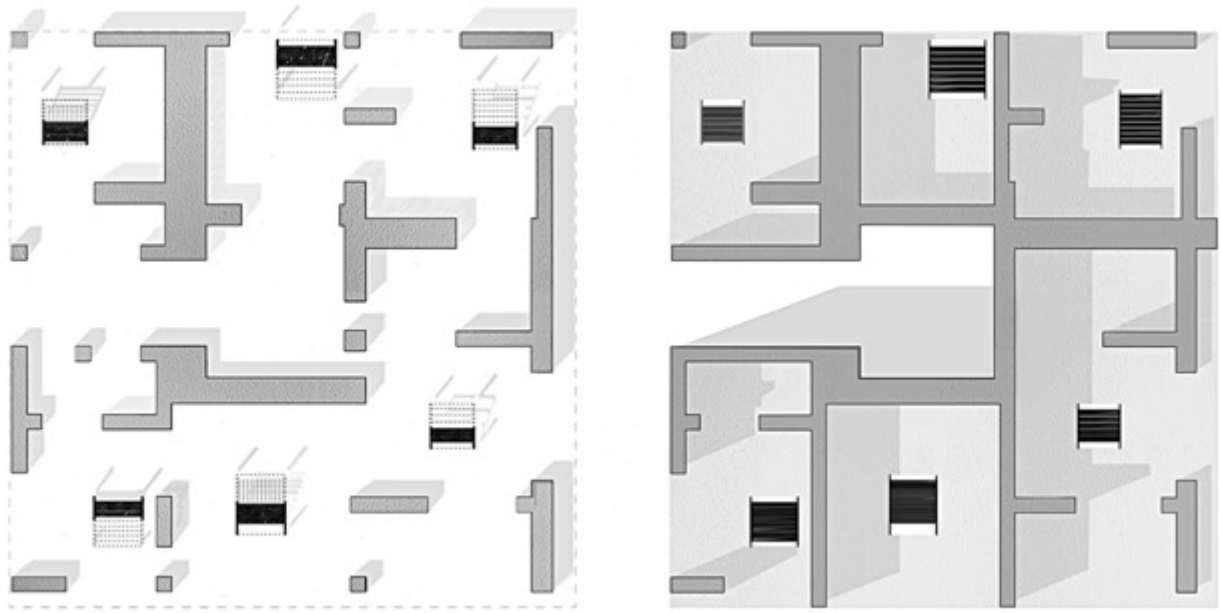

Fig. 5: The House – Thesis by Alessia Galdi, Supervisor Prof. Arch. Alessandra Cirafici, Co-Supervisor Dott. Arch. Concetta Tavoletta, Plan for a house in Pandemic era, First Plan and Second Plan, Drawing by Alessia Galdi

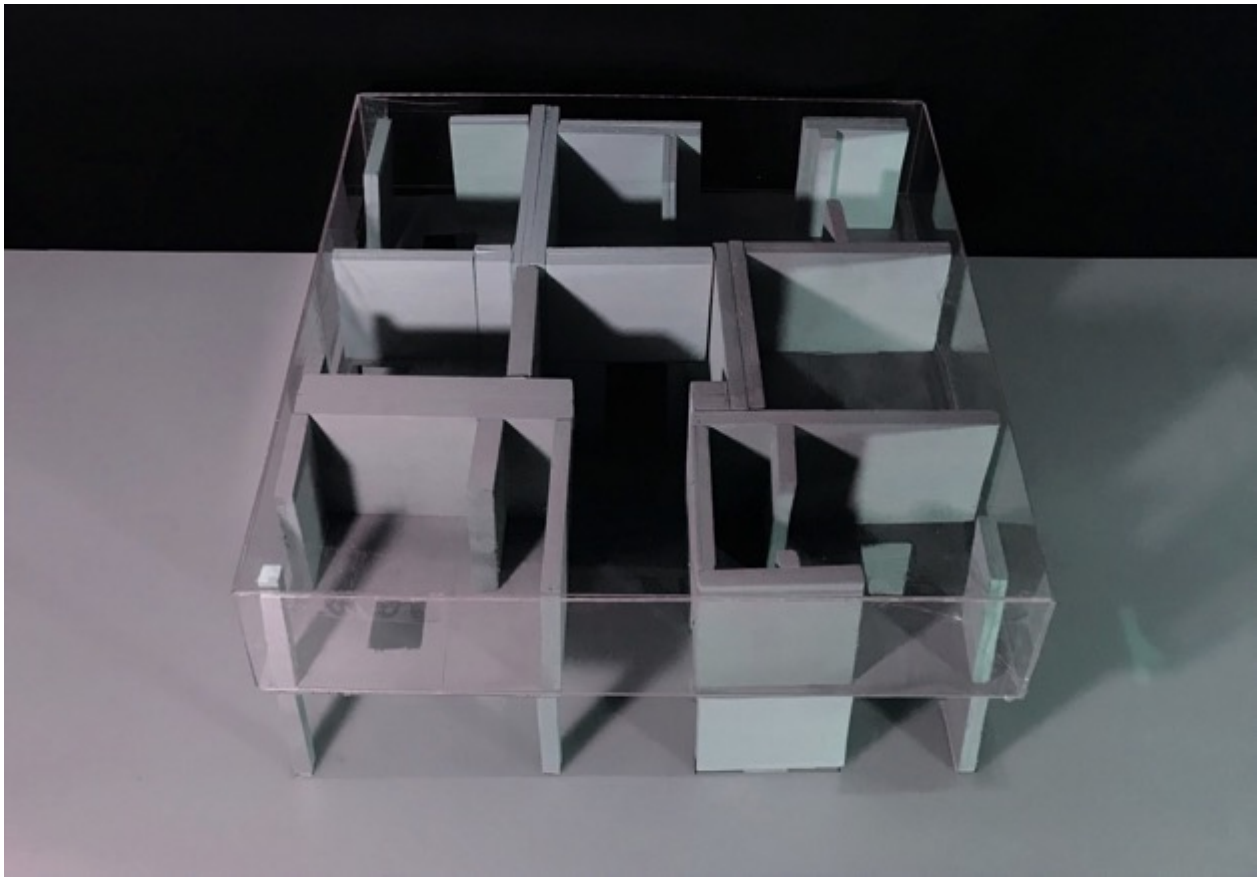

Fig. 6: The House – Thesis by Alessia Galdi, Supervisor Prof. Arch. Alessandra Cirafici, Co-Supervisor Dott. Arch. Concetta Tavoletta, Model by Alessia Galdi

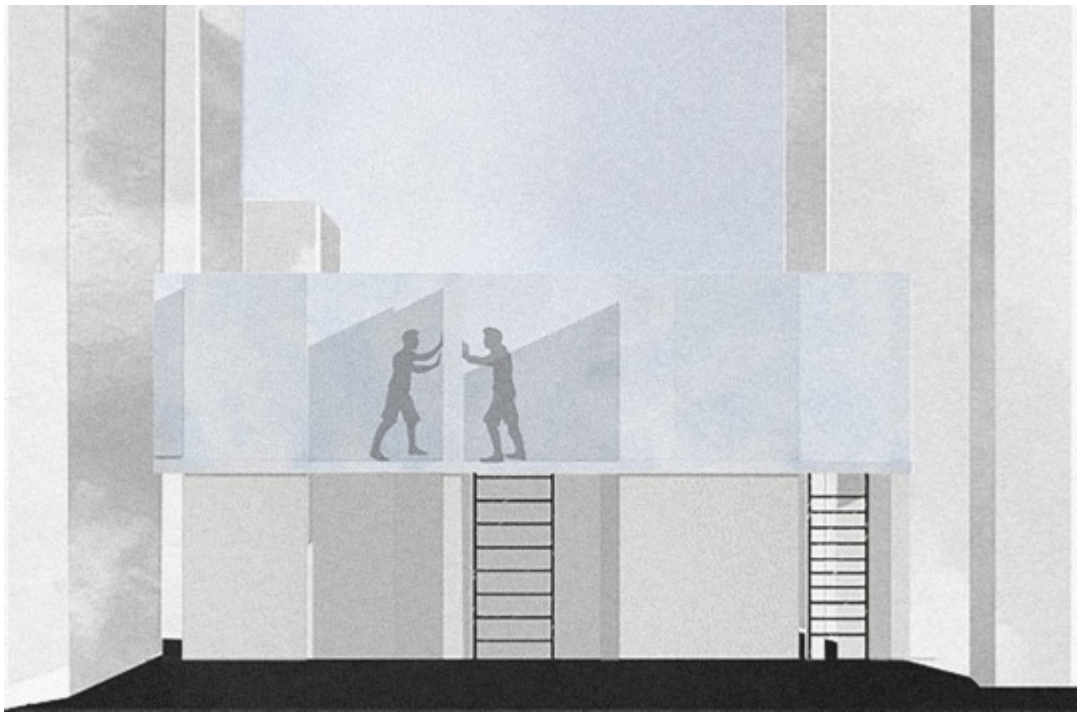

Fig. 7: The House – Thesis by Alessia Galdi, Supervisor Prof. Arch. Alessandra Cirafici, Co-Supervisor Dott. Arch. Concetta Tavoletta, Drawing by Alessia Galdi

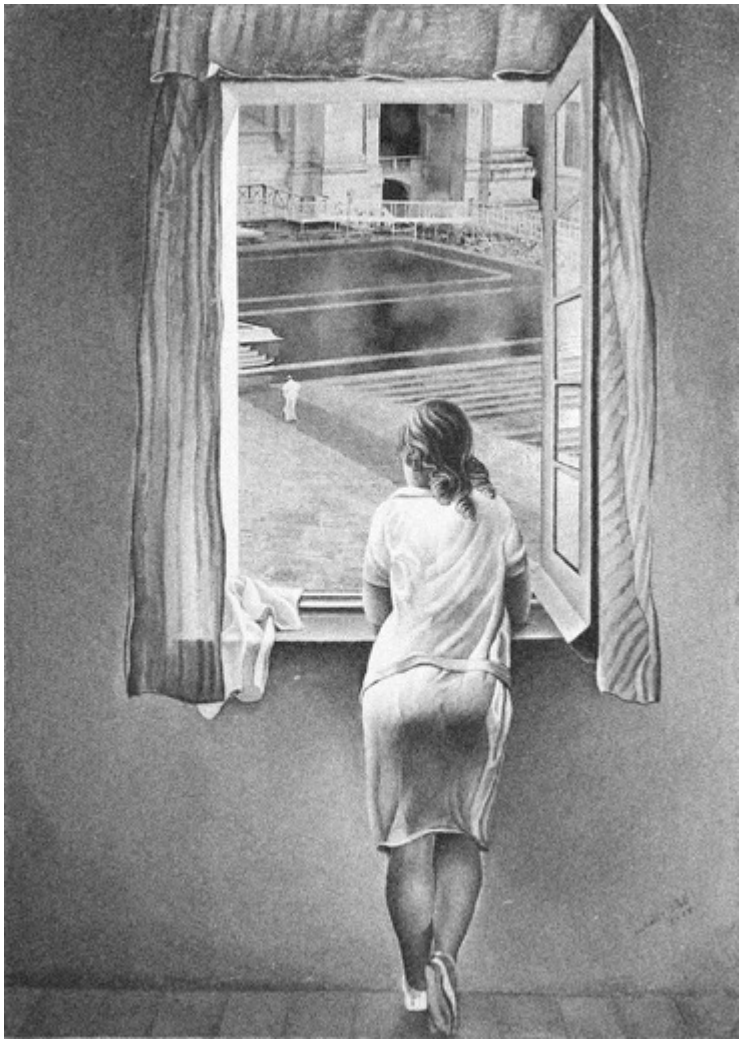

Fig. 8: The window and the city, Digital collage, Concetta Tavoletta, 2021

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WORLD HERITAGE and DESIGN for HEALTH
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Earth as a building material, the challenge of a traditional material in the 21st century Case study: Farewell room for the Serrenti cemetery in Sardinia

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Abstract
Earth as a building material undoubtedly has a strong fascination that merges the figure of the designer with that of the builder opening up various ecological, market and design perspectives. Many buildings have been constructed using this material since ancient times, some important in terms of size and cultural value; however, it is not frequently utilized nowadays, so it is natural to ask why such a promising material is not widely used. This paper presents the synthesis of research which aims to answer this question, starting from the study of historical examples leading up to the use of this material in the 21st century. Usually building materials can satisfy certain hygrothermal and mechanical characteristics, but when it comes to earth it is impossible to find univocal parameters. This reveals an even more worrying gap at an experimental level and above all in establishing general practices that make it impossible to compare the results. In turn it is reflected in the production of legislation where difficulties occur in abandoning the well-established empirical practices and therefore making worthy updates. Through this case study, the project of a small earth building in Italy, it was possible to verify the building construction problems from the point of view of regulatory response as well. The results of the research show how little is missing for a complete regulatory validation of this building material, thus being able to expand its use by designers.

Keywords: Water affinity, regulations, sustainability, green blocks, farewell room

1. Introduction
We live in a reality founded on continuous production, which manages to control less and less the effects that this entails on the environmental but also on the social and economic level. There is no lack of measures worldwide, so much so that today we all know the meaning of sustainability and "green" choices are increasingly socially accepted and favored, but these are sometimes only deviations from the main problem, whose imponderable solution would consist in interrupting the productive cycle. The construction sector has a big role in this, is one of the main producers of waste and emissions, if the problem is inserted in this area it is inevitable to look with interest at a material such as earth, as the one that comes closest to an ideal. interruption of the cycle: it is not produced but it changes shape. Why then does its diffusion remain linked to historical examples and sporadic cases?
The following paragraphs are presented as a conceptual path to evaluate the problem of the use of earth today, according to the different approach: traditional, innovative, historical, regulatory and sustainable. In the second paragraph, through the review of the best known techniques, their evolutions and some historical reflections, we try to understand what it means in practice to build on earth, and then continue to the third part where we try to understand with experimental bases what hinders the construction on earth, how the material is perceived by the regulations and what role it plays in sustainable turns. Finally, the article concludes with the case study where the problem is limited to the

Italian context through the design of a simple load-bearing clay building, to understand what limits are found at the regulatory level and how it is possible to initiate mediation.

2. Building with earth

Building with earth, for those who have never been interested in the subject, might seem an amateur gesture. In fact, this building material can be applied through many well-defined and documented techniques. The best known traditional techniques are rammed earth, torchis, bauge and adobes.

The rammed earth is a technique that in sporadic situations has regained some success in the last twenty years due to its aesthetic appeal. It is a very simple technique where the earth is used as soil: it supports the loads thanks to a high degree of compaction which in this case is artificially rendered. This technique returns a monolithic perimeter wall made by compacting the earth inside formwork having the thickness of this. The earth used ideally should be that from the excavation. In general, it is a land with a low clay content and the presence of aggregates so as to avoid cracking during drying. The necessary tools, in addition to the standard construction site ones, are formwork and compacting hammers. Technological advancement has been interested in both by creating pneumatic compactors and ever lighter formworks, but always preferring wood, which has proved to be the most compatible material for earth due to its ability to absorb moisture and prevent it from sticking. In particular, in 1976 in America David Easton (president of Rammed Earth Works) create the "California form", where the internal clamps were spaced up to two and a half meters thanks to the presence of horizontal external crosspieces placed at close intervals that stiffened the structure and not only did they become a sort of ladder for the operators [1]. In the twenty-first century, rammed earth was also used prefabricated, famous for this is the Austrian Martin Rauch. The components of the wall are industrially made like huge bricks and joined with simple mortar also thanks to the help of tapped joints.

Torchis is a non-load-bearing technique that historically proceeds the remaining ones, having developed as an extension to natural shelters, and can also be considered the first composite material: a fibrous structure, which resists traction, and plastic earth, a component that resists compression [2]. The earth used is much more fluid than the beaten one and is mixed with vegetable fibers that create a mesh that adheres to the main wooden frame. The earth mixed with straw between the end of the 10th century and the beginning of the 9th century BC autonomously built the wall, slowly becoming the technique that is now known as bauge [3] (widely used in Africa). This natural composite material has found its standardization in the idea of its extrusion up to one of the most recent results. In 1984 at the BRL, University of Kessel, the “Stranglehm” technique “strip of earth” was used, with this a prototype of a house was created. An extruder, which produced strips of 70 cm of earth had been positioned centrally to the building to be built, the operators stacked these to form the wall perimeter [4]. After just under half a century, this mixture, in a project by the Italian company Wasp, went to power a giant 3D printer, to create the first 3D house generated with earth. This project has opened up numerous constructive perspectives: “… minimum levels of environmental impact in the face of infinite design solutions.” [5].

The last traditional technique on our list is adobes, nothing more than clay bricks. These are traditionally made by throwing a mixture of earth and straw, quite plastic, into parallelepiped wooden molds. The mold is lifted and the bricks that can be used after adequate drying are immediately created. The adobes technique does not present any differences to classic masonry. The mortar used must also be based on earth or lime, with the attention that it is equally elastic. The adobes find their counterpart in contemporaneity first in the compressed earth blocks (BTC) then in the green bricks.

BTC was born in South America thanks to the Chilean engineer Raul Ramirez who in 1952 ivented the CINVA-Ram machine. A machine, manually operated, of reduced dimensions which, thanks to a lever, pressed a mixture of earth and concrete inside to create the blocks. This invention was very successful because for the first time it endowed earth with a technique with an important hint of modernity and standardization. The problem that makes it the subject of criticism to date is the need to use cement. The cement makes the mixture lose the possibility of being recycled with all the implications of the case. This is inevitable because the block arises from a single compression action and the cement serves to keep it sufficiently cohesive. A very valid alternative to the classic adobes or BTCs are the so-called green bricks. These are nothing more than classic bricks, made from a formula with only less clay, which skip the firing process. Skipping a process is not industrially more advantageous for today's highly automated processes, but with proper foresight and cross methods (such as drying blocks with the heat of traditional brick kilns), green brick is one of the techniques with more environmental and economic perspectives, because they would make it possible to reuse not only the raw material but already existing production centers.

We have seen how the study and innovations for the earth as a building material take place almost all over the world because its millennial history and nature have allowed it to spread globally. The history of the use of earthen material is important to see extraordinary examples of its application. The earth is and was a material available instantly and everywhere perfect for sudden needs such as those of war, which is why it is found in the remains of fortifications from China to North America, as in the "forts" against the natives. It was widely used, for the same reasons, even in vernacular architecture from the

poorest strata, so it is not always possible to find traces of it. Surprisingly also by Greeks and Romans of which we only remember the works that survived the time, those in stone or brick. In South America, hidden under the stone, the earth formed the nucleus of the great indigenous pyramids, while in West Africa it was used bare for religious buildings, as in the case of the extraordinary mosques (still in excellent condition) of Djenné (about 1200 AD) or Timbuktu, with the achievement of considerable heights [6]. Finally, the Pueblo de Taos (pre-Hispanic settlement) in New Mexico and the tall buildings of Shibam (around 1700 AD), in Yemen, are among the many testimonies that demonstrate the potential that the land has also in the residential area, both in comfort and in establish limits not yet tested.

3. The challenge of earthen construction

From the brief excursus of traditional clay techniques and their evolutions, seen in the second paragraph, we can see a certain simplicity in building with earth shared and implemented globally with surprising results as guaranteed by the paradigmatic historical buildings. Precisely this simplicity betrays the earth. In fact, being an omnipresent material that is easy to put into practice in a practical way, it makes you think you have a deeper knowledge than this actually is.

If a more engineering evaluation of the material is advanced, the first limits to the diffusion of its application arise. First of all, as regards the hygrothermal properties, we realize that there is an obvious difficulty in giving univocal values. In general, also for other parameters, a problem is the heterogeneity of the earth, specifically, instead, we have to do with a porous, highly breathable material which, with external variations in humidity and temperature, varies its water content internally. and therefore allows you to regulate humidity and heat but makes it difficult to predict. The amount of water is also decisive for the mechanical properties. Multiple studies show how the compressive strength and Young's modulus decrease as this increases. Furthermore, it also emerged that the resistance values are susceptible to the geometry and proportions of the specimen [8]. Paradigmatic is the article produced by Aubert and other scholars in 2013, with the captivating title "A block with a compressive strenght higher than 45 Mpa!"[8]. This relationship illustrates how the particular relationship between the dimensions of a block and the interaction of its sides with the surfaces of the compression test machine made it so that it did not realize that it had gone into crisis attributing to it a resistance equal to its maximum load of 2500kN. Furthermore, another aspect concerning mechanical properties concerns how the earth is perceived. In fact, if you look at this as "soil", the water present in its matrix takes on a completely different meaning and would fall within the boundaries of geotechnics. This allows to partially solve some problems but presents others. The crisis of the material would be linked to friction while it would not deal more with the compressive strength alone but also with the effective effort, but unfortunately also at this point giving in to a simplification and not taking into account the presence of air that a in turn complicates the geotechnical assessments.

The not so simple nature of the earth as a building material and its existence in a variable regime are not the real limit for this material as, despite the knowledge of these factors, at an experimental level no guidelines have yet been established. In the first place it would be appropriate to establish the standards to generate the so-called "dry mass", on which all the values that can be determined experimentally depend, following well-defined laboratory practices such as the shape of the specimens and the environmental temperature conditions at which to perform the tests. .

This uncertainty at an experimental level is reflected at the regulatory level where it is still difficult to abandon traditional and empirical evaluation methods, and very conservative designs.

In Europe the most prolific country for earthen matrrials legislation is Germany, not surprisingly, this in fact was interested in the material even at the end of the Second World War, when it was in hardship, with the drafting of the "Lehmbauordnung",a code that collected all the technical knowledge on earth acquired. The interest was reborn at the beginning of the century for raising awareness on environmental issues and today in Germany there is a special council for earthen matirials within the German standardization institute (DIN) which has six standards under its belt, for blocks, masonry, plasters, vocabulary, compliance and the latest for earthen boards dating back to 2019. Spain and France present a voluntary application standard on BTC, very similar with the difference that if in the Iberian peninsula it is a full-fledged standard in France remained at an experimental level. A cautious but justified position, due to its high seismicity, has also been taken by Italy where there are no regulations for earth but only the proposed laws that have not been successful precisely due to, most often highlighted, a technical deficiency. In the rest of the world, most of the rules always concern BTC, a legacy of its success and enormous diffusion in developing countries at the end of the 20th century. In Africa, the continental standards produced by the ARSO (African organization for standardization) for BTC were rectified in 2019. Also in Brazil as in Germany the regulatory apparatus (ABNT) has a specific commission for earth and after updating standards for BTC recently approved the “ABNT NBR 16814: 2020 adobe requirements and test methods” and is currently working on the next standard for compressed earth walls. Also in South America, the case of Peru is of interest, where the national building regulation (RNE) recognizes earthen materials among the construction systems allowed in the country. In 2017 this was updated, but as early as 2000 the earth could be found there as adobe. The standard is indicated at

number E.080 as "design and construction with reinforced earth". This is because, given the high seismicity of the country, the norm is obliged to reinforce the earth, for example with internal bamboo or mesh structures that wrap around the walls, with a still very traditional and practical style. To find the (perhaps) most refined and modern standardization, one must look to New Zealand, which since 1998 counted on the NZS 4297 standard, engineering design of earthen buildings. This was updated in 2020 and crowned by two other standards, 4298 and 4299, the first specification for materials, the second for buildings where no in-depth engineering is required. The first of the three norms foresees the limit state design and then introduces the “reduction factors” coefficients.
The last aspect to be evaluated in order for the earth as a building material to win the modern "challenge" is its actual sustainability..
The latest report on climate change of the Intergovernmental Panel of 2014 shows that human activities are the main factor in increasing emissions into the atmosphere and that about half of all these occurred in the last forty years between 1750 and 2011. Furthermore, emissions from fossil fuel use and cement production have tripled since 1970. It is no coincidence that the most recent report of 2018 "Towards a zero-emission, efficient and resilient buildings and construction sector", evaluating the trend regarding energy consumption and related CO2 emissions, attributes 36% to the construction sector to the total of the first and 39% of the total of the second. The emissions of the construction sector have reached a plateau in the last 5 years, remaining stable at around 9.5 giga tons of carbon dioxide per year, but far above sustainable limits. It should be noted that indirect emissions, for example from power generation for electricity or heating consumption, are responsible for the largest share of the construction sector emissions, accounting for around 70% of the total emissions from energy consumption. When we add to these direct emissions (for example the production of building materials) the emissions amount to more than 11 giga tons of CO2 or 39%. This makes it understandable the introduction of increasingly restrictive policies regarding the energy efficiency of buildings and the promulgation of programs at European level such as "Level (s)" where architects, builders and authorities are encouraged to think about the entire life cycle of a building, providing the basis for quantifying, analyzing and understanding the cycle. Among these is the LCA (Life Cycle Assessment) analysis whose purpose is to reduce waste and keep the environmental consequences at the lowest possible level in any "vital" phase of the building. If you try to make an LCA for earthen materials you will notice how in a phase of primary energy consumption it is superior to other materials especially if it is possible to use the earth from the excavation. This, however, loses the advantage acquired in the moments that you begin to analyze the building in operation. In fact, the insulating materials, which require a high energy input at the beginning, then guarantee the reduction of energy necessary for heating as well as the consequent economic savings [9] The direct consequence of the life cycle assessment is the Environmental Product Declaration, one voluntary product certification scheme born in Sweden but of international significance. Until now, certified EDPs for earth building materials are non-existent. The producers of these must become aware that the credibility given to the products in the earth, as ecological, will no longer be sufficient in the future. To be successful in the increasingly competitive market, it is necessary to establish own EDPs for earth products so that they can also be included in the most recent sustainable programs such as Level (s). Despite some problems due to the lack of data and the actual inferiority of the earth compared to modern materials ad hoc for the performance of the building, it should not be forgotten that with the earth it is possible to implement the “true recycling”, to use the material in the same condition from which it is been taken, thanks to the characteristic of the earth of being able to re-plasticize with the addition of water.

4. Case study: farewell room

Sardinia as a design area lends itself perfectly to the intent of our case study, it is one of the places with the lowest seismic risk and there is a long tradition of building with earth: the project fits into a very specific point which is the town of Serrenti , inland. Serrenti is located in the "clay region", the nerve center of all the production of “ladiri”, typically Sardinian adobes. It also offers a particular design opportunity, which can be found throughout the extension area of the town cemetery, which is currently still free. The cemetery is located in a peculiar position, so much so that the oldest part is separated from the houses only by a road. While to the south it is bordered by the botanical garden and connected by the same street to the “Arti della Terra” laboratory. So the project becomes a further point of interest and does not remain relegated to the cemetery area.
The choice of the farewell room as intended use is based on the mediation between the simple design required by the material, the project area and the organization of the spaces. Compared to a chapel, for example, with the farewell room something different is proposed that can also take on other functions, such as a place of contemplation, mortuary and secular environment, to offer an alternative to the many churches in the country.
The basic structural concept is that of the earthen masonry box, this then closes at the top by a light steel roof and in the foundation with a base and a reinforced concrete slab in such a way that each material is placed in the condition of better to offer the best intrinsic resistance compared to the effort to

which it is subjected. Furthermore, this choice is made to circumscribe the regulatory variant for the use of the earthen material, only to a part. In the same way, as little intervention as possible is done on the box to favour the continuity of the walls. So much so as to interrupt it only for the insertion of the main entrance, which in any case extends in height up to the reinforced concrete stiffening curb, eliminating the use of the lintel and the creation of a fragile point above it.
The bricks used for the masonry are the semi-solid extruded blocks both because, as we have seen, it is one of the most promising techniques being rediscovered, and because a product has been selected that guarantees good resistance but also produced within national borders.
For the entry of natural light, in the absence of further holes in the box, we therefore intervene with the insertion of a skylight on the roof and a long window covering the entire perimeter of the box, which allows the room to be elevated, since the walls, following the geometric recommendations, stop at three meters.

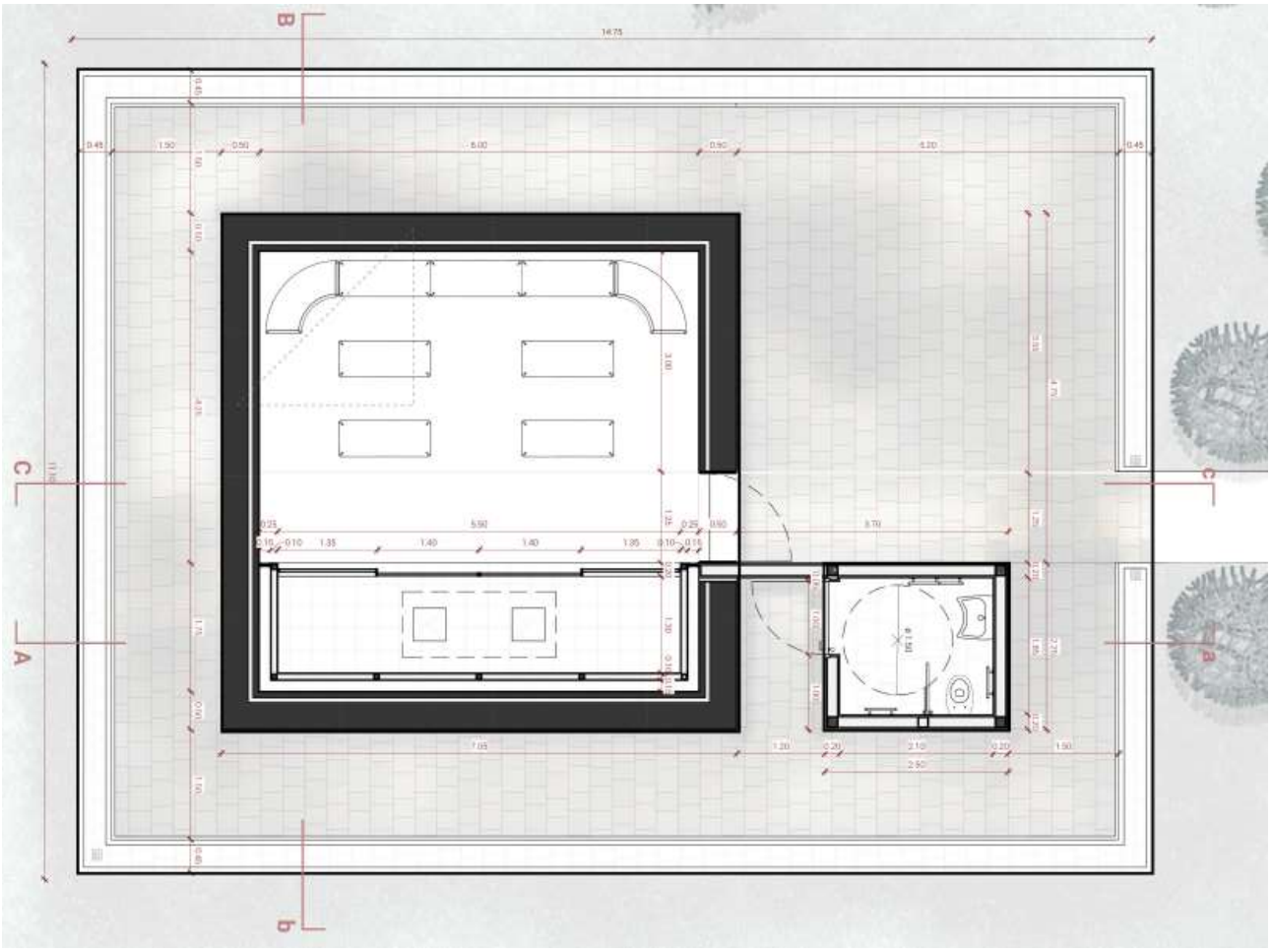

Fig. 1: Floor plan

Services are inserted and conceived as a box-like volume independent from the masonry, with a structural steel frame and dry infill. The services also allow us to insert the space for the systems with a false ceiling. The choice of these falls on controlled mechanical ventilation, which will only support winter heating as the green blocks used guarantee a phase shift of 23 hours as per the technical data sheet.
The very projecting roof removes rainwater from the masonry. This is shaped like a multi-pitched pavilion with an inclined eaves line. In fact, the four corners, two by two, have different heights. From the lower ones the downpipe starts in the form of a chain that conveys the rainwater into a monolithic stone drainage channel that embraces the entire building and has the dual function of a parapet.
The external base in reinforced concrete is finished with “Serrenti stone” tiles, or the local trachyte whose use is found in other artifacts in the oldest cemetery. The box will be plastered with local earth, therefore a warm and natural ochre colour while insulated panels in galvanized steel are used for the cover. The curb at the top of the box and the perimeter window frame are always hidden by a specially formed zinc-titanium sheet.



Fig. 2: Section Aa and Section Bb

In conclusion, the room has an internal area of 36 m^2, of which 9 m^2 are dedicated to the space for the coffin, its perimeter is 28 m, the total thickness of the wall (load-bearing and infill) is 50 cm. The external service equipped for the disabled is 3.8 m^2, while the total project area, including that under the overhang of the roof, is 165 m^2.



Fig. 3: Render

4.1 Regulatory strategy

The regulatory strategy consists in the targeted balance between use, geometry and structure to simplify as much as possible an application process outside the standard that already provides for restrictive conditions and long times. As regards the intended use, regional law is applied as simplified in the table:

Farewell room regulatory indications for use		
Regional law n.32/2018. 2/08/2018. "Rules on funeral and cemetery matters." Sardinia Region. Art. 17 "Farewell room":		
Requirements	**Accomplishes**	**Note**
a) rooms on the ground floor and directly communicating with the outside;	yes	
b) absence of architectural barriers in compliance with current legislation on the subject;	yes	
c) internal free height of not less than 3 meters, subject to different provisions established by local building regulations in relation to particular geographical situations;	yes	It has an internal height of 4 m
d) air conditioning system suitable to ensure comfortable microclimatic conditions;	yes	For the farewell room, a passive air conditioning system is provided, accompanied in the winter by a mechanized ventilation system, which instead remains active in the glass box when occupied by the coffin, to perform with the hygenic indications
e) public toilets accessible and equipped also for the handicapped;	yes	
f) provision of furniture suitable for the reception of the coffin and the participants.	yes	A clay bier is planned in collaboration with the Arti della Terra laboratory in Serrenti, while the design of the benches is entrusted to local artisans.

Fig. 4: Summary table of the prescriptions for the farewell room in the Sardinia region

For the geometry of the bearing box, it was mediated between the design needs and the indications that it was possible to have access to from the world regulations regarding earth masonry, as per table:

Geometric recommendations			Normative requirements	Note
(cm)	Effective			
Minimum wall thickness	36,0	20,0	Australia: Earth Building Association of Australia. *Building with Earth Bricks and Rammed Earth in Australia*. 2004.	Reference is made to a manual drawn up by the EBAA in the form of a regulation, but not recognized at national level.
		22,5	Nigeria: Federal Republic of Nigeria . *National Building Code*. 2006.	The earthen constructions are found under the heading "other materials".
		25,0	New Zeland: NZS 4297.*Engineering Design of Earth Buildings* .1998.	This standard was updated in 2020, but the text referred to is that of 98.
		*38,0	Perù: Norma E.080. *Diseño y construcción con tierra reforzada*. 2017.	The E.080 is part of the national construction regulations. It has very conservative values due to the country's high seismic risk.
		25,4	USA: CID-GCB_NMBC-14.7.4. *New Mexico Earthen Building Materials Code*. 2006.	The code is federally valid for the state of New Mexico.
Max height	300,0	300,0	Australia: Earth Building Association of Australia. *Building with Earth Bricks and Rammed Earth in Australia*. 2004.	
		288,0	India:IS 13827. *Improving Earthquake resistance of earth buildings-guidelines* . 1993.	The recommendation says that the height must be less than 8 times the thickness, in our case 288.
		650,0	New Zeland: NZS 4297.*Engineering Design of Earth Buildings* .1998.	
	725,0	630,0	Perù: Norma E.080. *Diseño y construcción con tierra reforzada*. 2017. **L + 1,25H ≤ 17,5e**	The formula shown is used where: -L distance from opening edge; -H height; -e thickness.
		366,0	USA: CID-GCB_NMBC-14.7.4. *New Mexico Earthen Building Materials Code*. 2006.	
Maximum slenderness	8,3	20/21,6	Australia: Earth Building Association of Australia. *Building with Earth Bricks and Rammed Earth in Australia*. 2004.	
		10,0	Nigeria: Federal Republic of Nigeria . *National Building Code*. 2006.	
		16,0	New Zeland: NZS 4297.*Engineering Design of Earth Buildings* .1998.	
		*2,16	Perù: Norma E.080. *Diseño y construcción con tierra reforzada*. 2017.	
Maximum spacing between load-bearing walls	650,0	*350,0	Australia: Earth Building Association of Australia. *Building with Earth Bricks and Rammed Earth in Australia*. 2004.	
		*360,0	India:IS 13827. *Improving Earthquake resistance of earth buildings-guidelines* . 1993.	Wheelbase must be less than ten times the thickness.
		700,0	Nigeria: Federal Republic of Nigeria . *National Building Code*. 2006.	Refers to the length of the wall.
		731,5	USA: CID-GCB_NMBC-14.7.4. *New Mexico Earthen Building Materials Code*. 2006.	24 feet.
* The values that are not met are in the case of countries with a high seismic risk such as Peru and India.				

Fig. 5: Summary table of the geometric limits of the global standards for earth masonry

With regard to the structural organization, the standard encourages "box-like" behavior, which implies making all the masonry faces integral with the use of reinforced concrete curbs in the foundation and on the floor, in addition to each other by means of damping along the vertical intersections. The standard also gives a minimum thickness of 200 mm for load-bearing walls with semi-solid blocks. In the case study the thickness is 360 mm.
Secondary-order effects are controlled with the use of conventional slenderness which is defined as: $\lambda = h_0 / t$. Value that must be less than 20.
Where h_0 is the free length of wall deflection and t the thickness. In our case we have a wall wedged above and below the curbs therefore with $h_0 = 0.5l = 1.5$ m, and $t = 0.36$ m therefore $\lambda = 4.2$.
The limit state design is checked. However, it should be noted that the precautionary design used, given the use of green blocks, allows us to perform simplified checks. In fact, the project fulfils all the requirements, as shown in the table:

4.5.6.4 Simplified verifications		
Limitations	**It accompl**	**Note**
a) the structural walls of the building are continuous from the foundations to the top;	yes	The walls are continuous on all sides.
b) no inter-floor height exceeds 3.5 meters;	yes	Inter-floor to the curb.
c) the number of masonry floors does not exceed 3 (inside and above ground) for ordinary masonry constructions and 4 for reinforced masonry constructions;	yes	The building is single storey.
d) the floor plan of the building is inscribed in a rectangle with ratios between the shorter side and the longer side of not less than 1/3;	yes	The plan of the wall box is a square.
e) the slenderness of the masonry, according to the expression above, is in no case greater than 12;	yes	There is a slenderness of 4.2 for all walls.
f) the variable load for the floors does not exceed 3.00 kN / m²	yes	There is only coverage, not intermediate floors.
g) the minimum percentages must be respected, calculated covered with respect to the total surface plan of the building, of the resistant section of the walls, calculated in the two orthogonal directions, specified in Tab. 7.8.II.	yes	The percentage given by the ratio of the resisting section of the masonry with the gross surface of the floor is about 20%, higher than the minimum value of 3.5% which occurs on the basis of the peak acceleration of the ground, which for Sardinia land we are building is among the lowest.

Fig. 6: Summary table of requirements necessary for simplified checks, load-bearing masonry structures NTC2018

Therefore the verification is satisfied if: $\sigma = N / (0{,}65A) \leq f_k/\gamma_M$
Where N is the total vertical load at the base of each floor of the building corresponding to the sum of the permanent and variable loads (evaluated by placing $\gamma G = \gamma Q = 1$) of the characteristic combination and A is the total area of the bearing walls on the same floor.

Check the most severe combination	**N (N)**	600374	γ_M	4,2	***Verified***
	A (mm^2)	10080000	**f_k (Mpa)**	*5,3	
		0,09		**1,26**	
* Compressive strength value shown in the green blocks data sheet					

Fig. 7: Verification satisfied

Even if the verification is satisfied and we have used all the indications for masonry constructions according to the NTC, so as to be included in the simplified verifications, it is still a different construction system from those regulated in the NTC. In chapter 4.6 “other construction systems”, three cases are distinguished: the first is the group of materials regulated by the NTC, the second that of the materials designed according to the rules found in "... documents of proven validity ...", while the third are those materials that do not fit into the first two cases. The documents of proven validity can be found in chapter 12: technical references. Among these are the Eurocodes but also the UNI standards, so for the future we could hope for a harmonization of the German DIN standards on land, to facilitate the process. The extruded blocks, even if used with traditional masonry, fall within the third case so it is necessary to receive the declaration of suitability of the project from the public works council. This is requested through an application consisting of a series of documents addressed to the central technical service, according to certain procedures. The manufacturer must also participate in this process, as the materials must comply with the requirements in chapter 11 and therefore be certified. In fact it will be necessary to attach an additional document to the declaration which is the technical assessment certificate. The process is certainly complex but it is important to highlight that the role of the manufacturer is also central if you want to start using earthen materials in Italy, in fact these must be appropriately certified (technical data sheet and CE mark).



Fig. 8: North-east elevation

5. Conclusions

The simplicity of earth, initially an advantage, triggered a superficial and unacceptable evaluation process, the consequences of which still persist today. The availability, the simple instrumentation and the cost-effectiveness of the process of building with earth individually have the consequence that we immediately pass to the execution, without more in-depth considerations, giving the illusion of having achieved a high level of knowledge on this material. It is enough to go a little further into the scientific literature to understand how extremely confused and difficult is to compare the technical results: each successful search has a specific and individual character, it starts with certain conditions to reach an end without ever advancing a real generalization. If we think about all the implications and consequences of conceiving earth as "soil" or as a building material it is not surprising that there is a lack of legislation that is repeatedly denounced, because it finds its justification in the words said above. On the contrary it is appropriate to evaluate with a critical attitude the cases in which regulations is present. The earth, as building material, to which the undeniable simplicity and infinite possibility of recycling remain, is not used than it should be, for this regulations paralysis due to a more serious lack of fundamentals, that of experimental confirmations. The case study allows us to understand the implications of building in this landscape. The first of them is the beginning of a long bureaucratic process which requires the collaboration of both the designer and the manufacturer of the materials, and certainly the patience of the customer. The second means sticking to an extremely cautious design that limits design opportunities, the third finally is the use of earth materials but with a certain degree of

industrialization and standardized enough to allow verification without undertaking a real experimental work.
Building with earth today has become a challenge against increasingly precise regularizations and parameters to be followed, but this is also a great opportunity to totally rethink a construction material in terms of standardization and examination. The savings that occur in replicability, finding the material and sustainability (as far as this can be proven), can be invested in determining ad hoc experiments for the material, also with the support of the technology that feeds to create increasingly dynamic models that would succeed. to reproduce also the susceptibility of the earth to humidity and therefore to environmental conditions. Finally, it would be possible to draw up complete and globally comparable guidelines and regulations. It is obviously a shared challenge, which concerns either the field of research, designers and manufacturers, but until it is undertaken with seriousness and a mindset free from the constraints of other (nowadays more traditional) materials and the common superficial approach it will be impossible to use this extraordinary material which is earth with ease and serenity.

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WORLD HERITAGE and DESIGN for HEALTH
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Cultural Inland Design
Products and services for territorial and people enhancement

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Abstract
Ecosystem provides unique support to quality of life and economic development (Scolozzi et al., 2012). Mountain animal husbandry, thanks to alpine pasture, performs important functions of conservation of biodiversity, enjoyment and preservation of areas differently addressed to become wild forest, in addition to guaranteeing the production of high-quality goods. Preservation and enhancement of inland, by sustaining rare community custodians, are key elements that must be supported. A goal that could be pursued by developing innovative actions capable of generating a high value with regard to commodities, culture, and tourism.
From 2019, the design research team of our University is part of three research projects within European programs (2014-2020 Interregional Italy-France Alcotra program) aimed at the promotion of (economic) communicative strategies for enhancing typical products, production sites and itineraries linked to high-quality mountain markets. Values that COVID-19 brought to the fore even further and are currently priorities for people's wellness.
In this context, as far as the Ligurian inland is concerned, the paper aims to highlight methods, strategies and products elaborated thanks to our design-driven approach. The objectives are to enhance production chains and reinterpret the 'slow tourism of proximity' principles during and after the pandemic, and, lastly, to spread a new culture able to recognize and appreciate the biodiversity produced by the synergy between community, territory and livestock.

Keywords: territorial identity, community custodians, biodiversity, agri-food well-being, slow tourism.

1. Introduction and action scenario
The essay focuses on the ecosystems connected to the areas of the Ligurian hinterland inside natural parks or areas of significant interest belonging to the 'Natura 2000'[1] network and on which they stand: small companies identified as community custodians devoted to breeding and the production of mainly dairy products, naturalist routes and, lastly, characteristic historic villages on the edge of green areas.
We are talking of a territory covered by three different research projects with European funding, comprised in the Natural Regional Parks of Beigua, Antola, Aveto and Alpi Liguri, as well as the neighbouring areas of the Bormida and Vara Valleys.
The research projects currently underway are: CamBio VIA (*CAMmini e BIOdiversità: Valorizzazione Itinerari e Accessibilità per la transumanza*, 2014-2020 Interregional Italy-France Maritime program), Biodiv'ALP PITEM PROBIODIV (*Piano Integrato TEMatico per PROmuovere la BIODIVersità*, 2014-2020 Interregional Italy-France Alcotra program) and ALPIMED PATRIM (2014-2020 Interregional Italy-France Alcotra program); they involve the identified areas in a differentiated form and with diversified

[1] Special areas or Sites of Community Importance (SIC), Special Areas of Conservation (ZSC) and Special Protection Areas (ZPS), available on the institutional channels of the Ministry of the Environment, currently Ministry of Ecological Transition, included within the 'Natura 2000' network. The 'Natura 2000' network represents for the European Union the main instrument for the conservation of biodiversity and interprets the Habitats Directive 92/43/EEC. Cf. *Ministry of Ecological Transition*, further information on the website [https://www.minambiente.it/pagina/sic-zsc-e-zps-italia] last consultation 10.03.2021.

objectives, but they are all geared towards the need to tackle from different viewpoints the enhancement of the territory and of the settlements within it in a broad and inclusive sense.
CamBio VIA and Biodiv'ALP PITEM PROBIODIV chiefly work on the companies, on the importance of their commitment as community custodians, on knowledge, on the enhancement of the production chain linked to their activity, and on the routes and activities associated with the transhumance, whereas ALPIMED PATRIM mostly revolves around the definition of a model of territorial governance that can contribute to the definition and reconstruction of a clear, noticeable and incisive visual territorial identity for all those more fragmented and less recognisable areas.
Apparently, the three projects might not seem completely aligned, but we are going to see how the contents of one, in the vision and interpretation of the working group, might contribute to pursuing the objectives of the others and vice versa, with a logic of integration and exchange capable of accomplishing additional interconnected results, as such better than disjointed and non-coordinated actions.

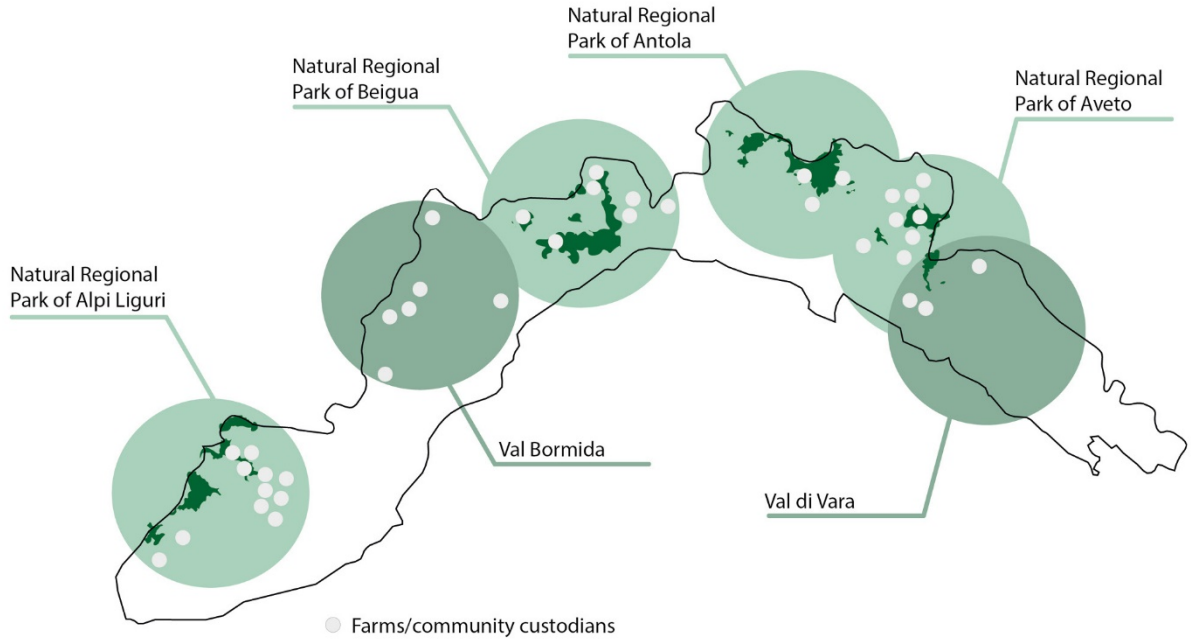

Fig. 1: Mapping of the territory, the settlements and the corporate realities involved in the Research Projects (Maria Carola MOROZZO DELLA ROCCA, Chiara OLIVASTRI and Giulia ZAPPIA).

The research team of the Department of Architecture and Design (DAD)[2] at the University of Genoa participates in the three projects, completing an inter-disciplinary team that integrates economics, animal husbandry, marketing and design. Design is actualised there through a systemic vision (Bistagnino, 2009) capable, at source, of creating networks, connecting dimensions of knowledge (Germark, 2019), steering visions and pre-visions for a sustainable future and, at the end of the road, putting forward precise solutions, be they 'intangible' and strategic or 'tangible', such as services, products and tools of communication.
At this stage, design, even prior to envisaging solutions appropriate to the outlined scenario, has interpreted in the first phase of the research precisely the slogan, 'Design to Connect. Persons, Assets, Processes'[3] to which the Italian Design Society (SID) has dedicated the 2021 annual conference, acknowledging it as a multidisciplinary and multifaceted issue that represents one of the primary focuses of interest in current and future scientific research.
In particular, the design-driven actions launched within the scope of the three projects tackle and translate the 'Design for Health' of this call in the thematic areas of sustainable development and territorial governance. The desire for resilience on the part of the companies, understood as community custodians guarding the territory, along with the institutional actions of the Park Authorities and the Regione Liguria, are interpreted by the research team pursuant to a renewed vision capable of acting

[2] The DAD research team consists of: R. Fagnoni, M.I. Zignego, M.C. Morozzo della Rocca, C. Olivastri, L. Chimenz, G. Zappia, X. Ferrari Tumay and A. Ronco Milanaccio.
[3] Cf. *Italian Design Society*, further information on the website [http://www.societaitalianadesign.it/?assemblee_annuali=design-per-connettere] last consultation 10.03.2021.

on several fronts to contribute with a virtuous circle to the conservation of biodiversity, the enhancement and knowledge of the area, based on a proximity tourism logic as well (Bertacchini and Nuccio, 2020), and, lastly, to the agri-food well-being resulting from local production and with spin-offs that could extend to the entire regional community.
The projects and actions undertaken within their scope fulfil at different levels some Sustainable Development Goals (SDGs) of the 2030 UN 'Agenda' and the 2020 Europe Strategy for an inclusive, intelligent and sustainable growth.
The community custodians linked to mountain animal husbandry, in fact, contribute with the institutional bodies to the conservation of the area and of local biodiversity through an approach that, 'unconsciously', already interprets in part Goal 2 of the UN 'Agenda', particularly target 2.4 «…ensuring sustainable food production systems and applying resilient agricultural practices that enhance productivity and production, and assist the conservation of ecosystems…»[4]. An attitude which, through suitable interdisciplinary research actions, can acquire greater awareness both in the companies and in the urban and peri-urban communities capable of benefiting from the productive work of these companies, occasioning in turn positive repercussions traceable to some targets of Goals 8, 12 and 15, and obviously, from a network and interaction perspective, to Goal 17.
The actions launched, primarily in response to Goal 2, reverberate in the enhancement, conservation and enjoyment of the area, and generally also interpret objective 8 that jointly tackles the topics of economic development and work, precisely target 8.9 «…elaborating and implementing policies aimed at promoting sustainable tourism that creates jobs and promotes local culture and products ...»[5], Goal 12, aimed at ensuring sustainable production and consumption models with a strong focus on target 12.2 «…achieving the sustainable management and efficient use of natural resources…»[6], Goal 15, and in particular target 15.4 «…ensuring the conservation of mountain ecosystems, including their biodiversity, with a view to improving their ability to provide services essential to sustainable development…»[7] which, lastly, applies the principles of Goal 17 of strengthening the existing partnerships in the area and outside it from a perspective of collaboration and cohesion that are indispensable for a successful outcome of the actions stipulated in the projects.
During the initial phases of empathisation and definition of the context, Design as discipline interprets the role of 'bonding agent' by adopting a strategic and systemic vision. It is capable not only of systematising the different inter-disciplinary skills of the project partnership, and interpreting the needs of active and passive stakeholders, but also of networking the three projects and the different objects by creating those interactions that are essential to obtain a greater overall benefit for the territory and for the people who inhabit it and make use thereof. In the second part of the development of the projects, instead, design reverts to its 'historic' or 'more traditional' vocations, putting forward design solutions mainly linked to the need to communicate and know realities and places though a mixed analogue-digital approach contextualised to contemporary technologies, to contribute thereby to the discernment of the objectives set and the results expected by the three research projects.

2. Community custodians, artefacts and biodiversity

Legislative Decree No. 194 of 2015 *Disposizioni per la tutela e la valorizzazione della biodiversità di interesse agricolo e alimentare (Provisions for the protection and enhancement of biodiversity of agricultural and food interest identifies)* 'custodian farmers' and 'custodian breeders' as subjects actively engaged in the conservation of 'local resources' at risk of extinction or genetic erosion. In line with the Legislative Decree, albeit not included in strict legislative parameters, we can regard as 'community custodians' all those communities of people and animals who, thanks to their work and their presence on the territory, ensure their protection in both environmental and cultural terms.

[4] Cf. *United Nations* > Regional Information Centre > 2030 Agenda [https://unric.org/it/wp-content/uploads/sites/3/2019/11/Agenda-2030-Onu-italia.pdf] and *Territorial Cohesion Agency* [https://www.agenziacoesione.gov.it/comunicazione/agenda-2030-per-lo-sviluppo-sostenibile] last consultation 15.03.2021.
[5] Cf. *United Nations* > Regional Information Centre > 2030 Agenda [https://unric.org/it/wp-content/uploads/sites/3/2019/11/Agenda-2030-Onu-italia.pdf] and *Territorial Cohesion Agency* [https://www.agenziacoesione.gov.it/comunicazione/agenda-2030-per-lo-sviluppo-sostenibile] last consultation 15.03.2021.
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[7] Cf. *United Nations> Regional Information Centre* > 2030 Agenda [https://unric.org/it/wp-content/uploads/sites/3/2019/11/Agenda-2030-Onu-italia.pdf] and *Territorial Cohesion Agency* [https://www.agenziacoesione.gov.it/comunicazione/agenda-2030-per-lo-sviluppo-sostenibile] last consultation 15.03.2021.

The various farms involved in the three projects mentioned at the beginning of the essay share a marked focus on animal well-being, which is translated into a special care for the nutrition and the life spent by the beast either outdoors or in a stable during winter months. Cattle from farms that choose wild or semi-wild grazing actively contribute to the conservation of pastures otherwise subject to the inroads by forests and the resultant loss of biodiversity. In the same way, the choice of indigenous raw materials to make typical dishes and products in local farmhouses contributes to preserving vegetable species and handing down the food processing and cooking techniques characterising the area they belong to.
The value of products originating in these and other realities definable as community custodians must accordingly be calibrated, besides the usual market laws, also by paying regard to the environmental and cultural importance intrinsic to the products themselves, a value strictly connected with the area in which each company-community is located. However, during the preliminary-exploratory phase, considerable difficulties have emerged when seeking to overtly manifest the (environmental, cultural) value associated with the products on sale and network with communities and companies falling within the same area as well as between physically distant geographical areas, and the presence of a strong territorial identity, generally of agri-food origin, though not exclusively so, hardly recognisable by other than local residents.
As part of the research projects, by following lines of action channelled by the specific objectives of each of them, the DAD design research team has carried out different and strategically interconnected activities that ensure a complete territorial enhancement. In particular, the two complementary fronts on which the actions undertaken revolve envisage:
- the creation of communication tools capable of conveying and enhancing territorial knowledge and knowledge of the community custodians, starting with the foodstuffs produced by the communities themselves;
- the creation of a system of recognition and enhancement of territorial identity which, starting from the peculiarities of the individual geographical areas, generates a strong visual identity and a network connecting park areas, territories and distribution centres by also activating slow proximity tourism itineraries.

Within the scope of the CamBio VIA and Biodiv'ALP PITEM PROBIODIV projects, the actions of the DAD team are accurate and focused on the issue of enhancing the company through its products. As disclosed at the beginning of the essay, however, the communication activities tools are not limited to considering specific local foods but exploit them as a departure point for a multi-level systemic enhancement. The productions and activities of the local area: the cheeses, the meat, all the way down to the typical dishes served in farmhouses visited by tourists, are the first vehicle for traditional knowledge and the first strength to lean upon in order to spread the culinary culture of the localities, but not only that … the organoleptic characteristics of the products are deeply connected to the place of production. With cheeses, for instance, the emphasis on animal well-being, especially as regards pasture feeding, is transmitted to the finished product, which acquires different aromas depending on seasonal blossoms cows feed on, aromas that are then recognisable in the finished dairy products.
«I do not sell a piece of cheese, I sell a piece of territory» is the statement[8] by the owner of one of the companies in the Beigua Natural Regional Park during an interview dating from the autumn of 2020, a statement that clearly summarises the essential focus on which the work of the DAD research team builds further.
The main tool of communication (born with the CamBio VIA project and deployed in Biodiv'ALP as well) the design team proposes in order to manifest and convey the product-company-local area bond arises from a market investigation that sees the slow food[9] label as interesting food for thought to design and implement something capable of narrating the trinomial and bring out the value, which increasingly grows the closer the relationship between the three parameters is. This explains the birth of *OLÉ – Oltre l'etichetta* (Beyond the Label), a different and novel digital product which, supplemented by the traditional labels, focuses the narration on the context in which the foodstuff is born and lends voice to all those immaterial values associated with the tradition and the local area.
OLÉ, backed up by the legally compulsory labels, has access via QR code to digital contents evincing the environmental and traditional value of the product, where the stress is placed on the importance of community custodians within the area.
OLÉ is made up of different parts: a short video that, like a business card, introduces the company in the first person, a selection of pictograms specifically created for the research projects, which visually recount with fresh immediacy the excellence of the narrated topic, a photographic book and a short description.

[8] Extract from the interview campaign conducted between 2020 and 2021 by the DAD research group during the initial phase of hepatization and definition of the objectives of the various research project.
[9] Cf. *Slow food* further information on the website [https://www.fondazioneslowfood.com/it/cosa-facciamo/etichetta-narrante/] last consultation 10.03.2021.



Fig. 2: Mock-up for the sticker label of *OLÉ – Oltre l'etichetta* (Beyond the Label), 2020 (DAD research team).

From a technical viewpoint, the contents of *OLÉ* and of every company are hosted inside the *lamialiguria* website, but can also be enjoyed and perused through the smartphone app bearing the same name. Here we find, moreover, information divided into sectors headed 'experiences tastes and routes'; 'events and shows'; 'places and culture'; 'hospitality and catering', aimed at incentivising tourist activities in Liguria. We can glimpse therefore the high potential in terms of benefits which the Ligurian territory – not just the rural one – can provide, thereby encouraging a slow proximity tourism that moves from the products of the community custodians in the areas involved in the European projects to eventually reach neighbouring populated centres and historic villages.



Fig. 3: Layout for the inclusion of companies and *OLÉ – Oltre l'etichetta* (Beyond the Label) on the *lamialiguria* App, 2020 (DAD research team).

3. Identity, governance and local territory

Many of the areas inhabited by the community custodians that are the protagonists of the CamBio VIA and Biodiv'ALP projects are also protagonists of the ALPIMED PATRIM project that contributes to a generalised enhancement by acting directly on the area. PATRIM benefits from the actions carried out in the two previous projects, while simultaneously launching an accurate model of territorial governance dedicated to the definition of a unified visual identity for the Park of Alpi Liguri and the local habitats.
The complex shape of the Park, divided into four separate areas and seven different municipalities, specifically requires precise local actions. PATRIM's additional challenge, compared to the previous projects, is thus to let the visitor understand 'at first glance' that he has crossed the boundary of these protected areas or is immersed in them. A goal that can be pursued by defining a territorial governance revolving around identity landscape elements susceptible of being included in the urban furniture and wayfinding regulations of each municipality.
Within this specific context, the task of the design team is primarily to identify indigenous types and productions specific to each area or municipality, on which to work in order to discern a clear and concrete identity. Inspections of the local areas have brought into relief specific peculiarities, such as the white cuisine characteristic of the municipalities of Montegrosso, Pian Latte and Triora, the white bean (slow food product) or the goat meat of Pigna[10], the roads and routes of transhumance, etc., accompanied moreover by characteristics extending to the Park as a whole, i.e. landscape and naturalistic features that serve as common thread unifying the entire area. The DAD working group is working therefore through a research approach based on 'variables and invariants', on the anthropic and natural elements that in a near future might form the basis for a strong and readily recognisable territorial identity.
Both in the definitional phase and in the subsequent case studies, the ideational process typical of the methodologies adopted by the design team aims to involve all subjects present in the area with an attitude that targets co-design, involving public and private, namely: institutions, municipalities, communities, operators, traders and inhabitants. The final aim is to eventually formulate a series of shared guidelines of territorial governance capable of visually bringing into the fore that identity value, currently dormant, which, once recognised and expressed, could lend further awareness to local communities and will contribute to the rise of a proud sense of belonging to the hinterland.
Guidelines, presently in the ideational phase, which will, when finalised, lead to the adoption of a unified and consistent visual identity for the Park of Alpi Liguri and will find completion in the seven gates of the park. Seven iconic elements placed along the main access routes to emphasise the boundaries of the area and highlight the equal number of municipalities forming part thereof.
In this scenario, CamBio VIA, Biodiv'ALP PITEM PROBIODIV and ALPIMED PATRIM find that completeness where analogue, physical and digital blend to contribute on different levels to the overall enhancement of the researched areas.

4. Well-being, tourism and storytelling

A recognition that has underlined the current relevance of the issues dealt with in the researches underway occurred in December 2019, when transhumance joined Unesco's list of immaterial heritages. An essential stage that further establishes the fact that the living traditions handed down by our ancestors, such as oral expressions and social practices, rituals and festivals, knowledge and practice about nature and traditional crafts, are a fundamental part of contemporary culture.
«This immaterial cultural heritage is essential to preserve cultural diversity in the face of globalisation, and its comprehension helps intercultural dialogue and encourages mutual respect of the different lifestyles. Its importance does not lie in the cultural manifestation as such, but in the wealth of knowledge and skills transmitted by one generation to the next»[11].
Therefore, the enhancement strategies must inevitably work on a two-fold basis, and develop projects, services and events (Vannicola, 2017) through multiple intervention strategies capable of publicising and modernising the two souls of rural culture, the primal and material type as well as the immaterial and cultural one.
The role of resilient rural communities, in fact, is not only to be the guardians of mountains protecting the area against the resultant environmental decay, but they can themselves be eyewitnesses of cultures at risk of extinction.
We need to reason about a softer economy, more focused on the areas, which, instead of exploiting them, studies new contemporary approaches to interact and create experiences of slow tourism.

[10] Cf. *Parco Alpi Liguri* further information on the website [http://www.parks.it/parco.alpi.liguri/prodotti.php] last consultation 10.03.2021.
[11] Cf. *UNESCO* further information on the website [http://www.unesco.it/it/ItaliaNellUnesco/Detail/189] last consultation 10.03.2021.

An example in that sense, adopted by one of the agricultural companies inside the Park of Alpi Liguri, on the border with France and Piedmont, (of the ALPIMED PATRIM project) is to affiliate to the international association *WWOOF-World Wide Opportunities On Organic Farm*[12], which has been operating since 1971 in England and currently has offices throughout Europe. It is a matter of offering a program of actions linked to active participation in selected and certified organic farms in exchange for hospitality.
The underlying concept is to sell the intangible, the training about typical manufactures, the culture of experiencing the area and the entertainment as much as the traditional basic product, through a simple service of relationship between producer, local territory and user. An immersive tourism that fosters loyalty and spreads a virtuous sensitivity between man and hosting environment.
Designing for the territory accordingly implies the recognition not only of its physical dimension but also of the relational one that implies a systemic and strategic approach, one capable of producing cross-scale models and processes of concreteness and overall vision at the same time (Lupo, 2009). An intangible geography, superimposed on the real one, with the ability to reactivate hybrid experiences of interaction with the places.
Intangible Heritage refers precisely to a system of processes linked to local resources and disseminated through a narrative and performance-based dimension as the outcome of a communal co-creation process.
The role of design is that of story-listener and storyteller (Piredda, 2013), which identifies in narrations the indispensable passage around which project proposals, based on iconographic matrixes, event projects, or communication projects involving traditional events often known only by the locals, can be developed.
In the choice to promote the history of the company and the territory behind a product termed *OLÉ – Oltre l'etichetta* (Beyond the Label), the dominant element was precisely this need to combine and compensate for the tangible values of taste and smell through the more ephemeral ones of passion and tradition hidden behind the mere production of biological foodstuffs.
We are furthermore referring to the transhumance festivals organised by the rare shepherds still practising transhumance, or to the summer white cuisine fairs, aimed at attracting curious people towards a culinary mine as reflection of a culture preserved by successive generations.

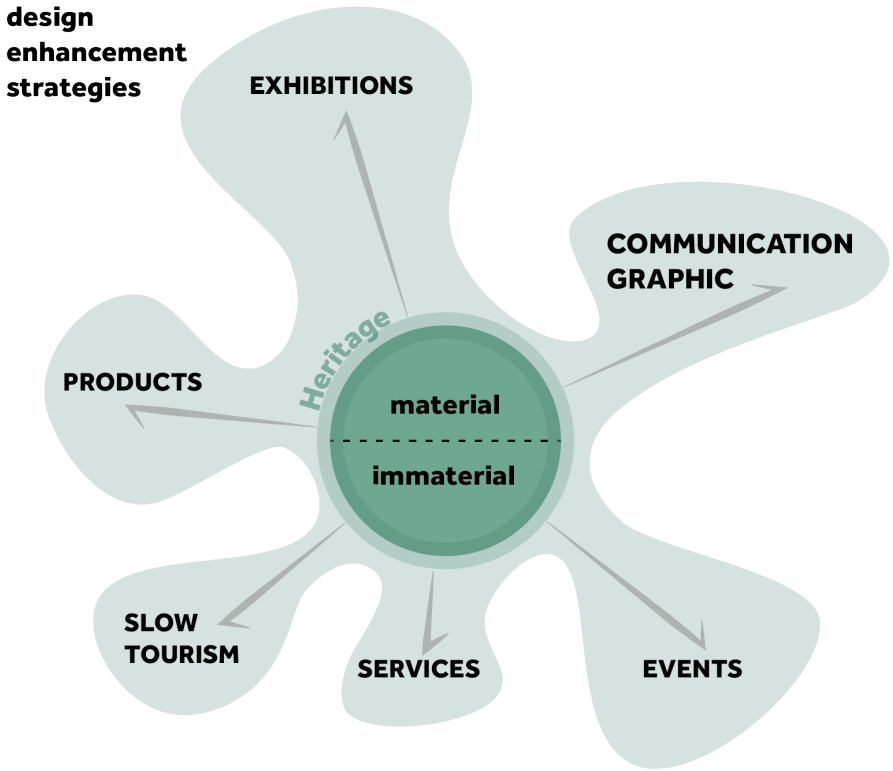

Fig. 4: Material and immaterial heritage and possible design enhancement strategies (Maria Carola MOROZZO DELLA ROCCA, Chiara OLIVASTRI and Giulia ZAPPIA).

[12] Cf. *WOOF* further information on the website [https://wwoof.it/it] last consultation 10.03.2021.

5. Future scenarios

To put things very much in a nutshell, the three research projects illustrated, and the motivations that have determined the actions launched within their scope, occasion positive repercussions in line with the different analysed Goals of the 2030 UN 'Agenda', operate in accordance with different timeframes and methods, albeit pursuant to a common overall vision, and discern immediate returns, medium-term effects and the long-term preservation of benefits gained in the middle term.

The adoption of *OLÉ* by the companies creates at once a sense of community. The narration of the value of the products and their spread across the entire Ligurian territory transcend the boundaries of local production to reach the urban centres, while engendering, in the second place, a medium-to-large scale dissemination of traditional, environmental and ethical values linked to the territory through social media and the digital channels the Regione Liguria can resort to.

By so doing, the rural areas become smart *vis-à-vis* the city and its inhabitants through a digitization process that generates value for mutual advantage. Lastly, through the narrated products, a process of growing interest is launched in respect of the places they come from, as part of a tourism logic aimed at bringing about the discovery or rediscovery of scarcely known naturalist beauties by people residing in the area itself, so that they might appreciate afresh the paths, routes and villages of the Ligurian hinterland.

Places that will witness the simultaneous and progressive operation of the model of territorial governance defined within the scope of the ALPIMED PATRIM Project, linking digital back to real and providing a clear and recognisable territorial identity to the Park of Alpi Liguri in particular, in a manner capable of being transposed in future to the entire Ligurian territory, among others[13].

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The Sanatorium of Bucaille in Aincourt (1929-1933): the analysis of the site, between modern architecture and landscape, from the political project to the current need for conservation

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Abstract
The experience of the program for the realization of a network of antitubercular sanatoriums in France between the two world conflicts shows how the medical history of a disease is always accompanied by the social history of patients, the institutional history of politics and the history of the buildings called to give concreteness to all these instances. Through the presentation of the case of the Sanatorium of Bucaille in the department of Val d'Oise in France, which is considered an exemplary expression of technological and formal experimentation of modern architecture and which is a registered site in Inventaire supplémentaire des Monuments Historique, the paper investigates the dual nature of the sanatorium, both as scientific instrument and architectural object. Starting from the analysis of the convergence of different design contributions in the material outcomes, the study seeks to highlight the renewed medical project, aimed at setting up the most favourable living conditions for the patient and at supporting medical therapy through the site's landscape, the ergonomic design, the social isolation. Such a multidisciplinary approach to illness has helped to define that multiplicity of values, which not only connotes the identity of the site, but which is now indispensable to understand its potential role in the contemporary world, to respond consistently to the need for preservation and new use, despite the abandonment and degradation caused by the time lag with which development and innovation proceed in scientific and architectural fields.

Keywords: XXth Century Architecture, Cultural Heritage, French Architecture, Sanatorium

1. The sanatorium as architectural manifestation of therapeutic concepts against pulmonary tuberculosis
Antitubercular sanatoriums as cultural objects embody the efforts and commitment of generations of doctors and scientists, but also of political personalities and technical designers, in the fight against a disease that characterized an era more than ever before in human history. The sanatorium is defined not only as a place of hospitalization and isolation of the sick, but also as a real instrument of care, the improvement of which has been the theme of a wide international debate for about a century, starting from the second half of the 19th century. By removing the patients from the unhealthy environment in which they contracted the disease, the sanatorium, through a treatment based on healthy air, heliotherapy, rest and hyper nutrition, becomes the main weapon in the fight against tuberculosis, until the advent of antibiotic therapy in the 1950s [3],[4]. The description of the sick's life, hospitalized there for months or even years, suspended in a dimension far from the world, punctuated by repetitive daily gestures dictated by strict behavioral rules, is now affirmed in the collective imagination also thanks to important literary contributions, including the famous book of Thomas Mann *The Magic Mountain* (1924)[1]. The places that constitute the background for the vicissitudes of Hans Castrop, the protagonist of the novel, are representative of the phenomenon of luxury sanatoriums, that is / i.e. private initiatives reserved for wealthy guests and placed mainly in the Swiss and German Alps or in some seaside

[1] MANN, Thomas. *The Magic Mountain*. (Transleted by WOODS E. John). London. Everyman's Library. 2005.

resorts. This constitutes the prevailing typology of sanatorium in Europe until the end of the First World War. In the first place, the invention of the sanatorium as a new functional program does not imply the introduction of new architectural forms; therefore, these elite shelters are initially located in reconverted hotels or resort areas and, even when the first ex-nihilo realizations come to life, the relation to the models of the *hôtellerie* remains clear and expressed through neo-regionalist architectural forms [10],[16]. However, the experience of the Great War makes it clear that there is an urgent need to formulate a large-scale response to the spread of the disease through the creation of territorial devices for the identification and care of patients and the systematic dissemination of good hygiene practices. (In particular,) in France, that is the area on which this paper is concentrated / focused, the construction of public and popular sanatoriums starts from the 1920s. They are characterized by technical and formal solutions based on rigorous hygienic theories and on the debate between the *pavillonnaire* typology and the single-building solution. In these projects it is possible to recognize health and social values that unite the building to the site, through a democratic principle of space organization and an architecture design based on transparency, thanks to which every patient has an equivalent space unit and the same/similar (?) possibility to visually enjoy the surrounding landscape [8],[18]. Although the German-Swiss-inspired model, consisting of a single and longitudinal building, in which the healing galleries are divided between two side wings for administration and common rooms, has established itself as a preferred solution for popular sanatoriums, it does not present itself as fixed: instead, each project constitutes a possible declination of the therapeutic conceptions of the moment [11]. Precisely this predisposition of architecture to adapt to the evolution of scientific research demonstrates the degree of involvement of doctors and scientists in the design phases and in particular the decisive role of the chief medical officer. This design process describes sanatoriums as the result of a twofold history: architectural and medical. To further encourage collaboration between clinicians and designers, the project of sanatorium buildings in France in the first post-war period is often entrusted to departmental architects, making competition procedures rare. Among the sporadic exceptions to this *modus operandi* we find the case of Bucaille sanatorium in Aincuort in the department of Val d'Oise, about 60 km from Paris. For this specific case, in fact, the *Comité départemental de lutte contre la tuberculose* approves the call for a contest open to all French architects in 1929, in order to alleviate the overload of health structures already existing in the region. The competition program is precise and well detailed and it involves the construction of three identical and independent main buildings accompanied by numerous complementary buildings. Among the participants in the competition are Pol Abraham and Henri Jacques Le Même, who will give life to the famous sanatoriums of the Plateau d'Assy in Savoy a few years later (1932-1937). In addition, the project presented by the architect Georges Henri Pingusson will become the subject of a publication on the *Architecture d'aujourd'hui* in 1932 [1]. However, the results of the selections are favorable to the architects Edouard Crevel (1880-1969) and Paul Decaux (1881-1968) whose design proposal is based on some clearly defined fundamental principles: at the site scale the buildings are placed according to the topography of the land, the separation of sexes and ages between patients is ensured by the three functionally independent pavilions, for the buildings devoted to the reception of patients the terraced typology is adopted. In 1931 the ceremony of the laying of the first stone takes place and already in 1933 the three pavilions can welcome the first patients. The following year, however, the architects complain to the construction companies that they had not complied with the requirements and this led to several judicial processes between 1935 and 1938. Following the outbreak of World War II, as some compensatory works had just been completed and after only a few years of full operation, the darkest phase of the history of the site of Bucaille begins: the armed forces seize the entire structure and evacuate the sick and installing an internment camp for political dissidents and a center for prisoners [14]. Only in 1946, due to the worsening of the spread of tuberculosis and despite the serious state of deterioration, the sanatorium resumed its functions (and) in line with developments in medical research. In 1955, the *Pavillon des Enfants* was equipped with a modern operating block and a swimming pool. Since the 1980s, following a reconfiguration of the French health system, the sanatorium of Aincourt is associated with the management of the hospital department of Vexin. This administrative operation is followed by numerous redefinitions of the spaces, particularly on *the Pavillon des Enfants*, the building in which all the medical services are still concentrated today. Both the Pavillon des Hommes and the Pavillon des Femmes were in fact phased out and until 2007 this last one was used for practical training exercises for fire brigade teams, despite the *inscription au titre des monuments historiques*, in force since 1999 [23]. However, over time, the enactment of this legal act has effectively protected this reality from fatal demolition operations, allowing the sanatorium of Aincourt to stand out even today as a flagship work in the French sanatorium production, as a witness to the architectural expression proper to the Modern Movement, with a few other rare examples, - Clermont-Ferrand (1930), Hyères (1952), Saint-Raphaël (1931) and Passy (1936) [5],[6],[7].

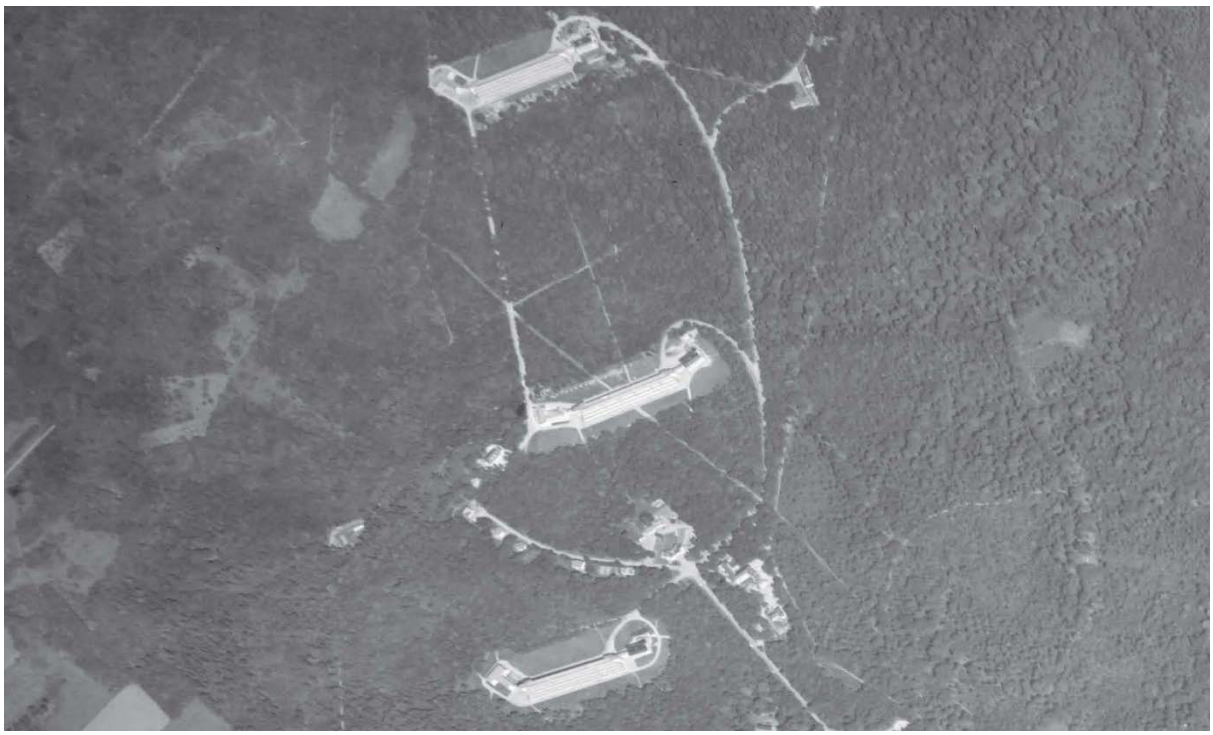

Fig. 1: Aerial view of the Bucaille Sanatorium area in Aincourt, 1954. © IGN



Fig. 2: Historical postcard of the *Pavillon des Cèdres*, 1936. © Archives départementales du Val-d'Oise, 30 FI187 1.





Fig. 3 – 4: Historical postcards depicting a typical room of the Sanatorium of Bucaille and the kitchen areas serving one of the pavilions, 1936 © Archives départementales du Val-d'Oise, 30 FI187 3, 30 FI187 5.

2. The socio-political context of the "sanatorium boom" of the 1930sin France

During the last decade of the nineteenth century, pulmonary tuberculosis becomes one of the major concerns of Western societies, therefore scientific research around the disease and possible cures inevitably opens up not only to architectural and constructive demands, but also to the political debate. In consideration of the resources needed for the construction and management of sanitary buildings and the need for systematic and widespread action, it is clear that political institutions are called in the first instance to take action on the sanatorium('s) architecture. In the early years of the 20th century, favorable and contrary positions to the investment of resources in this type of architecture are faced. The detractors of sanatoriums put forward arguments of medical/scientific nature, such as the need for early diagnosis of the disease and the dissemination of correct hygiene standards among the population, thus favoring, also for reasons of cost, more restricted structures, e. g. dispensaries and possible healthcare at home [14]. These proposals reach the French Parliament and led to the approval of the *Loi Léon Bourgeois* (1916) to promote the screening of the illness. If on the one hand the beginning of the First World War slows down the work of the institutions, on the other hand it leads to a strong and lucid awareness of the spread of the disease in the country and to a contrast strategy, which was still organized in embryonic form. In particular, the joint action between committed politicians and doctors and an important American research project funded by the Rockefeller family highlight serious problems related to the number and quality of beds available and the urgent need to provide for popular sanatoriums. The precious reports produced by the American mission form the basis of the drafting and approval, in 1919, of the Loi André Honnorat, core of the investment strategy for the provision of health infrastructure adopted by the French, at national and departmental level. In fact, the Honnorat Law not only provides for the creation - over a period of five years, then extended to ten - of a sanatorium in each French department, but it also lays down precise hygiene rules and guidelines for the administration of these structures. Moreover, according to this law the presence of a dispensary for the prevention of infection becomes an essential condition for the provision of public funds for the realization of a sanatorium.

The ambitious political will of the 1919 law, although supported by convincing scientific arguments and interesting subsidy schemes, is forced to clash with the inertia of the departmental administrations and the serious state financial conditions, that do not allow parliament to mobilize the resources provided for funding, thus giving only partial follow-up to its important social objectives. The different economic and social context of the departments becomes the main discriminating factor for the reception and interpretation of the Honnorat Law, in fact creating important imbalances between these. To compensate for the lack of construction of local sanatoriums, a real traffic for the movement of patients from one province to another is created. The intensification of these dynamic(s) between the two wars, which was particularly advantageous for the departments because of the disproportion between available beds and demand, even requires a state intervention in an attempt to regulate the traffic through coordinated conventions. Between 1928 and 1930, with the approach of the ten-year deadline provided by the law of 1919 for the endowment of departmental sanatoriums, more and more project and constructions sites are inaugurated, in an attempt to make up for lost time . The Ministry of Labour and Hygiene itself once again judges fundamental the financing to this type of structures, despite the economic difficulties. So, thanks to the commitment of the congressman André Tordieu, the Ministry draws up a national *Plan d'outillage* [8]. This is possible also thanks to the war allowances due by Germany (often paid through the supply of building materials), [18].

Although this new financing plan also fails to structurally solve the problem of the availability of beds for the treatment of tuberculosis in France, the state manages to move from the 65 existing sanatoriums in 1922 to 185 active in 1939, with peak number of beds between 1932 and 1933 - 3000 new beds per year – in this context some large complexes become operational, including the Aincourt sanatorium [18]. The Bucaille project is in fact one of four initiatives selected by the commission responsible for grants linked to the national *Plan d'outillage* as deserving of extraordinary funding. Although the selection criteria leading to this disbursement of funds are not known, it is interesting to note how the reproduction of the drawings and the technical report of the project presented by Decaux and Crével - these documents are kept in the Archives départementales du Val-d'Oise[2] - allows to understand the influence on their work exerted by the ministerial note entitled *Instructions concernant l'emploi des prestations en nature par les établissements d'assistance et les sanatoria* issued in 1929 and therefore closely linked to the *Plan d'outillage.* This note provides guidance on the administrative procedures for granting subsidies, the construction processes applicable to sanatorium buildings and the general organizational arrangements useful for this type of building. If Decaux and Crével differ from the partially standardized design content proposed by the document, they refer to this as regards the methodology for the preparation of the documentation required for the competition.

[2] Archives départementales du Val-d'Oise (A.D. 95), Serie N : 4N360 - Acquisition du domaine ; adjudication des travaux, 1930-1931 ; 4N361 - Devis et plans, 1930-1932 ; 4N374 - Travaux, plans, photos, correspondance, rapports, 1930-1941.

3. Vis medicatrix naturae: site and landscape at the service of care

By definition, the sanatorium is designed as a mediation device between the sick and the nature in which they are called to isolate himself and immerse himself to embark on the path to healing. The relationship between building and landscape is based on the ability of architecture to dominate the wildest aspects of the site, to modulate the natural elements according to therapeutic needs. Thanks to special arrangements in the plan, the winds are thus transformed into healthy air to breathe, through the windows sunlight allows sessions of heliotherapy, terraces and large windows become privileged and safe points for contemplating sublime and evocative views [19].

As already mentioned, the first sanatorium experiences undertaken in the last decades of the 19th century are characterized by the close link with the places of nineteenth-century resorts, in particular, Alpine resorts with remarkable aesthetic, nature and climate qualities [16]. However, in the first post-war period, the need to organize the French infrastructure of sanatoriums on a widespread basis (on the territory) causes a real landslide of these buildings towards the plain and the altitude ceases to be one of the main discriminating factors in the choice of the site.

The aforementioned Honnorat Law of 1919 asks to overcome the contrast between mountains and plains and to reinterpret the climate issue through the enhancement of the peculiar characteristics of each territory and the introduction of the concept of microclimate. In its modernity, the Honnorat Law also takes into account aspects related to the psychological well-being of the patient, who may find himself destabilized by moving to too decentralized structures, in landscapes in which he does not identify, thus encountering further difficulties in the healing process [12].

In the context of the so-called "sanatorium boom", this new approach to the issue of the site, which however does not overlook the consideration of environmental quality requirements, allows to respond more easily to the demand for great availability of land necessary for the construction of pavilions surrounded by parks or gardens. In this search for suitable sites for the settlement of new sanatoriums, interesting realities such as small castles and noble residences with parks or hunting reserves emerge. If in many cases the residences themselves are converted to accommodate medical functions, in others these remain peripheral elements of the entire *domaine*, due to the construction of new buildings and infrastructure of a completely different scale. A similar fate is reserved to the ancient castle of Bucaille: with its hunting reserve covering 100 hectares of forest, in 1930 it is identified as the ideal site for the construction of the new departmental sanatorium of the Val d'Oise. Set in a dominant position with respect to the valley of the

Seine, at an altitude of 180 m above sea level, this land is characterized by a north-south oriented slope and protected from winds by a forest of oak, birch and beech trees, therefore it perfectly meets the environmental and climate criteria required by the competent authorities. In Aincourt, the importance given to the therapeutic value of the landscape over time is confirmed by the project of setting up a Japanese-inspired garden: wanted by one of the doctors and directors of the sanatorium in the 1970s and still usable today, it is mentioned in the inventory of the parks and gardens of the department. At the same time, the three main pavilions of the complex are renamed according to tree essences introduced into the park: poplars, tamarisks and cedars.

Finally, it should be noted that the site is now located within the perimeter of the *Parc naturel régional du Vexin français* established in 1973.

4. *La modernité sans excès* of a terraced architecture

In the sanatoriums' production of the early 20th century there are just rare examples of the use of flat roof in France, because of the problems encountered by architects in getting this solution accepted by clients, afraid of the particularly rainy French climate. Only thanks to the demonstration of the durability and effectiveness of this construction typology, confirmed by various experiences in Switzerland, the image of the flat roof began to spread in the projects for antitubercular sanatoriums during the 1920s [8].

The contemporary strengthening of the debate about the validity of heliotherapy theories suggests the potential of terraced roofs for therapeutic purposes. Particularly significant are the studies conducted by the German doctor David Sarason that lead to theorize the essential role of sunlight in the treatment of tuberculosis and the use of a real system of terraces. Sarason's theories and achievements, however have some difficulties in spreading within the French context [8], despite the interest with which they are welcomed and repeated already in 1912 in the residential context by the architects Herny Sauvage and Charles Sarazin in their famous residence in rue Vavin in Paris.

At the beginning of the 1930s, the work of another German doctor, Richard Döcker, has more success. He focuses on studying the arrangement of patients' rooms in order to allow the direct movement of the bed in the open air and to ensure the maximum possible sunlight to each room. Döcker's solution, featuring overlapping floors, gradually set back on the southern elevation, allows the construction of terraces and floor-to-ceiling windows on each level. To maintain a constant depth of building in each

floor, these are then offset also on the northern facade, where reinforced concrete pillars hors oeuvre provide support for the cantilevered elements [11].
The precise and effective coding of a real *Terrassensystem/Terrassentype*[3], which was spread in Europe through the publication of several works, influences many sanatorium projects, (also) even in France.
The competition for the sanatorium of Bucaille in Aincourt is a clear proof of the faithful diffusion of Döcker's model. In this case, in fact, not only the winning architects propose a solution *à gradins*, but the issue is also addressed in the project presented by Georges Henri Pingusson [1]. In the proposal of the theme offered by Crevel and Decaux at Aincourt, all the elements functionally different from the patients' rooms (dining room, recreation rooms, medical services…) are extracted from the central terraced building of each pavilion and placed in separate but attached blocks.
Despite the great appreciation for the graduated model shown by the trade press and exemplary achievements such as that of Aincourt, the actual reproduction of this type is limited in France to a few dozen examples. The reasons for this phenomenon are partly explained by analyzing the construction costs, which are higher due to the lack of repetitiveness of a standard plan, and considering the technological and structural difficulties related to the presence of cantilevered elements on the northern facade. The administrative prudence of the departmental offices also plays an important role in attenuating the project momentum in experimental directions [18].
The article that appeared on (the pages of) the magazine *Bâtiment illustré*in 1933 [2] just a few months after the inauguration of the sanatorium of Aincourt provides a detailed description of the buildings, whose architecture is characterized by a *"sobriété racée, moderne mais sans excès, sans outrance* (…)*" che libera "une impression de calme reposant, sans aucune monotonie"*.
A representative example of this sober and modern elegance is undoubtedly the treatment given to floor surfaces. These are in fact made in a marble grit, called *granito*, and organized in slabs of significant size, whose color palette changes depending on the type of room: whitish in the patients' rooms, pink in corridors and stairs, grey-blue in kitchens and medical rooms. The refined design of the floor requires that each slab is surrounded by a thin mosaic pattern in light colors, which is also used to complete the junction between the floor and skirting boards. Furthermore, the skirting boards is designed with a special concave shape functional for cleaning and hygiene.
The attention to the hygiene of the project includes the presence of *granito*, which is to be found also along the walls of all the rooms like kitchens, bathrooms and medical services.
Finally, a further detail that well describes the attention and refinement that characterize both the formal and technological expression of the entire building can be found in the treatment of thermal expansion joints in the long central buildings. These are in fact left visible on the external facade, while on the inner walls they are carefully covered with decorative elements in wood and zinc and on the ground by a band of ceramic mosaic.

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Fig. 5: Aerial view of the area of the Sanatorium of Bucaille in Aincourt, currently within the perimeter of the Parc naturel régional du Vexin français, 2019. © IGN.



Fig. 6: The *Pavillon des Tamaris* in the current state of conservation, 2019. © Photo by the author.





Fig. 7-8: Interior views of *Pavillon des Tamaris* in the current state of conservation, 2019. © Photo by the author.

5. The weaknesses and the potentialities for defining the role of sanatorium architecture in the contemporary world

Since the 1950s and 1960s, with the spread of pharmacological therapies and surgical treatments, it becomes evident that the architecture of sanatoriums is in real difficult in updating and adapting its forms to the increasing development of scientific innovation. Gradually compromising this prerogative, which is indispensable to the operation of sanatoriums, these buildings undergo a gradual process of conversion, divestment or disuse, shaping a monumental architectural heritage, whose fragility we can (clearly) perceive today [9]. The underutilization, if not the complete abandonment, of these structures and the relative lack of maintenance interventions have impacted on the surrounding architectures and green areas, thus becoming clear and often irremediable signs of degradation that denounce the urgency of the issue of protection and conservation [19]. In France, the reality of this architectural heritage is reflected in several hundred complexes between sanatoriums and care homes, only three of which, in addition to the Sanatorium of Bucaille, benefit from a formal act of protection with inscription *au titre des monuments historiques*: the sanatorium of Saint Martin du Tertre in Francoville, registered since 1987, and the sanatorium Sabourin in Clermont-Ferrand and the *aérium* of Arès in Gironda, both under protection since 2000.

Compositional systems, facade solutions and furnishings, as elements of a complex hygienic mechanism and participate in the great evocative force of the entire project, with their clarity of architectural and technical provisions [5],[7]. However, as already stated, the precise, scientifically determined functional program does not correspond to a model of perfectly reproducible space devices and one of the most interesting characteristics of this vast heritage lies precisely in the composite and variable richness of expressive and technological solutions.

The reconversion processes that affect the sanatoriums since the middle of the 20th century are mainly administrative and their aim is limited to mitigating some peculiar characteristics of these architectures, bringing them closer to the more standardized image of other hospitals, from which they originally wanted to distinguish themselves. Nevertheless, the increasingly stringent requirements of modern health standards have quickly forced operators to overload the architectures of an increasing number of technical layers (false ceilings, installations, parapets, coatings, etc.), which have inevitably prejudiced its appreciation [13].

With regard to the Sanatorium of Bucaille, this phase initially corresponds to a period of legal vacuum due to an administrative reorganization of the department Val d'Oise. This vacuum, despite the advanced deterioration affecting the buildings following the military occupation, is functional to preserve the architecture from overzealous and compromising renovation interventions, except for some false ceilings in common areas and a redesign of green spaces near the pavilions. However, with the installation of some new medical equipment, the desire to centralize the main functions in the *Pavillon des Enfants* begins to emerge. During the 1970s, this project comes true with dthe substantial renovation interventions that affected the pavilion, in the simultaneous decommissioning of the *Pavillon des Femmes* (1975) and in the closure of the tuberculosis treatment service still housed on the ground floor of the *Pavillon des Hommes* (1987). Since the general questioning of the medical vocation of sanatorium buildings throughout France in the 1990s, demolitions and heavy renovations have led to the loss of important portions of history and heritage [9],[13]. In this context, the municipality of Aincourt fortunately refused the permission for the demolition of the Pavillon des Femmes to the departmental hospital of Vexin in 1997. Also because of this risk, in 1999, a ministerial decree allows the registration *au titre des monuments historiques* of the *Pavillon des Tamaris* (ex *Pavillon des Hommes*, formally exempted from hosting medical services since 2000), of the *Pavillon des Peupliers* (ex *Pavillon des Femmes*) and the purification station serving the infrastructure.

It is clear, however, that the mere formal act of protection, which is a necessary prerequisite and an indispensable legal instrument, is not sufficient for the conservation of the site. This one is in fact now vandalized and in complete abandonment, except for the only pavilion still in full operation, the ex *Pavillon des Enfants*, the architecture of which irretrievably pays for further, highly inappropriate, recent adjustments. The question of the reclamation of a function for sanatoriums becomes therefore central and decisive for every discourse regarding the protection and valorization of this heritage [21]. The subject of functional reconversion is undoubtedly complex and presents many challenges: first of all, the dimensional characteristics of these buildings, which force to deal with expensive costs and investments, then the image that accompanies them, still linked to the spectrum of disease and infection. Even so, a strategic interpretation of the architectural qualities that identify these buildings, such as the north-south orientation and the location in naturalistically relevant sites, but also the constant attention to patient comfort and the great variety of spatial configurations, allows to elect these sites to privileged realities for a territorial development articulated between architectural heritage and environmental quality [19].

The important experience of some flagship projects for the recovery of sanatoriums, conducted in several European countries between 1990 and the early 2000s [15], that are expression of the Modern

Movement, has made possible to understand the need to set up a process of systematization and hierarchization of heritage's values as the main axis of the project, in order to effectively adapt the program to the building and not forcibly bend the architecture to new functions.
Since 2009, an initiative for the recovery and enhancement of the Bucaille sanatorium site has been under study, with an initial focus on the transformation of the Pavillon des Tamaris into a residential complex. The project, coordinated by Riccardo Giordano, *Architecte en Chef des Monuments Historiques*, aims to restore the facades and roofs of the building, offering a critical and coherent reading of the design, materiality and colors proposed by Edouard Crevel and Paul Decaux in the thirties. In particular, the insertion of two staircases on the northern prospectus, imposed by safety norms, offers an additional interpretive and design-related challenge, resolved by declining through architectural language and contemporary materials the functionalist - but refined and elegant - approach to the existing architecture. The proposed configuration for the interior spaces does not involve any increase in surface or structural change, as the residential program comes to be declined in accordance with the main existing spatial arrangements, inspiring the interventions on the partition walls and the works for the system integration to the principle of minimum intervention. The project is also characterized by a particular sensitivity to the enhancement of the link between architecture and landscape, recovering visual axes altered by the uncontrolled growth of the park vegetation and ensuring that each housing unit can enjoy the large terraces, that are the most emblematic feature of the sanatorium of Bucaille. The same attention has been paid to the history of the building, which also includes painful and tragic aspects, related to illness and imprisonment, to which the project intends to pay respectful homage by dedicating some rooms to the memory and narration of the past events. Since it is clear that the conversion into a residential complex definitively divests the building of its original role of public and collective architecture, it is imperative to ask oneself about the delicate balance that emerges in every project of revitalization of the architectural heritage between the demands for protection and conservation and the needs for economic and functional sustainability [20],[21]. In several national contexts, the attitude to preserve the public vocation of this type of building tends to prevail, sometimes complicating the possibility of real reconversion and risking to leave out the buildings where it is impossible to find sufficient public resources. Instead, in France, the architecture of the 20th century benefits from some forms of protection less stringent, such as the label *« Patrimoine du xxe siècle »*, have made the need for new functions and sustainable use of the building a priority element that inevitably leads to compromise on some values [22],[24]. However, the waiver of public vocation of these buildings should be always a deliberate choice, conscious of the loss of meaning it entails. It is also equally important try to respond to this deprivation with compensatory solutions already in the project phase. This attempt to read architecture as a fulcrum for a system of values and relationships underlines the degree of complexity when approaching the conservation and active use of this monumental architectural heritage [17]. Also, the project does not renounce to face technological problems, such as the thermal comfort of the rooms or the waterproof of the terraces. In these cases, the project directs the solutions' research to the existing building, where it is possible to see a design process in which the patient and the attention to his well-being are an interface between designer and architecture.

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NEW URBAN DEVELOPMENT AFTER THE COVID-19 PANDEMIC. AN INCLUSIVE VIEW FROM THE CULTURAL SPHERE

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Abstract
The starting point of this paper is a circumstance that generates concern: culture has not been directly included in any of the 17 Sustainable Development Goals (SDGs) that underpin the 2030 New Urban Agenda.
Today, the restrictions and social isolation caused by the COVID-19 health crisis make it clear that culture is more necessary than ever. In contrast to the limited interest shown in the 2030 Urban Agenda, paradoxically, the G20 does highlight its importance, as was clearly expressed at the joint meeting held in Saudi Arabia under the title “The Rise of the Cultural Economy: A New Paradigm”. In the context of planning for the implementation of the European economic recovery funds, culture must take on a leading role as a strategic and sustainable driving force capable of contributing more to the Gross Domestic Product than other economic sectors.
Throughout our paper, we will reflect on this and other contradictions, focusing on the new challenges facing urban conservation within the context of 21st century cities. Challenges that must be adapted to an idea of a dynamic city in continuous development where capitalism has found an excellent environment for intensive consumption. Globalization, trivialization and depersonalization must be considered, as they are rapidly gaining ground in the face of timid appeals in defense of local, every day and collective aspects as new bastions of identity.

Keywords: Culture, Sustainable Development Goals (SDGs), Urban Conservation, financial capitalism.

1. Background:
As early as the 1970s, the United Nations (UN) General Assembly confirmed the need to create and promote socially and environmentally sustainable settlements in the face of the threat posed by global urban sprawl (“Habitat I Conference”, Vancouver 1975). Twenty years later (“Habitat II Conference”, Istanbul 1996), the global deterioration of settlements and living conditions, particularly in developing countries, became evident, giving rise to the Habitat Agenda. The dawn of the 21st century was accompanied by the “Declaration on Cities and Other Human Settlements in the New Millennium” (New York, 2000), which gave shape to the Millennium Development Goals (MDGs) with which to outline a common discourse that would facilitate the achievement of global agreements by 2015. These goals were based on the principles of human dignity, equality, and fairness, with the ultimate purpose of freeing the world from extreme poverty.
Exponential urban growth and associated issues have intensified over the last two decades. As noted in the summary of the “Reflection Meeting on the Implementation of the Recommendation on the Historic Urban Landscape Paris 2011” ("HUL + 2” UNESCO, Paris 2013), the world has witnessed an unprecedented level of urbanization. Increasing numbers of people have moved to the cities, which have become engines of global growth. More than half of the world's population lives in urban areas and the prediction is that, within a generation, two-thirds of humans will be residing in towns and cities.

Consequently, these territories are under great pressure, which hampers the quality of life to which the inhabitants aspire and the preservation of the cultural value of these areas in a context of unrestricted urban development.
To address this situation, the New Urban Agenda 2030 adopted at the “Habitat III World Conference” (Quito, 2016) has been designed to establish the guidelines for global land and urban planning policies in the 21st century, seeking to strengthen universal peace and access to justice. To this end, the Millennium Development Goals (MDGs) have been replaced by the Sustainable Development Goals (SDGs), which were unanimously approved by all 193 members at the 70th United Nations General Assembly (New York, 2015). There are seventeen goals aimed at combating poverty, gender inequality, and tackling the climate emergency.

2. The Subsidiary Nature of Culture in the SDGs:

The new territorial context of the 21st century must be understood as a global socio-systemic process that integrates all the landscape factors (environmental, economic, and social) involved. Building on this basis, the SDGs are structured into five thematic areas (Planet, People, Prosperity, Peace and Partnership) from which 169 specific targets are derived and implemented through 232 indicators [1]. However, it is striking that culture has not been explicitly included in any of the five thematic areas mentioned above, nor in any of the 17 Sustainable Development Goals. It is only included as a secondary item under Goal 11 “Sustainable Cities and Communities”, which envisages 10 specific targets and culture is one of them; more specifically target 11.4 “Strengthen Efforts to Protect and Safeguard the World's Cultural and Natural Heritage”. This goal is made effective through indicator 11.4.1, “Total expenditure (public and private) per capita spent on the preservation, protection and conservation of all cultural and natural heritage, by type of heritage (cultural, natural, mixed and World Heritage Centre designation), level of government (national, regional and local/municipal), type of expenditure (operating expenditure/investment) and type of private funding (donations in kind, private non-profit sector and sponsorship)”. This secondary and insufficient focus on culture is rooted in the MDGs –an often forgotten consideration when dealing with this issue–, whose eight goals [2] laid the foundations of a common discourse that marked the roadmap for addressing development in the new millennium, and in which culture was clearly overlooked. At this point, it is worth referring to the “United Nations Conference on Sustainable Development” (Rio de Janeiro, 2012), as it set the tone governing the process that resulted in the new SDGs with the firm conviction of continuing the momentum and guidelines generated by the MDGs.
Although the New Urban Agenda and the SDGs are not binding, as decisions on urban issues are taken by the governments of the various countries [3], it is necessary to highlight the importance of this initiative, as it has been endorsed by the “SDG Fund”, an international multi-donor and multi-agency development mechanism created in 2014 that supports joint programmes in 23 countries, with an initial budget and the necessary mechanisms to invest in joint partnerships. Today, in a global context of economic recession, restrictions and social isolation caused by the COVID-19 health crisis, it is more necessary than ever to vindicate the prominent role culture plays as a driving force of strategic sustainable development, especially in the urban sphere. In the words of UNESCO's Assistant Director-General for Culture, Ernesto Ottone R. “Now, more than ever, people need culture. Culture makes us resilient. It gives us hope. It reminds us that we are not alone” [4]. Along these lines, the G20 has recently emphasised “culture’s potential contribution across the public policy spectrum in forging more sustainable societies and economies” (Meeting on “The Rise of the Cultural Economy: A New Paradigm”. Saudi Arabia, 2020). Culture must be understood as a global need that includes all aspects of our society and must, therefore, play a leading role in the global recovery. Consequently, the responsibility to preserve and pass on our cultural heritage to future generations requires us to manage culture sustainably by addressing the devastating impact caused by the pandemic in this sector. To this end, developing new technologies at the service of cultural dissemination, implementing new economic models that regulate cultural tourism, and promoting synergies between culture and education must become key aspects to be implemented in new strategies at world level [5].

Below, we shall focus on the new challenges facing urban conservation while keeping in mind the pressure derived from the consumption needs of financial capitalism.

3. Reflections on Cultural Heritage in the Current Urban Context:

Culture and city are two intertwined concepts that are expressed through the “constant reflection on their values, evolution and memory building” [6]. The critical emphasis is on how they are managed. Today, cultural heritage is threatened by its requirement to be functional and by the economic interests derived from its exploitation. In this context, the discussion on the role that cultural assets should play always hinges on a precarious balance between their unrepeatable nature, which is

intrinsic to them, and their use within a globalised free market society, a hallmark of the modern 21st century world.

In this respect, we should not forget that neoliberalism is driven by the powerful machinery of consumption, precisely calibrated through the laws of the market. In the urban context, the voracious appetite for the use of space leads us to demolish and renovate, restore, rehabilitate, or revitalise, depending on the needs of the market and the competitive advantages that each space can generate. "urban space is an efficient way of fixing capital, allowing accumulation processes to work within certain levels of stability." [7]. In this regard, we must not forget the concept of "creative destruction" that the Austrian economist Schumpeter used to define the essence of capitalism: the business of the powerful financial capital that operates in the city is based on the destruction of space through any mechanism that is useful to its interests. "Everything is potentially usable in every way" [8], therefore, any approach is valid as long as it is flexible enough to consume more and more. As Yory [9] clearly points out, "after all, it is a question of "opening market niches" or strengthening, where appropriate, existing ones".

Based on this, globalisation and the consumer society in which we live require a constant level of dynamism, immediacy and novelty. Obsolescence and destruction are indicators of "healthy" urban development with which to boost profitability through the juicy opportunities offered by the postmodern paradigm: spectacle, tourism, gentrification, Disneyfication, etc. This is the framework in which conservation operates in these "liquid times" in which we are living according to Bauman's [10]. A confusing panorama, whichever way you look at it, in which only flexibility, ingenuity, and good practices can reconcile apparently contradictory interests, but which are the obverse and reverse of the same coin. The challenge is not a trivial one.

We are, therefore, facing an uncertain outlook with many unknowns and few certainties. These unknowns are multiplying due to the problems that the coronavirus crisis has brought to light in our cities and which compel us to analyse data and indicators with which to build new models of sustainable cities where people and their health are of paramount importance. At the same time, we are presented with an exceptional opportunity to tackle the structural issues affecting urban conservation and to promote the development of cultural industries, which are essential to preserve and enhance our extensive cultural heritage. Such an endeavour requires, without a doubt, the promotion of a new humanistic and supportive mentality of love for culture.

The recently published "Report Cities and Pandemics: Towards a More Just, Green and Healthy Future" (United Nations Human Settlements Programme, UN-Habitat, 2021), provides a diagnosis of the current situation of the pandemic and cities by identifying four key priorities: Rethinking the Form and Function of the City, Addressing Systemic Poverty and Inequality in Cities, Rebuilding a "New Normal" Urban Economy, and Clarifying Urban Legislation and Governance Arrangements. It is precisely this last priority, Urban Legislation and Governance Arrangements, that is crucial to managing the sea of uncertainties surrounding the duality between the traditional city and development that has always characterised all approaches based on urbanism and sustainability [11].

From a social viewpoint, the conservationist spirit embodied in our legal system since the beginning of the last century has become deeply rooted in the population, generating a widespread awareness for the defence and preservation of all iconic cultural assets of significant interest. However, in the 21st century, the conservation of cultural heritage in the urban environment requires the development of legal instruments capable of overcoming the cultural uniformity that traditionally characterised cities when they were a fixed and objective reality. But how should all this inherited ancient heritage be managed within the new ecosystem of a modern city?

On a conceptual level, it is widely accepted that historic buildings should never be seen as models frozen in time, as has been taught in the fields of the history of art and architecture and even archaeology for decades [12]. The evolutionary understanding and the ongoing study of change leads us to engage in a dialogue with buildings as "a living architectural ensemble" [13] "that continues its vital development through transformation and re-adaptation to new realities" [14]. Fortunately, the development and implementation of the discipline of Architectural Archaeology in Europe since its beginnings in Italy in the 1970s (Francovich, Mannoni, Manacorda, Parenti, Brogiolo, Doglioni, etc.) have replaced idealist and neoconservative currents, asserting "the consideration of built heritage as a stratified deposit of a social and collective memory, the resignification of which must be made in an interdisciplinary and democratic way" [15].

However, this advanced, progressive, and innovative conceptual renewal in the field of heritage has had limited impact at the legal level. In general terms, progress in the legislative framework has been minimal, as it continues to be anchored in the aestheticist understanding of a work of art; a deeply rooted view in conservative idealism that sees the restoration architect as the only person responsible for unlocking the individual keys to the identity and authenticity of a monument [16]. This is a fixed and static view, forged at the dawn of the 19th century in the West, which, far from understanding heritage as a democratic cultural process, considers it to be an inherited legacy that constitutes the source of our identity. As Smith notes [17], we are faced with a discourse that "stresses that heritage must be

passed on to the future unchanged, and that, therefore, the “essence” –or the assumed meaning in inherent heritage, and the past and culture it represents– will not be changed or challenged” [18] .

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[2] 1. Eradicate extreme poverty and hunger. 2. Achieve universal primary education. 3. Promote gender equality and empower women. 4. Reduce child mortality (under-fives). 5. Improve maternal health. 6. Combat HIV/AIDS, malaria and other diseases. 7. Ensure environmental sustainability. 8. Global partnership for development.

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The Drawing and the "Cocoon-*House*" or The Drawing and the "Cocoon-*Home*":
The blue and the other colors of the sky, and the greens under it.

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Abstract
Perhaps the human being invented "the house" when he realized that his naked body was not enough to protect him from *the horrors of the world*.
Perhaps today "this house invented for this *naked body*", already expelled him from the idyllic unreal dreamed Paradise. This house, as an *other-body*-invented, is today, as never before, more than a shelter or a defense, more than a second skin or an other-self, more than a "corporal interval", as Aristotle called it… this house is *life* as it never was.

Keywords: Drawing, architecture, house, home, cocoon.

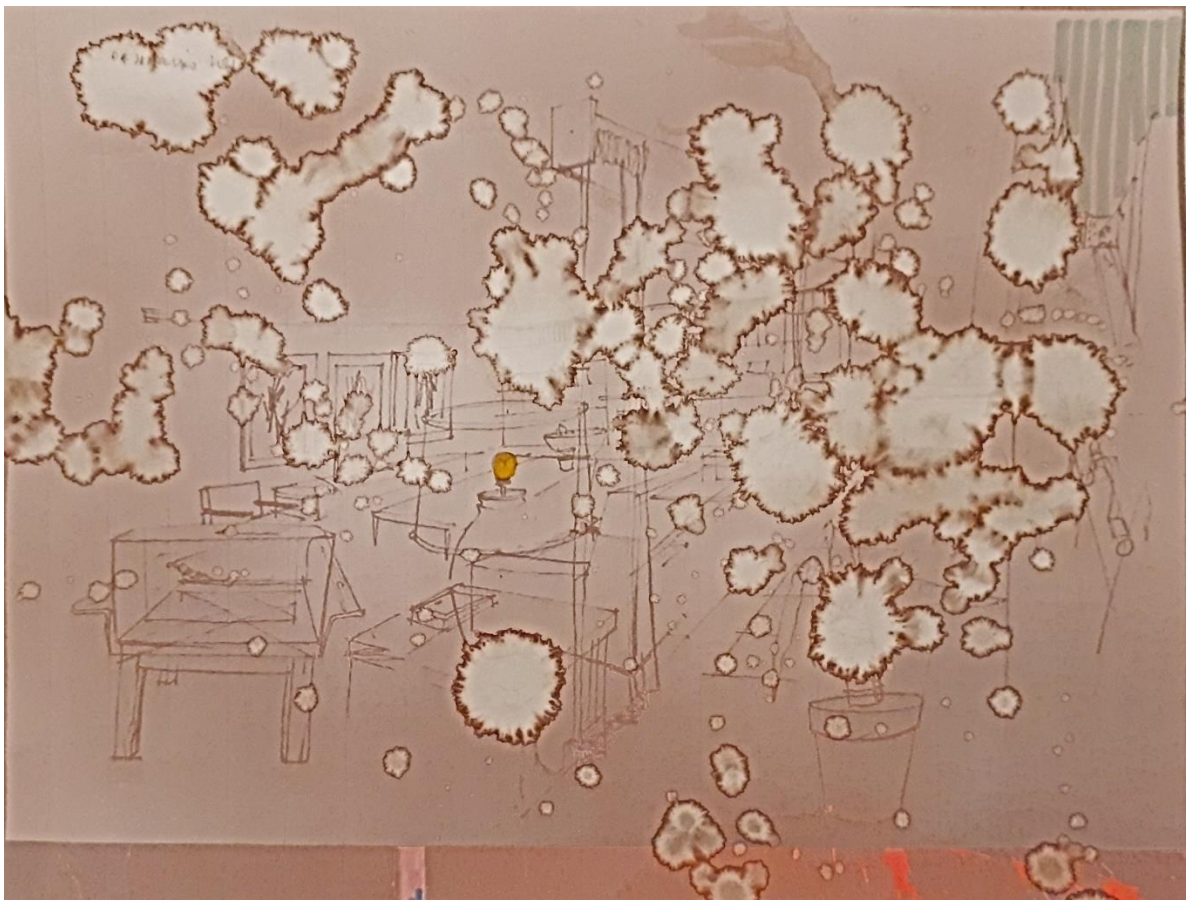

Fig. 1: Pedro António Janeiro, pencil and watercolor on paper, 29X42 cm. Viscount of Talaia Collection.

"The house", today, is so much more, it is more than a shelter, a defense, a protection, a trench, a receptacle, a cover, more than the Filarete cloud (or, ceiling?), creek, cove, port. "The house", today, it becomes, *is* an amputation of the World.

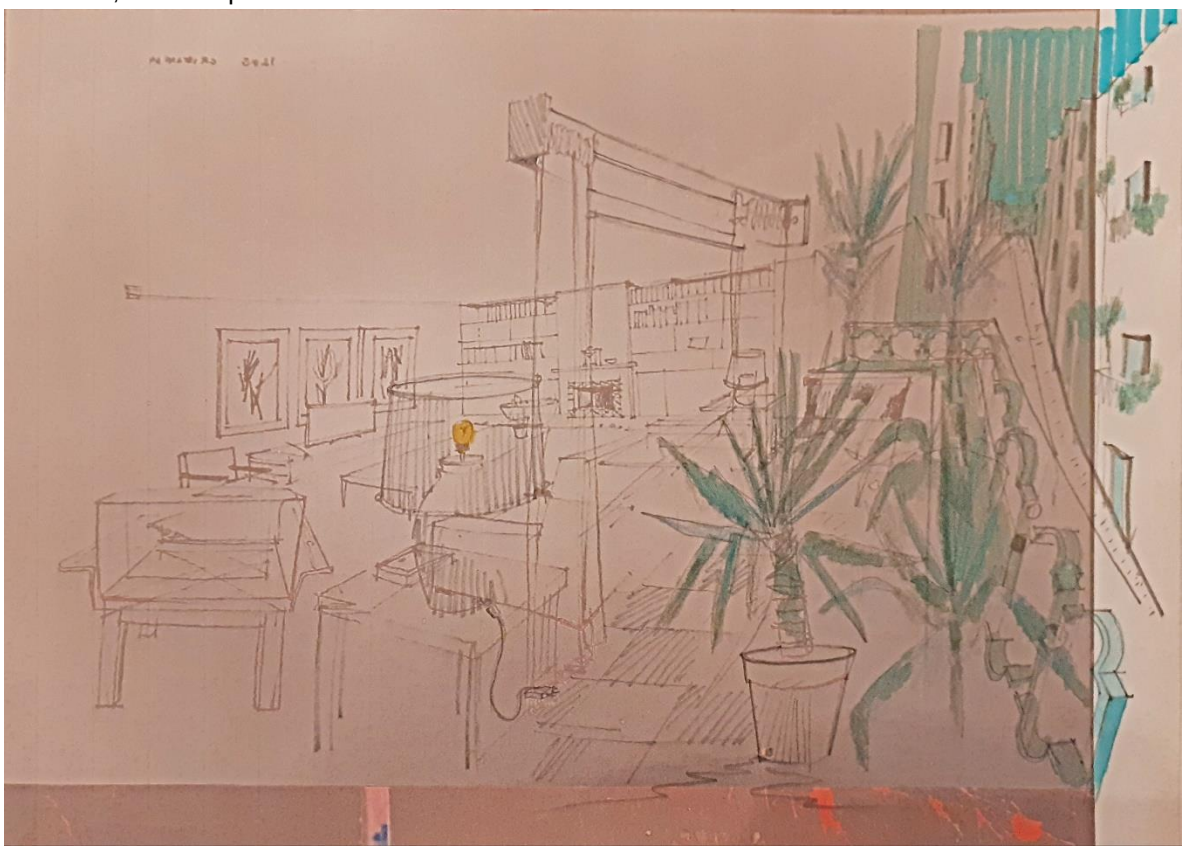

Fig. 2: Pedro António Janeiro, pencil and watercolor on paper, 29X42 cm. Viscount of Talaia Collection.

Therefore, in this sense – as an amputated segment of the World – “the house” is a “cocoon”, although this amputation is provisionally a reality: “the reality”.
Amputated worlds, or amputations of the world, we know them many throughout the history of architecture: monasteries, convents, other panoptic jails, other cells, etc., voluntary or involuntary deprivations in the name of faith or necessity, or law.
But, to amputate the World is to establish another one: blue or any other colors that the sky admits, Franciscan, Benedictine, Dominican, Cistercian cloisters, or others; green Carthusian yards; but their inhabitants bodies free, even though imprisoned or cloistered or encased.
Nowadays, in this new way of *being* or *staying* “at home, in a cocoon”, that’s were architect's Drawing can act:
The importance of the courtyard, the cloister space, the balcony, the gallery, the greens of the plants, which are also impermanent and which also mark the passage of hours, the important trajectory off the sun, the time, is fundamental for human habitations, and plants, flowers and fruits; the importance of the colors that the sky takes on. Let us all remember Heidegger in 1952 in Darmstadt: “The Sky is the arched course of the sun, the alternating course of the moon, the wandering brightness of the stars, the seasons and their change, the light and twilight of the day, the darkness and the light of the night, the hospitable and the inhospitable of time, the passage of clouds and the bluish depth of the ether [...].”
“The house”, nowadays, has become, *is*, in fact, an amputation of the World – a hyperbolic virus, which requires humans to encase, to encase “at home”.

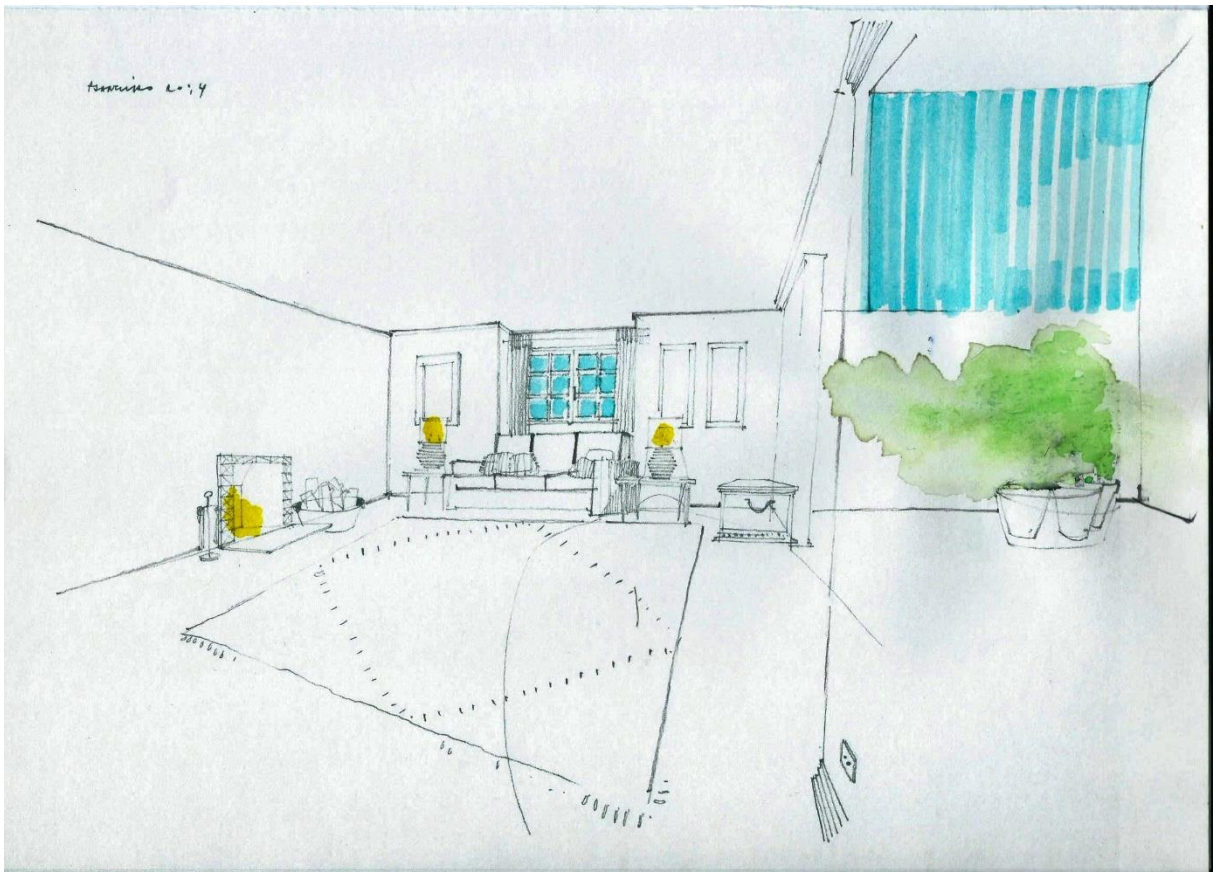

Fig. 3: Pedro António Janeiro, pencil and watercolor on paper, 29X42 cm.

Houses have ceased to be the place where humans practically only sleep and take one or two meals, to become a Parallel-Universe of ablation, cutting, excision, mutilation of “outside World” (as defined by Phenomenology and Existentialism), to become a *World of being and staying*.
"The house" today has, in fact, become an amputation of the world – a virus has required humans to encapsulate themselves "at home".
The architect, after all – the one who knows the sky colors of the cloisters of convents and monasteries, the one who knows *the arcuate course of the sun*, the one who knows the human and its *Metamorphosis*... can act: more than ever, courtyards, balconies, open air are needed.

“Stay at home” – “protect yourself”, “get away”.
But what exactly does it mean to "stay at home"?

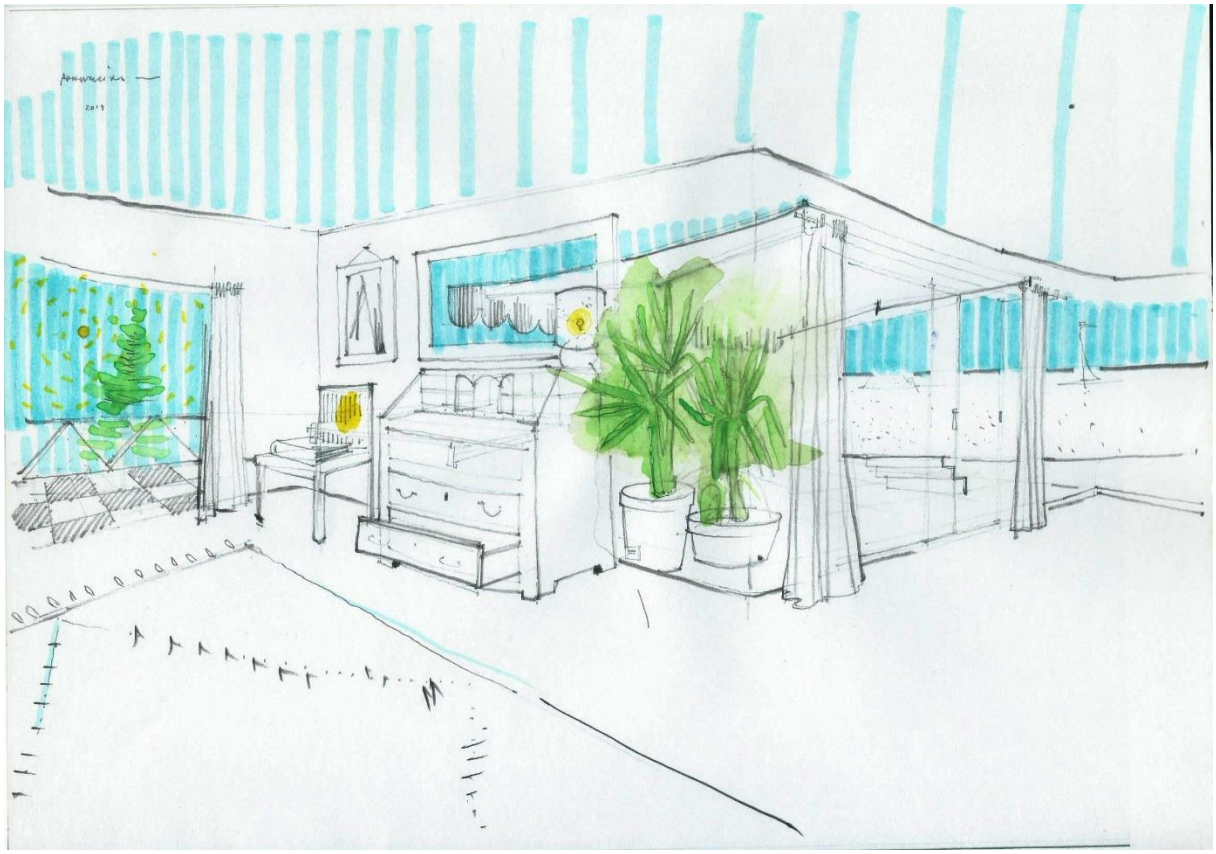

Fig. 4: Pedro António Janeiro, pencil and watercolor on paper, 29X42 cm.



Fig. 5: Pedro António Janeiro, pencil and watercolor on paper, 29X42 cm.

The pandemic has further accentuated social differences between human beings.
“Staying at home”, if the house is a home with a garden or a patio, is different from “staying at home” if the house is an apartment.
“Staying at home” in an apartment without a balcony, in a house only made of one door, walls and windows, is different from “staying at home” if the house, as a device, has a generous balcony where, in addition to the sky, you can breathe the air in a different way – that space that advances and stretches like an arm to a body, like an isthmus to a peninsula, that extends out of the house, is where humans can water the plants, can see them grow and bloom, and, through them (through the changing shades of their greens, and the colors of their flowers that call the birds and the bees), feel time passing.
Time passing beyond the *arched course of the Sun*.



Fig. 6: Pedro António Janeiro, pencil and watercolor on paper, 29X42 cm.



Fig. 7: Pedro António Janeiro, pencil and watercolor on paper, 29X42 cm.

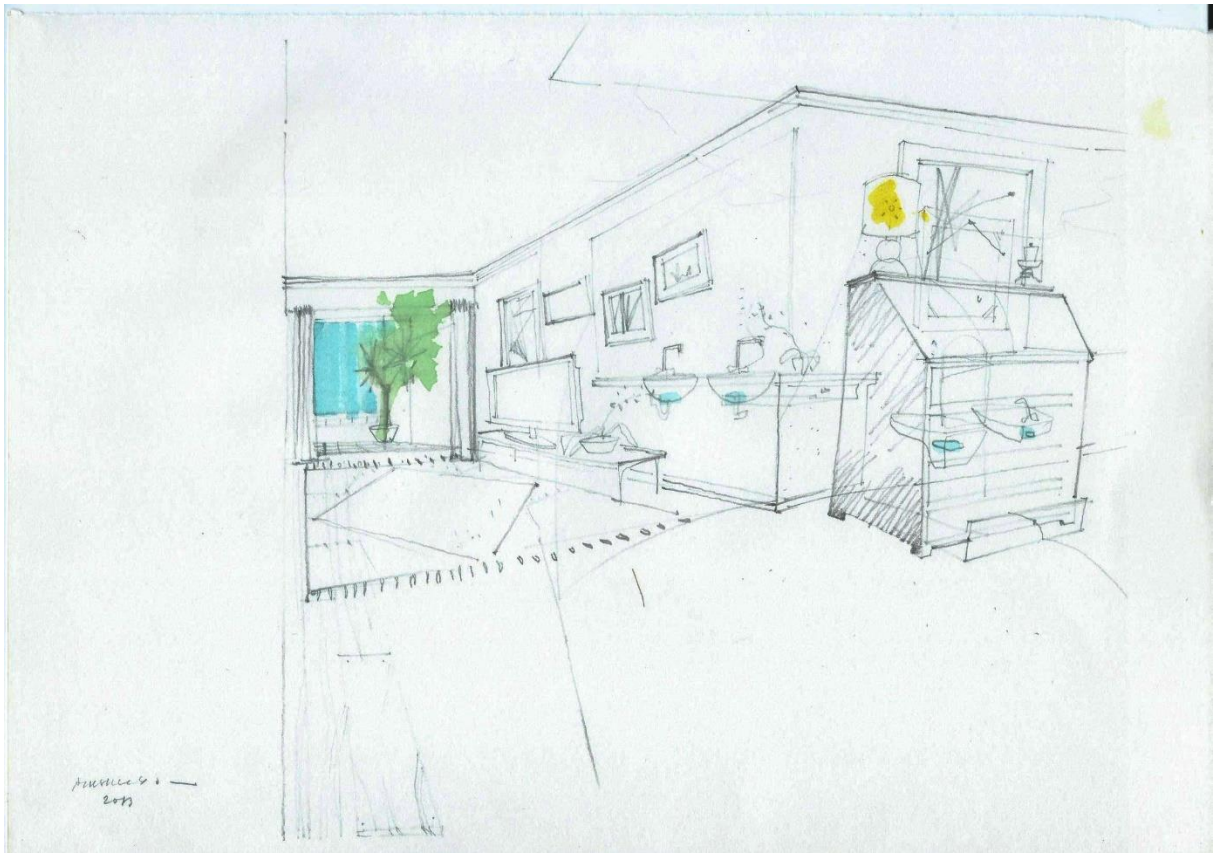

Fig. 8: Pedro António Janeiro, pencil and watercolor on paper, 29X42 cm.

Away from the world, protected from the world, *at home*, we have observed, it is quite different for each human being in the times we're living at.
Architecture has always known that "the house", as a shelter, served to protect – "*La capanna*" as it is known by Treatises, at least since the Ten Books of Vitruvius. What Architecture did not knew is that "the house", one day, would, in fact, become the necessary amputation of the world – one, in fact, delimited part of the space of the *continuum* of all space, a frontier. Architecture did not knew that this "*domain*" – so well described by Moore and Allen, in *Dimensions of Architecture* –, which must respond to the perceptive and sensitive dimensions of its inhabitants, was, after all, such a fundamental wall, an essential "cocoon".



Fig. 9: Pedro António Janeiro, pencil and watercolor on paper, 29X42 cm.

After all, an "amputation of the outside world" requires the "establishment of another world", an inside one. "Staying at home" means, not in a theoretical or philosophical sense, not within almost an osseous discourse, one effectively encapsulating or hermetically sealing, like the caterpillar is encased with thread filaments its house like a drawing – a *metamorphosis*(?) (*Μεταμορφόω*), such as Ovidius dialectics, that unites gods with mortals in a world in constant movement moved by balanced passions and desires. The caterpillar is encased, it is its destiny; the human being built cities, it is his becoming, it is his way of being able to fly.
Seldom, people, like the caterpillar, draw their own houses with thread filaments; therefore, it is up to the architect, and Architecture as a discipline, to do it for them, to draw these houses for these people, projecting them in order to became homes. There is, therefore, an ethical duty in the architect's job and its architectures: the necessary *amputation of the world* and the *establishment of another world*. A better one.
Tradition, Theory and History of Architecture have known this since the time when, for example, they designed and built cloisters, monasteries and convents, cells: while they were drawing them, they thought about the importance of the *alternating figure of the moon*; while they were building them, they thought of the *wandering glow of the stars*; while imagining them lived and inhabited, they tried to reach, through their design, *the bluish depth of the ether*. But, those, were drawings that satisfied deliberate and voluntary wills and faiths – nevertheless, the blue and the other colors of the sky, and the greens

under it, always contemplated by its architects; in these spaces there is always something of Eden (as the two books of Genesis describe it); in these spaces, deliberately thought as excisions to the world, there is always something of a *natura naturans* as Spinoza said it; something that could bring or could restore the human being to return to the *origin*, an origin where the human being is no longer naked, unexposed, but protected from the dangerous looks and temptations of the *outside world*. Architecture and architects managed those excisions – just to mention two examples, among thousands, of the same typology: *Monastero di Santa Maria Scala Coeli*, in Évora, Portugal (1587); *Monastero della Certosa di Galluzzo* (1342), Firenze, Italy, which Le Corbusier curiously visited in 1907;
Le Corbusier learned from it...
(…)
The human being remains naked ("naked", not in the strict sense; "naked", as "vulnerable", as "helpless", as "at mercy"); therefore, the architect must learn from drawings of spaces like these (learn even from those spaces built after the Council of Trent (1545-1563), and from the conservative shame of Innocent X, Clement XIII and, from the statues amputator, Pius IX in 1857), and apply that knowledge to the design of the houses to be drawn and built, as Le Corbusier did.
In monasteries or social districts, Eden can now be resurrected by Architecture so that, whenever necessary, *the seasons and their changes* and the *passage of clouds* can continue to exist, so that people who *stay at home* can breathe something from the world from which they were expelled.
This, or arrested behind bars.

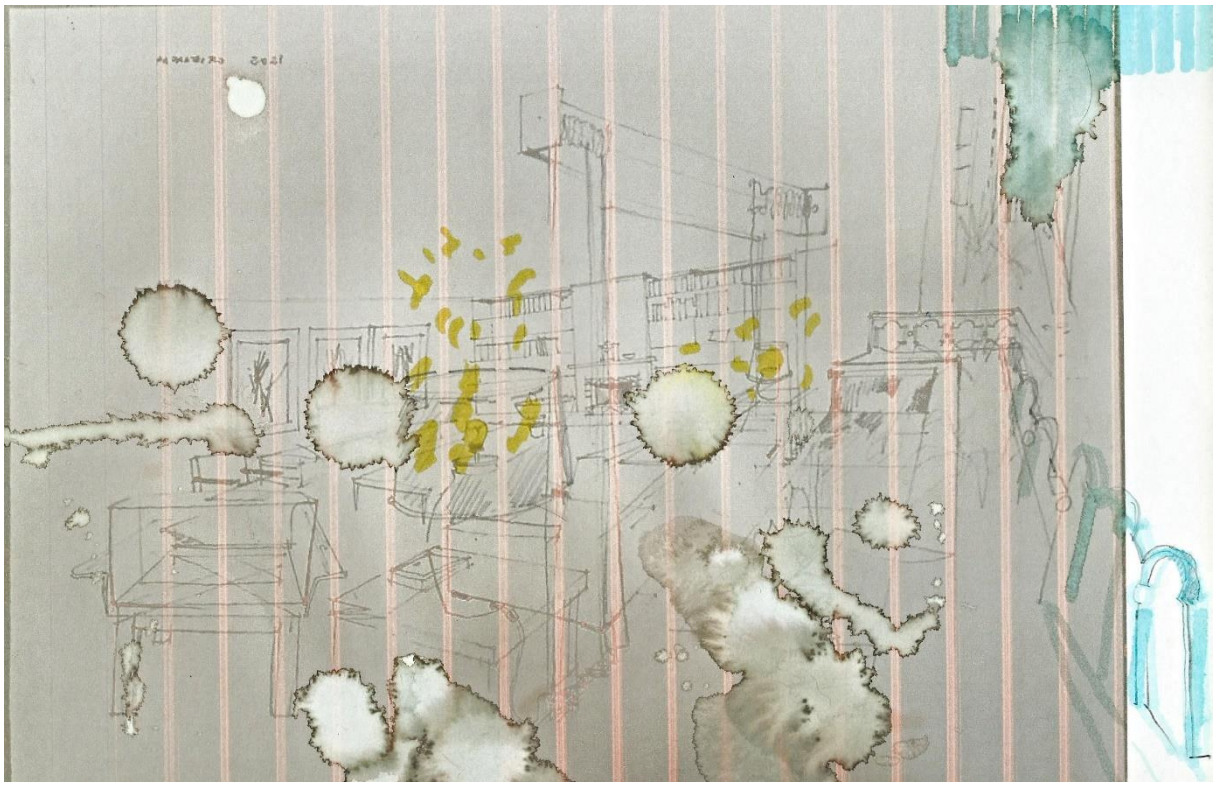

Fig. 10: Pedro António Janeiro, pencil and watercolor on paper, 29X42 cm.

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Redesigning living spaces following COVID-19. A multidisciplinary study

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Abstract
The impact of the COVID-19 pandemic has changed the way we used to live. The increase of the smart working and the inability to attend public spaces have constrained people to spend the most part of their time at home. This has turned the spotlight on the residential housing, leading to its rethinking in order to pursue healthy, multifunctional and comfortable living spaces, capable of ensuring psychological and physical well-being. This paper proposes a multidisciplinary study, architectural and psychological, carried out through the review of recent scientific researches, news, articles and the integration of a new study through the administration of semi-structured questionnaires in order to update residential dwellings to current needs.
Health is the topic that has suffered the most during the quarantine, and the one that need to be improved through new design strategies. Our findings show certain limits of modern homes, such as standard spaces, open floors and monofunctional rooms, and offer points of reflection toward flexible living spaces addressed to personal well-being.

Keywords: COVID-19, housing, mental health, design, well-being.

1. Introduction

1.1. Framework
In March 2020, the World Health Organization (WHO) declared the outbreak of a new coronavirus disease, COVID-19, to be a 'pandemic' [1]. The only way to contain this disease has been to cut off the route of transmission and home isolation has been appropriate for preventing the spread of COVID-19 [2]. Therefore, the house has been playing a crucial role in the daily life, as the only safe place and has become more than just a living space.
Until today the home has been designed as a place mainly to return to at the end of the day, mostly focused around the sleeping area. From this moment of home constriction emerged that this living model is not enough for our well-being [3], hence the idea of a design for health.
Studies found severe mental health problems, such as anxiety, depression, irritability, insomnia, confusion and anger among population who has undergone quarantine and isolation in different contexts [4]. The present study, conducted in Italy, investigates the relation between house design and its effect on mental health.
From cholera, influencing the modern street grid, to the bubonic outbreak, changing the design of drainpipes, and building foundations, history shows how pandemics affect the way we design cities [5]. Considering that remote work and virtual meetings are likely to continue after the pandemic, and consequently the staying at home [6], it is a fundamental challenge placing the well-being at the heart of the living design. This paper explores limits and potentiality on current living spaces and proposes design strategies following COVID-19 pandemic experience, through a multidisciplinary study, architectural and psychological.

1.2. Living space and mental health relation

During the lockdown period 25.7 million of Italian families [7] spent the totally of their time at home for a period of up to 2-3 months. The built environment is a determinant of human health and well-being [8]. In recent years, a growing number of studies have been conducted on the relationship between urban built environment and human health [9]. Assuming that in high-income countries, around 70% of people's time is spent inside their home, residential buildings are fundamental for the population health. In this direction, in 2018 the World Health Organization defined Housing and health guidelines [10].

Furthermore, following the COVID-19 pandemic, the WHO affirmed that living space must guarantee adequate privacy in order to meet the needs of the occupants, be accessible and usable for extended users and be large enough to comfortably accommodate people of different age [11]. For this reason, the housing units must satisfy the need of privacy of residents with adequate and flexible spaces for possible isolation or for working and studying from home. The pandemic showed certain limits of modern homes and contemporary minimalism, such as standard design, open floors, mono-functional rooms and clean, white and anonymous spaces and offered points of reflection toward personal spaces virtually connected and physically enriching [12].

Another post-pandemic multidisciplinary study reports that the well-being and public health recommendations for a healthy, safe and sustainable housing are: a) visible and accessible green elements and space; b) flexibility, adaptability, sharing and crowding of living space, compliant functions located within the buildings; c) re-appropriation of the basic principles of sustainable architecture, thermal comfort and Indoor Air Quality (IAQ); d) water consumption and waste water management; e) urban waste management; f) housing automation and electromagnetic fields; g) indoor building and finishing materials [13].

2. Methods

The present study is based on literature research and survey administration. The former involves the selection of international case studies on housing design following COVID-19, the latter investigates the relation between dwellings and psychological state.

2.1 Research

The research consisted in selecting papers, journal articles and case studies on new trends and approaches on living spaces design. Being in the era of globalization, information that can be gathered on the pandemic is innumerable and keep changing with the evolution of the virus itself [14]. This variety of news, opinions, articles in which we find ourselves immersed today is an extraordinary source, but its truthfulness need to be certified, and selected with great responsibility and attention.

This research focuses mainly on two aspects: the first is cognitive, to understand how the world of architecture is reacting to incentives and consequences of lockdown, as the large amount of time spent at home has called into question some key aspects of the modern home. The second seeks to bring case studies responding to the new needs of a home that turns the spotlight on well-being. The focus has been on those aspects that mostly influence human psychology within the housing unit, such as: outdoor spaces, private spaces, open spaces, wi-fi connection, greenery, lighting and colours.

2.2 Survey

A sample of population was invited to answer an online survey from the 15th of February to the 14th of March 2021. The survey was developed with the Qualtrics software and took approximately 5-10 min to complete. Inclusion criteria were living in Italy and being at least 18 years old. Participants were recruited through social media (e.g., Instagram, WhatsApp, LinkedIn) and were asked to invite friends in similar circumstances. The survey was anonymous and confidentiality of information was assured. Participants were allowed to terminate the survey at any time they desired, and no monetary rewards were given for completing the questionnaire. The questionnaire is composed of three sections: the first one investigated the generic and sociodemographic features of respondents, the second, housing physical characteristics, in the third section, responders were requested to complete COVID-19 Peritraumatic Distress Index (CPDI) questionnaire [15], to evaluate the psychological impact. CPDI has 24-items whose content refers to anxiety, depression, specific phobias, cognitive change, avoidance and compulsive behavior, physical symptoms and loss of social functioning in the past week. Items are rated on a 5-point scale ranging from 0 ('not at all') to 4 ('extremely'). The total score ranges from 0 to 100. A score below 28 indicates no distress, between 28 and 51 mild to moderate distress, and above 51 severe distress. The content validity of the CPDI was verified by psychiatrists from the Shanghai Mental Health Center. The Cronbach's alpha of CPDI is 0.95 ($p > 0.001$) in the original study [16].

Data analysis was conducted using frequency distributions for categorial variables, summarized using ratio and percentages. Statistical analysis was performed using SPSS Statistics and the Pearson's correlation to determine the relationship between house characteristics and psychological distress of the responders.

3. Research results

The architectural and psychological study revealed certain aspects to be valued, following the COVID-19 experience, in order to pursue the mental health. In carrying out the research, case studies have been relevant to validate the analysis. In their entirety with multiple methods and strategies, architects proposed more flexible design lines for a house in evolution following the needs highlighted during the lockdown. According to them the period of constraint at home represented a moment of reflection, where the limits of modern architecture [12], as the matrix of today's housing design, do not respond to the needs of individuals who live it throughout the day. The aspects to be improved to pursue the personal well-being are: outdoor spaces, private spaces, wi-fi connection, greenery, lighting and colors.

3.1 Outdoor spaces

In Italy 2,650,000 families live in apartments without balconies, terrace or gardens [17]. During the lockdown the outdoor spaces performed a socially relevant character because, placed in between the external environment and the domestic shelter, they represented an outlet for the decompression of the interiors, allowed social contacts and helped people to reduce the sense of isolation and loneliness in a historical moment in which the public space has been unable to play an active role [5,18]. The HKS Architecture Studio suggests to design balconies with multiply strategies in order to connect the neighborhood. For instance, dynamic and diverse configurations (cantilevered balconies, traditional balconies and fully recessed balconies) allow residents to interact with each other, giving opportunities for activities such as having concerts, parties, playing bingo [19].

3.2 Private places

Recent studies revealed that people with adequate space for work, study, exercise, and personal privacy at homes have lower stress levels compared to those who lack those accommodations [14]. Worsening of working performances related to working from home and living spaces that do not guarantee adequate privacy during phone calls for work or personal reasons, increased the risk of depressive symptoms [9]. Intimacy plays an important role in the psychology of the architecture. Open floor plan has been popular from the modern movement, offering single, large and open space for multifunctional purposes. However, many people find it difficult to find private space when the whole family is at home. After quarantine SO-IL architects updated residential building in Brooklyn towards the privatization of spaces. The goal is to make the housing unit livable for long periods by creating a multiplicity of spaces previously considered unnecessary. The kitchen, living room and dining room are all separate areas, to allow greater privacy, the bedrooms are acoustically insulated to ensure that rooms can also be used as a study / work area and, above all, they aspire to increase external space destined to multiple functions [12].

3.3 Connection and smart technologies

During the COVID-19 pandemic, people, confined to their homes, transformed their living environments into places for recreation, work, study and physical activities and a presence of Internet and a good Wi-Fi connection becomes strategic and fundamental [13]. Digital technologies can bridge social distance, even while physical distancing measures are in place and contribute to psychological well-being increasing connection within people and reducing loneliness [20].
Since remote work and virtual meetings are likely to remain, albeit less intensely, after the pandemic [6] the need for better performing IT systems at homes is demanding. The importance to adapt dwellings to new technologies will bring to advantages for personal comfort. The project developed by Euromilano and designed by Labics Studio follows the principles of preserving health, generating a house experienced as a multifunctional hub. For instance, most of the condominium spaces such as gym, game room, co-working spaces can be booked individually via an app following a sanitization [21].

3.4 Greenery

Green elements contribute to reduce stress such as anger, anxiety, sadness and depression, acting on various levels, promoting physical activity, providing meeting places for residents, encouraging social ties [22]. However, following COVID-19 pandemic, confinement at home has also revealed that is necessary to understand that being able to view greenery from windows or to grow plants inside the homes contribute to the mental health of residents. Certain studies highlight how greenery view windows can have beneficial effects in reducing stress especially if natural elements or landscape are visible [23]. The restorative influences of exposure to nature involve a broad shift in feelings towards a more positively-toned emotional state, positive changes in activity levels in different physiological systems, and moderately high levels of sustained attention. This produces higher levels of positive feelings, reduce negatively-toned or stress related feelings such as fear and anger, and suppress stressful or extraneous thoughts [24]. The study of Kaplan [25] reported that the view from windows which includes streets, sidewalks, other buildings, parking areas, and fences or walls was associated with less satisfaction with nature and with the neighbourhood. As opposite, view of nature (vegetation in many

forms including trees, residential landscaping, gardens, and even mowed areas) was a strong factor in well-being. People generally feel more energetic, focused, positive, satisfied and relaxed.

3.5 Lighting

The proper use of lighting, natural and artificial, is a determinant for the indoor quality [10]. In Italy the proper orientation recommends to have living spaces exposed on south, bedrooms on east and working areas on north. Building codes don't require workspace to have an access to natural light and air via operable windows, but with the increasing of the smart working this topic becomes a fundamental need. Literature concerning the effects of windows on work and well-being confirmed that natural light enhances work and well-being in a number of ways including increasing job satisfaction, interest value of the job, perceptions of self-productivity, perceptions of physical working conditions, life satisfaction and decreasing intention to quit [26]. Beyond natural lighting, it is important the design of artificial lighting and the use of light colors for internal surface to increase luminosity [13].

3.6 Colors

The use of colors in architecture has always being central and from literature we know that psychological properties of colors is associated with mood of people in general [27]. Colors have many emotional impacts, namely, temperature, strong and weak, hard and soft, active and calm. Brightness and low saturation create a soft feeling, whereas dimness and high saturation create a hard feeling. Warm colors are those that are vivid in nature and those, such as red and yellow, increase arousal more than cool colors, such as green and blue, which instill calm [28]. For example, red is a powerful and strong color and it can be perceived as demanding and aggressive. It may activate the "fight or flight" instinct, stimulation and excitement effect on people. Green is considered an emotionally calming color. It gives a sense of refreshment, harmony and equilibrium and it also induces relax because his remind of nature. Blu encourage intellectual activity, reason and logical thought. In the same evidence about raising blood pressure with red, blue is deemed to lower the blood pressure. It is a calming color which encourage reflection, associated with the sky and the sea.

4. Survey results

A total of 330 responders completed the online survey, and, of those, 64,2% were female and 35,8% were male, 35,8% were 25-34 years old, 50,9% were smart workers and a total of 59,8% were living during the lockdown with partners and children (fig. 1).

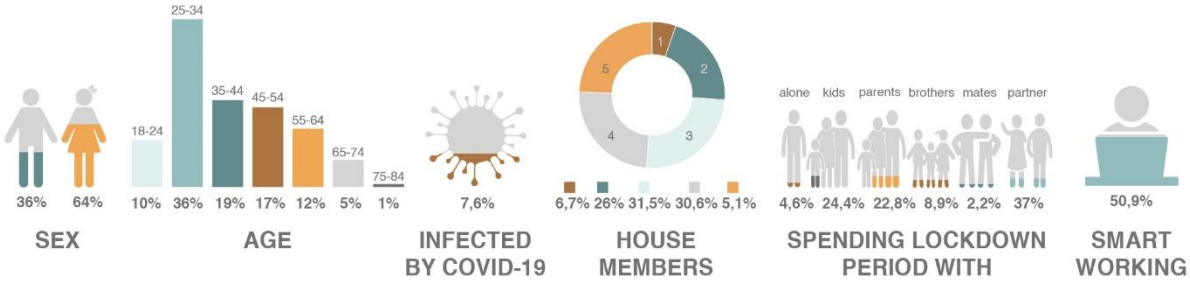

Fig. 1 Data on the respondents, referring to the lockdown period (1st section of the survey). Survey data elaboration A.M., Graphic visualization A.B.

The second section of the survey, dedicated to house characteristics, shows that 44,7% of people have a balcony in the house, 69,6% were living in a bright house, 40% have a beautiful view from the apartment and 62,7% have a good wi-fi connection (fig. 2.).

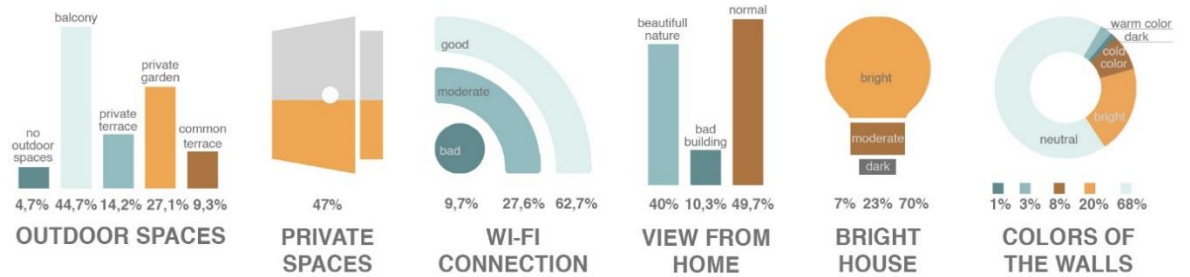

Fig. 2. Data on the houses (2nd section of the survey). Survey data elaboration A.M., Graphic visualization F.A.

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In the open section of the survey dedicated to what people would like to change in their house, most recurrent answers were regarding the outside space (garden, terrace, balcony), the need of space (bigger house, more rooms, bigger rooms), the presence of private space (room dedicated to playing/studying, separated rooms for children), more natural light and a better view from the apartment (fig. 3). Regarding the result of the CPDI questionnaire, of all responders, 231 (70%) reported no distress (CPDI score above 28), 81 (25%) reported moderate distress (CPDI score between 28 and 51) and 18 (5%) reported severe distress (CPDI score above 51). Of all responders, a total of 72 female (34%) and 24 male (20%) reported distress (moderate or severe).

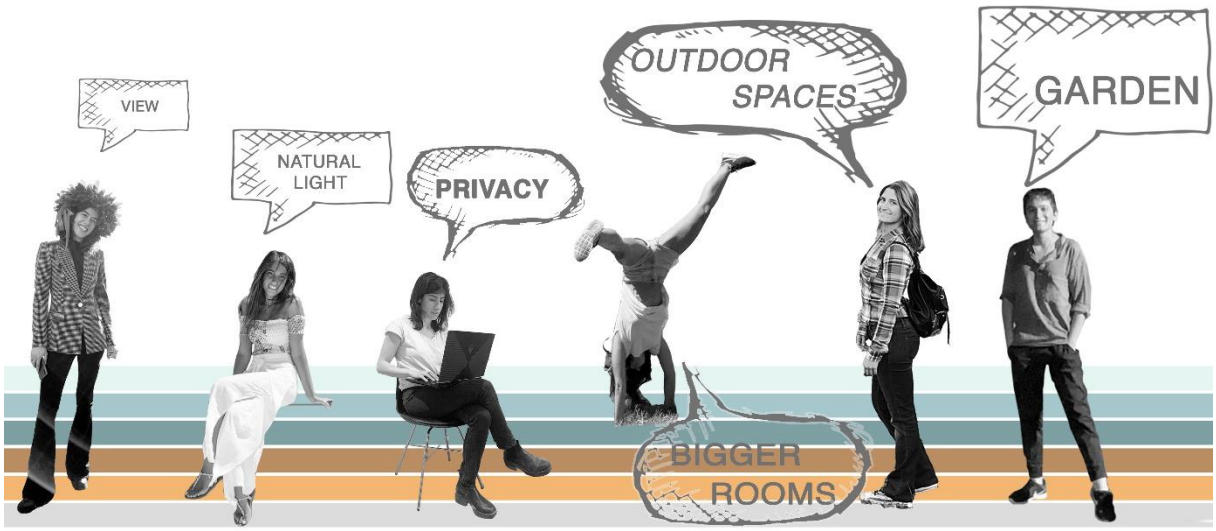

Fig. 3. Answers from the open section of the survey. The size of the comics is proportional to the frequency of the answers. Survey data elaboration A.M., Graphic visualization F.A. and A.B.

Associations between house characteristics and psychological distress (moderate or severe) during COVID-19 outbreak

4.1 Outdoor spaces
Association between presence of outside spaces and CPDI score, showed distress in 35% (6/17) of people not having an outside space and 29% (90/313) of people having at least one outside space (private or common). In addition, people having common outside spaces (terrace or garden) reported distress at 35% (56/162) vs people having private ones at 29% (44/151).

4.2 Private spaces
Association between having a room dedicated for studying/working and CPDI scores showed that stressed people with a private room are 26% (40/155) vs 32% (56/175) of people without that.

4.3 Connection and smart technologies
Association between wi-fi connection and CPDI score, reported distress in 25% (52/207) of people with a good wi-fi connection, 38% (31/81) of people with a wi-fi connection on average and 43% (18/42) of people with a bad wi-fi connection. In addition, 38% (6/16) of smart workers with a bad wi-fi connection were stressed vs 26% (38/146) of smart workers with a good or on average wi-fi connection.

4.4 Greenery
Association between the view from the apartment and CPDI score, showed distress in 28% (37/132) of people who have a beautiful/panoramic view (nature), 29% (47/164) of people who have a normal view and 41% (14/34) of people who have a bad/ugly view (buildings).

4.5 Light
Association between brightness in the house and CPDI score, found out distress in 26% (60/229) of people who have well bright house, 31% (24/77) of people who have a normal bright house and 42% (10/24) of people who have a not bright house.

4.6 Colors

Association between walls' colors and CPDI scores showed distress in 26% (64/248) of people who have neutral colors (white), 33% (11/33) of people who have walls with cold colors (blue, green) and 37% (27/73) of people who have warm colors (red, orange, yellow).

The results of the statistical analysis showed that an increasing CPDI score was associated with not having a good wi-fi connection. None of all the others variables were statistically significant associated with psychological distress (Tab. 1).

		N. of rooms	N. of people	Outdoor spaces	Private room	Brightness	View	Wi-fi connection
CPDI scores	Pearson's correlation	0,092	0,002	-0,014	-0,081	-0,082	0,047	-0,134*
	Two-tailed	0,103	0,976	0,806	0,151	0,145	0,410	0,018
	N. of answers	330	330	330	330	330	330	330

* Statistical significance was evaluated using 95% confidence interval and a two-tailed ρ value of < .005.

Tab 1. Pearson's correlation between CPDI scores and house characteristics

5. Conclusion

Home environment is of fundamental significance to human beings and various characteristics of housing quality and housing type may influence psychosocial processes that in turn can affect mental health [29]. Home is a place that reflects identity and provides security and maximum control. The study reveals an association between the findings of the literature research and results of the survey, although some limitations can be found. For example, the small sample (330 people) should be implemented, investigating various ages and classes of the population. This research investigated the living design following Covid-19 in relation with the mental health, not treating topics such as thermal comfort, Indoor Air Quality and housing automation field, leaving open the possibility to continue the study with those connected with physical health.
The authors make the following recommendations for a healthy living design, based on the research findings:

1. Enhancement of the outdoor spaces, improving their characteristics of social cohesion.
2. Design of flexible spaces, through movable panels and furniture, that can guarantee either open spaces as private and intimate spaces.
3. Use of a proper lighting design with an optimized exposure of the sunlight and use of efficient artificial lighting as LED.
4. Implement of greenery within both existing and new buildings with green infrastructures such as green roofs, walls and commons gardens, but also through the interior, for example having the so called "urban jungle" design.
5. Wi-fi connection to be improved, gradually switching from ADSL (asymmetric digital subscriber line) to optic fiber. This will allow the users to shift from 20 Megabit in download and 1 Megabit in upload to 1 Gigabit either in download and in upload, being hundred times faster.
6. Use of colors suited for people and type of rooms. Use of cold and soft colors for people that are stressed or hyperactive, who need to calm and relax or for rooms utilized for having rest, such as bedrooms. Use of warm and bright colors for passive people, who need vitality and for environments requiring energizing feelings, such as kitchens and dining rooms.

In conclusion the authors believe that a collaboration between architects and psychologists can lead to a great advantage for the design of living spaces, increasing mental health and people well-being.

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In this framework, even if this paper refers to a joint research activity of the three Authors, the paragraphs 1.1, 2.1, 3.1, 3.5 are attributable to F. Arcangeli, 1.2, 3.2, 3.3, are attributable to A. Barnocchi, 2.2, 3.4, 3.6, 4 are attributable to A. Mocci and 5 is attributable to F.A, A.B, A.M.

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Approaches and solutions for inclusive parks in the "new normal". The case study of the Vernavola Park in Pavia, Italy

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Abstract
The COVID-19 pandemic hit the cities while they were trying to accomplish the UN Agenda 2030 Goals for the Sustainable Development, with complex transforming processes, approaches and strategies. The restrictions dictated by the consequent limitations to the mobility and social activities, fundamental to contain the spread of the virus, already changed the way of living the public spaces and it will inevitably have an impact also in the "new normal" we are going to live in the future.
New approaches, strategies and solutions have to be researched in the design of the parks and green public spaces, with the awareness of their importance, considering their positive impact on the communities, also due to the opportunities for playing, exercising, meeting and socializing in close contact with nature.
To limit the risk of contagion, design solutions encouraging a clear, safe and flexible use have to be proposed. These solutions should be able to guarantee the respect of the physical distancing – when needed – and to satisfy the needs of all people, including elderly, children and disable people.
The paper shows the project proposed for the valorization of the Vernavola Park in Pavia, Italy, where new flexible solutions are designed to guarantee an inclusive and safe experience, also during the pandemic. The text explain the exportable methodology based on an objective tool of analysis and design strategies used to achieve the goal.

Keywords: Urban valorization, inclusivity, parks, pandemic

1. Introduction
In the last years a lot of professionals, not only architects and engineers, are thinking about and working on towns and cities focusing on words like "smart city", "sustainable city", "living nature", investigating solutions to satisfy the increasing number of users – and their different needs – due to the globalization and the process of urban development. The UN estimates that 55% of the world's population now lives in urban areas, but this number is expected to increase to 68% by 2050.
The attention is usually focused on the mobility problems, on the pollution and on the needs to improve the quality of the common spaces for leisure time; about these topics, numerous thoughts and solutions were developed, but for many different reasons – not only political and economic – they were not all realized.
The 2020 Pandemic due to COVID-19 requires fast and concrete answers in order to make safe and healthy the commons spaces; the forced lockdown and the subsequent reopening of urban spaces – both public and private ones – require strategies for bringing life back while still complying with public guidelines for physical distancing.
The cities change their imagine: less people moving meant, first of all, less cars, and then, at the end of the lockdown, a growing spread of bicycles and scooters, preferred to the use of public transport and renting cars towards which there is a certain mistrust in terms of anti-contagion safety. Economic and commercial needs caused the invasion of the car lanes with tables and chairs to favor restaurants

and bars; parks and green areas, which maintenance was ignored, also to save money, started to be beseeched and used after weeks of “prison” in the private houses.
A lot of architects and designers began to study solutions to allow people staying outside while maintaining physical distancing, both during the pandemic and at the end of the health emergency. One of the most interesting examples is the Park de la Distance designed by Precht Studio for Vienna: a maze-like park divided by high hedges that creates a safe physical distance between its visitors. The designers’ idea is that, after the pandemic crisis, the Park will be “used to escape the noise and bustle of the city and be alone for some time”; they also underline the lack of green areas in the downtown of the cities, where banks and office blocks are now empty for the revolution of the job and have to be re-thought due to the smart-working or remote working.
In New York’s Domino Park the grass was painted with white circles (diameter 2.4 m, spaced 2 m apart) to encourage the public to stay safely apart. This simple and cheap solution was immediately identified and visitors started to use the park in a safe way.
In Italy, some architects focused also on the physical distancing in the squares and the downtown, with specific attention to the reversibility of the solutions, in order to preserve the built heritage allowing people to move safely in the town. The StoDistante project provides for a 1.8 m grid of squares painted onto the cobblestones of Piazza Giotto, a square in Vicchio, a small district near Florence. The white squares are made by removable paint so that they can be removed without any tracks at the end of the pandemic.
Looking at these examples, even if several other solutions can be easily found, it is possible to define some simple principles that have to be followed in order to create safe conditions in outdoor public spaces during the pandemic period:

- flexibility – solutions have to be realised thinking about their use also at the end of the emergency, so that the invested resources can satisfy also the future needs;
- usability – solutions have to be simple and their use has to be understood immediately from any person: children, adults, elderly, persons with disabilities, who probably suffered much more than the others during the lockdown;
- reversibility – if the intervention is on the heritage, solutions have to be reversible, in order to allow to come back to the original imagine and value of the environment.

In this context, the research team of the Department of Civil Engineering and Architecture of the University of Pavia worked on the Parco della Vernavola, one of the most important green area of the town of Pavia, about 30 km south from Milan (Italy).
In January 2020 the Municipality of Pavia signed a contract with the Department in order to design architectural solution to improve the accessibility, the inclusive use and the safety of the pedestrian path inside the park, considering also the special needs of people with disabilities.
During the first weeks of the research, while the team was still analysing strengths and weaknesses of the entrance and the main paths, looking for the right balance between solutions to improve the accessibility and the safety with the needs to preserve the rural imagine of the park, Italy – first of the European countries – fell into the pandemic crisis of COVID-19.
For these reasons a new approach was necessary, considering the health emergency.

2. Materials and methods

The Department of Civil Engineering and Architecture of the University of Pavia has been working on accessibility and usability of urban spaces since 2006. Several researchers and studies, coordinated by professors Gian Luigi Pietra and Alessandro Greco, worked on the implementation of assessment tools structured in objective indicators and parameters, to be applied on several case-studies. The approach is always based on the awareness that an inclusive project can be reached only starting with a deep knowledge of the site and of the people’s needs.
During the researches on urban environments, an assessment tool is defined to identify macro-indicators, structured on objective parameters that combine geometric, material and morphological features of the urban site. The assessment includes measurements and multiple choices from a list of elements that takes into consideration the needs of several users. Thanks to this deep and systematic analysis the design of architectural solutions is easier and more focused on the improvement of the accessibility and usability for all.
The research presented in this paper focuses on parks. Bearing in mind the Municipality’s specific requests for the Vernavola park, the study analysed several design solutions for public spaces all over the world developed to face the COVID-19 pandemic.
In each analysed project, the following seven topics are investigated and compared:

1. the warranty of the physical distancing;
2. the clearness and easy understanding of the solution, e.g. the easy comprehension of what kind of behaviour visitors have to follow in every situation or place;
3. the use of multisensorial aids to help blind

4. and visually impaired people;
5. the introduction of aids easy to use also for people with mobility impairments;
6. the presence of signs for the information about the place and the rules for a more safety use;
7. the exportability of the solutions to other sites (considering the minimum adaptation to the context);
8. the reversibility, so that the solution can be removed in the future without any trace.

Unfortunately, to visit the project sites was not possible because of the lockdown and the subsequent restriction of the circulation, but a lot of information was available on the internet and easily collected and analysed.

From the comparison of the case-studies (Fig.1) it is evident that there is a lack of attention for persons with disabilities, both physic and sensorial ones: no aids for blind persons were inserted and the signs usually do not consider vocal announcements; at the same time most of the solutions are thought without the right attention for persons with physical impairments, even if it is possible to overcome some barriers with simple and cheap solutions, like ramps, such as in the project Liverpool without walls.

This is a shame because the lockdown was a hard period for all, especially for the persons with disabilities and for the children, whose world was limited with even more sacrifices; the fragile users are not always considered in the project after the lockdown, while also the 2030 Agenda for the Sustainable Development focuses on the importance to reduce the inequity (Goal n.10).

There are a lot of studies demonstrating that the access to natural sites can help maintaining well-being also with physical distancing. In addition, the topics of increasing the quality and the quantity of nature inside cities, making them accessible and inclusive, are also included into the goals of the 2030 Agenda for Sustainable Development:

- Good health and well-being (Goal n.3);
- Sustainable cities and communities (Goal n.11).

The first design approach of the team of University of Pavia was based on the proposal of a big wood structure able to offer new shaded spaces and seats in the middle of the park, and to guarantee new clear and safe connections to the town. This structure was conceived as a contemporary landmark for the town.

However, thanks to the new awareness deriving from the analysis of the case-studies in response to the pandemic emergency, the team adapted the project balancing these new needs with the objective to improve the accessibility and the usability of the Vernavola park to offer more inclusive urban spaces to Pavia.

CASE - STUDIES / TOPICS							
Parc de la Distance	✓	✗	✗	✗	✗	✗	✗
Domino Park	✓	✓	✗	✗	✗	✓	✓
StoDistante	✓	✓	✗	✓	✗	✓	✓
High Line Green Dots	✓	✓	✗	✓	✓	✓	✓
Superverde	✓	✓	✗	✗	✗	✓	✓
Liverpool without walls	✓	✓	✗	✗	✗	✓	✓
Here comes the sun	✓	✓	✗	✗	✗	✓	✓

Fig. 1: Analysis of the case-studies.

3. The Vernavola park

The Vernavola park (Parco della Vernavola) is a protected natural oasis. With its more than 35 hectares it is the largest green area of the Municipality of Pavia. It takes its name from the Roggia Vernavola, a small watercourse about 15 km long coming from the rural area and crossing the east neighborhoods of the town, tributary of the Ticino river. Established in 1985, in the following years the park was equipped with a play area for children, cycle paths and benches. It is located in the northern part of the city, only 2.5 km far from the historic centre: this proximity makes the park fundamental for the urban life and mobility. This green lung is a very important ecological corridor that connects the urban environment with the agro-ecosystems of the surrounding.

The Vernavola park has got also a great historical significance, not only because of the famous Battle of Pavia (1525) but also because it represents a part of the magnificent Parco Visconteo, built by Galeazzo II Visconti (1360) and enlarged by Gian Galeazzo Visconti adding the Parco Nuovo up to the walls of the Certosa di Pavia (1390). Several testimonies describe the Visconteo Park as a place with several species, both flora and fauna, with very precious rarities. In addition it was a hunting reserve of the Visconti, fenced by a wall 22 km long, the remains of which can be seen still today. The Vernavola park also coincides with a section of the Greenway that will connect the Ticino Valley of Pavia to the Certosa (Greenway della Battaglia).

Nowadays the Vernavola park is very popular during the weekends while during the week it is used by runners and walkers only in the morning and in the late afternoon. There are not many equipments, with the exception of some benches and tablets, and of a playground near the parking at the entrance. The park has got some rural areas interposed with woods and there are several paths crossing it; some companies manage guided visits to watch at wild animals and plants.
For its history, its natural features and its strong potentials, the Vernavola park has to be considered as a strategic connection between rural and urban realities, nature and people, past and future.
Several site inspections highlighted some problems to be answered:

- the lack of a proper signage system to facilitate the orientation and communicate the importance of the park;
- the neglect of some specific points, where there are no quality and no use;
- the lack of services, such as toilets and lights, but also free wifi and points to recharge electronic devices.

Moreover, the research team looked at the park with the aim to improve its inclusivity, with the awareness that the design of a park in 2020 – with also a pandemic in progress – cannot ignore the different needs coming from the multiplicity of users and their needs. As in the investigations on the urban environment, the design approach for the Vernavola park is based on two specific claims:

- the UN Convention on the Rights for Persons with Disabilities – established in 2006 and become law in Italy in 2009 – and its idea that the disability is an evolving conditions, no longer a personal impairments but caused by the relationship with the environment; so that it is necessary to propose different solutions to adapt the environments and to protect the human rights and equal opportunities for everybody, including people with disabilities;
- the idea that it is now necessary a new approach based on inclusive solutions more than on solution to overcome architectural and sensorial barriers, as in the Eighties of the last century, or on universal solutions, as in the Nineties. The Universal Design was focused on a unique solution that can be used by the largest number of people, whereas the so called Inclusive Design starts from the understanding of the user diversity and it wants to try to cover the variation in capabilities, needs and aspirations offering solutions for a specific individual and extending these to others.

4. The project

The new strategy of the project developed by the University of Pavia learns from the study, the analysis and the comparison of several solutions all over the world, some of which are reported in the Table 1. From these case-studies the following design goals are summarized:

- to avoid gathering of people;
- to keep the physical distancing checked and ordered;
- to assure people of the same family unit the possibility to share spaces and equipment;
- to guarantee the spread of widely points for sanitation;
- to create inclusive solutions, giving people clear and safe possibilities of use, regardless of their own abilities.

The specific architectural proposals of the project to achieve the goals asked by the Municipality of Pavia, that means to improve the inclusivity and the safety of the Vernavola park, also during the restrictions caused by the pandemic, are the following:

- to adopt a regular compact and draining paving, with a constant and adequate width (180 cm) to guarantee its use to everyone, including people with wheelchairs;
- to improve the conditions of safety and comfort, inserting elements and aids able to favor an independent fruition of the park, such as a new lighting system, equipped areas and emergency points along the paths;
- to implement signage and information about the whole park, including its history, structure and equipment, through multimedia and multisensory systems.

These objectives will be realised through lots subsequent intervention, which have to be properly thought and planned to guarantee the coordinated image of the park.
The project is divided into three main themes (Fig.2), properly described in the following sub-chapters:

- the main entrance on via Vigentina and its accessibility;
- the path connecting the main entrance on via Vigentina to via Bardotti, letting people cross safely the park, even in the dark, to reach two different neighborhoods of the town;
- the so called “Safe Island” (S.I), able to create safe and comfortable equipped places, where people can seat, relax and enjoy the park, regardless of their own capabilities. These seats are designed with special precautions both to stress inclusivity and to guarantee their use also during the restrictions for the COVID-19 pandemic.

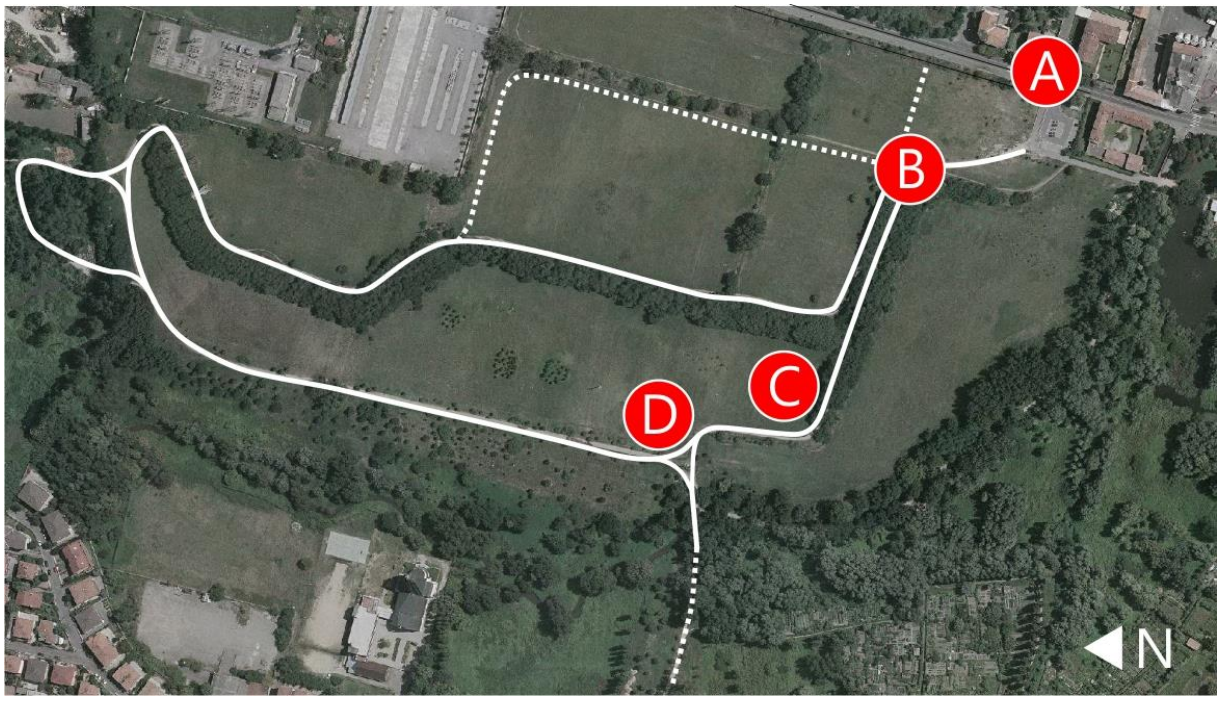

Fig. 2: Plan of the main path of the Vernavola park: Point A. Main entrance on via Vigentina. From Point A to Point D. Pilot project to improve quality and safety of the path. Points B. C. D. Safe Islands.

The main entrance of the park is designed with new variable seats set on the existing bricks wall along the sidewalk of the street, new parking places - also reserved to people with disabilities - and a new accessible toilet.
The new seats are made of composite deak vertical slats, while the toilet is covered with a green coating. The choice to select these materials has got the main aim to better integrate the new elements with the natural context of the park (Fig.3.a).
In addition, a tactile map will be positioned at the entrance of the park. This object is designed with proper dimensions, position, shapes and colours in order to be easily read and understood by all visitors, including people with disabilities, elderly and children.
In addition, the tactile map will be integrated with the QR code linked to a web site explaining all the main contents, so that people can abstain touching the map during the pandemic period and guarantee the safety.

One of the main goal of the project is a new organization and communication of the paths with an extended signage system, in order to clarify and facilitate the different possibilities of use. With this approach four main typologies of path are determined:

- the short path, from the parking on via Vigentina to the connection with Città Giardino (via Bardotti);
- the flat path, from the parking area to the furthest point and back;
- the complete path, ring;
- the extended path, extended ring.

The project also focused on the restoration of the short path as a pilot-intervention, with the objective to complete the other paths with the same precautions in the near future.
The project concerns the use of a new paving in clay material, regularizing the ground but also the width of the path, bringing it to a constant size of 1.8 m. In addition, a ground lighting system is installed, with led-light points every 6.5 m. These elements are designed with coordinated shape and material compared to the other design solutions for the park. (Fig.3.b).



Fig. 3: a. Accessible toilets, with green coating on a standard plastic unit, at the main entrance of the park. The volume is adjacent to the continuous new seat line on the existing bricks. State of the art (left) compared to the design proposal (right). b. The new lighted and regular path connecting the main entrance of the park and via Bardotti. The state of the art (left) compared to the design proposal in the dark (right).

The Vernavola park needed of course a new identity. The concept of the projects starts from this need and it identifies specific nucleus, called “SI – Safe Island”, where people can find comfortable rest and relax areas properly integrated with nature.
The “Safe Island” are equipped areas with fixed and differentiated seats, designed with arrangements that also allow to keep physical distancing. These areas are located in the park, spread along the path connecting the main entrance to via Bardotti, but easily replicable in the future for the rest of the park.
They are identified by a coloured clay paving around which circular seating are made in composite deck strips fixed on a thin steel structure, as for the seats along the bricks wall of the main entrance. The seats include backrests and ischial supports to guarantee everyone a flexible and convenient use. In addition, an empty but paved space is left to ensure the approach of people on wheelchairs.
Each island is characterised by a circular border of different green essences, which are properly selected among the species admitted by Annex B of the Plan of the Rules of the Municipality of Pavia. Thanks to different colours and perfumes of plants and flowers, the islands not only help improving the quality and the relation with nature, but also support people to better find their way around the park.
In addition, the different essences will be accompanied by specific multisensorial signs illustrating their features – also in braille and with QR codes – and underlining the motivations of their choice.
The islands will be also equipped with electrical and USB sockets to offer the possibility to recharge personal electronic devices.
Near to the Island is possible the installation of different additional elements: accessible drinking fountains, water dispensers also available for dogs, baskets for separate waste collection, “smart point” with electrical outlets and multisensorial informative signs.
All these additional elements equipping the “Safe Islands” are properly designed and made of composite deak stipes, as the seats, with the aim to obtain a coordinated image integrated with the natural context of the park. (Fig. 4).

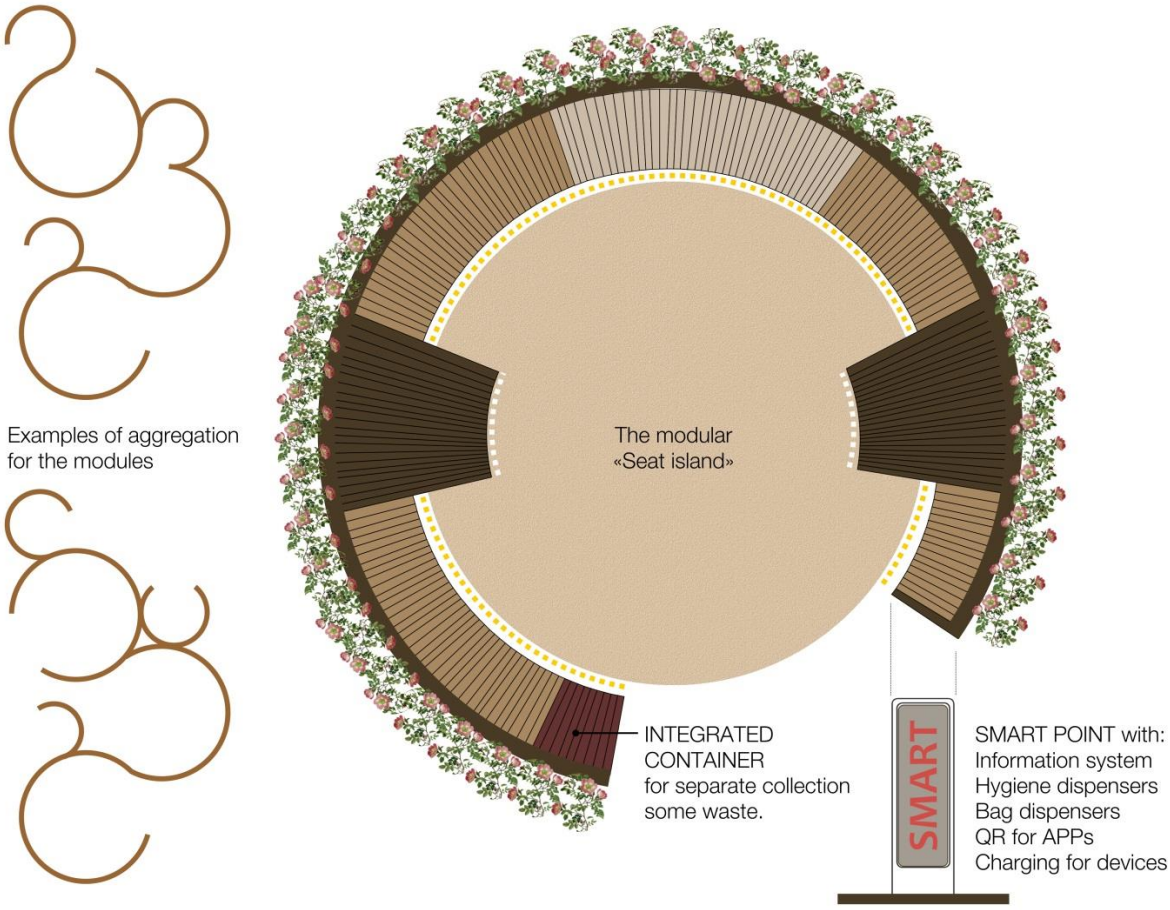

Fig. 4: Example of “Safe Island”: 1. “Smart point” with electrical outlets and multisensorial informative signs. 2. Deck chairs, which can be marked as the only available during periods of physical distancing. 3. Normal seats. 4. Empty space for the inclusion of people in wheelchairs. 5. Border of fragrant flowers and plants to characterize the Island also to the sense of smell. 6. Lighting system with floor LEDs. 7. Clay court (calcestre). 8. Baskets for separate waste collection.

5. Conclusions

The studies and the project for the Parco della Vernavola in Pavia developed by the University of Pavia allow to assert some principles about the parks and the public urban spaces:

- they are a fundamental resource for the cities and towns of the Third Millennium, especially during the pandemic crisis. The chance to run or walk at the open air is fundamental to agree a contact with the nature to the people living in the small apartments. In addition, the changes coming from the smart working, increased by the lockdown, will lead some blocks of the cities to empty of their original functions and this could be the chance to increase the parks and the playground, offering new spaces where to enjoy the leisure time. Moreover it is time to consider the dismissed areas as opportunities to create new parks, as it happened in Paris at the end of the last century;
- their maintenance has to be not neglected and the equipment and signs have to be kept update in order to encourage people to stay in a safe way and enjoy nature. The care of parks and green areas is expensive for the Municipalities but their existence and quality is necessary to work towards the 2030 Agenda for Sustainable Development, not only the already remembered Goal n. 3 and Goal n. 11, but also the Goal n. 13 “climate action” and the Goal n. 15 “life on land”;
- it is possible to design equipment, aids and signs that can help people respecting the physical distancing while enjoying the park and that do not discriminate any users. Inclusive and safe solutions can work both during and after the pandemic, only with some small adjustments. The fast transformations of the society will not end with the health crisis for the pandemic, and architects and engineers have to develop ideas that can be adapted in easy and low-cost

ways, considering local materials and technologies, also achieving the Goal n. 9 of the 2030 Agenda "industry, innovation and infrastructure";

- all the projects developed to allow people living public spaces during the health emergency must consider also the needs of the persons with disabilities, often discriminated due to the hurry to develop projects only oriented to the economic recovery. A more inclusive approach will help aiming for the Goal n. 10 "reduced inequalities" of the 2030 Agenda for Sustainable Development.

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Lisbon today: Heritage and Design for the Health of a city.

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Abstract
In recent years, Lisbon has seen a huge surge in architectural construction and remodelling, changing its urban and social geography. Phenomena such as tourism, gentrification and the use of other physical models applied in other capitals, whose main characteristics have nothing to do with their inherited substance, have substantially altered their idiosyncrasies. Models adopted from other cities, whose political hegemony is more influential, originated a well-established cosmopolitan process; however, this origin is based on a deceptive local heritage. At this moment, Lisbon, despite maintaining an apparently original and solid patrimonial image, has essentially become a city just like many others.
This work seeks to identify the various phenomena that contaminated Lisbon, relating them with its heritage and a possible design for the health of this formidable city. This does not mean that models are adopted and consequently adapted, which qualitatively improve the city, as long as it is not totally contaminated by the demand for one and unutterable globalization, we must search for the most agreeable and healthier design solution. And… so we question: what are the healthiest reactions to adopt for Lisbon in the post-pandemic era?

Keywords: Lisbon, heritage, tradition, tourism, architecture.

1. Introduction
In the last fifteen years, tourism speculation has emerged in one of the oldest and most traditional capitals of Europe: Lisbon. Tourism suddenly increased and despite the successive crises the country went through, due to a huge public debt with disastrous consequences for the national economy, it suffered a deep crisis in the second decade of the present century. The people of Lisbon suffer the pressure of wild real estate speculation, forcing them to leave the historic centre, transforming these places into playful voids, solely intended for entertainment and high-priced luxury rooms. What were once areas with specific characteristics of Lisbon's popular neighbourhoods, have now become a huge scenario of false local heritage, where everything resembles stereotypes, as in a reinvented tradition.
This work seeks to identify the phenomena that contaminated Lisbon, relating them with its own heritage.

2. Exodus, desertification, and contamination through tourism
The policy launched around a supremacy given to the large-scale tourism industry, as being the only salvation for the country's economy and more specifically for its capital, had tragic effects in a recent past. This tragedy was driven by a policy exclusively oriented towards consecutive real estate sales, due to the despair generated by the foreign debt accumulated contagiously over the years. The urban eviction policy, generated by the new rental laws, through a national government subjected to the inflexible economic context and adjusted to a neo-liberal strategy, led to a wave of mass evictions of citizens, causing a rapid exodus. This speculative contamination, carried out through these immoderate sales of the built heritage in Lisbon's historic centre, has generated an enormous imbalance, as it has forced a large part of the Lisbon people to leave their places of origin and move to other destinations. This 'economic demand' culminated in a rapid social fragmentation, adapted to the sale and rental of real estate for leisure (hotels, hostels, Airbnb, restaurants, bars) and luxury housing, inaccessible to most people. The terrible method used was diluted between the muted despair of the citizens and the

complicit silence of the various government sectors. Lisbon quickly became a city almost exclusive for the visitor and not for the autochthonous.



Fig. 1: The historic center of Lisbon full of "Local accommodation" (AL) and "Airbnb" (M. Baptista-Bastos 2021).

3. Heritage and memory versus dissemination and contagion

The dynamics of the city have fluctuated between the exaltation of an economic motivation, renewed by the profit generated by real estate, and a consequent uncontrolled proliferation of infrastructures almost exclusively dedicated to tourist uses and luxury housing.

The reinvention of the memory of places, for no other purpose than the profit of a sector – which in this specific case is the tourism sector –, turns the city into a commonplace. Its value transcends regional specificity, becoming universal, reconstructing itself into a generalist anthropological non-place, similar to all cities that required the ambition of a cosmopolitanism of a generic/globalising and non-characteristic/universalist character. 'To frequent the non-places constitutes, nowadays, the occasion of an experience without historical precedent, of solitary individuality and non-human mediation' (Augé, 1998, p. 122) [1].

Readapted traditions, exacerbating the place of origin by imposing simplistic, immediately recognisable habits and customs, merely using their folklore as the only means of communicating local practices and customs, have had harmful effects. The cultural and authentic recognition is lost in an excitement directed only to entertainment. Recreation, here, is interpreted simply as an uncharacteristic amusement park, similar to so many other European cities that have fallen prey to this gentrification and tourism net. The idiosyncrasies inherent to each place no longer exist and the equal contagion of a population increasingly less related to places and memory has grown at a hallucinating pace. Notice the historic centre of Lisbon practically without its citizens and their houses, being replaced by strangers and hotels. The territory of the autochthonous Lisboner has ceased to be part of itself by right and has become an unknown, uprooted, and foreign space. The region is inseparable from its inhabitant; therefore, this growing disruption is artificial, transforming the city and its citizens into artificialized scenarios. The peculiarities of a local Lisbon culture are increasingly rarer, because originality – when it is incessantly replicated – ceases to be so and becomes vulgar. Notice Fado – Lisbon's musical style par excellence and its obligatory and inseparable reference –, which was sung for years in marginal spaces, where high quality was an obligatory condition, became vulgarised and disseminated throughout the city, going from local to international. The regression of the representation systems specific to a society are now transformed into simple objects of rapid consumption. Their primitive meaning has lost the importance of permanence, becoming an undifferentiated product, devoid of a hierarchy of importance. 'The

representation systems have become objects of consumption and they are as interchangeable as a car or a flat' (Lipovetsky, Charles, 2011, p.32) [2].
One of the most publicised examples is that of Lisbon's gastronomic culture, which is varied and simultaneously singular. It has been reduced to what is most trivial for its inhabitants – but as something identifiable and exclusive before the eyes of the stranger –, the grilled sardines and custard tarts: the contemporary 'image' of the historical memory. A redundancy transferred by the local gastronomic tradition and exposed as something exclusive before the rest of the world. The generalist globalist vision and the resulting denial of a holistic view of the various local specificities has brought to Lisbon an absence of distinctive particularities, which do not distinguish it from the other European capitals where tourism rules, without, however, there being a differentiated and simultaneously contemporary response.
The massification prompted by the contagion of a 'tourist industrialisation' has uprooted the habits and customs of the 'genuine,' because it has forced the resident to leave his place. The appreciation of the concept of 'authenticity' ceases to be felt when it becomes banal, because the intensity generated in local specificities should not have trivialized attributes. In fact, we are witnessing a rapid and contaminating reproduction in applications of practically identical fashion phenomena in different habitats. The diversity of a unique culture is multiplied, generalising in to a frivolous banality – and, consequently, a commercialisation of the habits and manners of the place emerges. This 'dissemination of customs' overlaps with the exclusive habits of its inhabitants, standardising any social structure that is different. Nowadays, the lifestyle and behaviours of a Lisboner are no different from those of a New Yorker, a Parisian or a Madrilene: the difference is not based on unanimity, but paradoxically on 'unanimism.'



Fig. 2: Housing building transformed only for tourist purposes and without permanent residents (M. Baptista-Bastos 2021).

4. Possibilities for a design for the health in of Lisbon in the post-COVID 19 era?

Nowadays, local traditions have become even more fragile, due to the present time and to this terrible trend, which has transformed the diversity of urban routines into an invariable course: a subsistence directed towards the industrialisation of tourism, simultaneous with the search for maximum real estate profit. Currently, due to the pandemic caused by COVID 19, the successive confinements, and the closing of borders, the cities most oriented towards these economic sectors are becoming the biggest victims.

The denial of a socio-cultural understanding has reduced the meaning of the very belief of territory, based on the heritage of a place, increasing the social disparity between different types of knowledge. How can we promote a healthy and universalist alternative, when local particularities are deliberately ignored? The traveller, who always finds the same result at his chosen destination, without understanding the idiosyncrasies of the place, is now physically confined to his country and unable to assimilate what he saw when he visited Lisbon. In other words: taking Lisbon's varied and specific gastronomy as an example, it has been reduced to the most trivial of things to the locals, something that is exclusive and extraordinary to the foreigner: the grilled sardines and custard tarts; the contemporary 'image' of local gastronomic tradition to the rest of the world. In this scenario, the city, geared solely towards the tourism sector, is going through a very complicated situation, as it is now stagnant – the 'travellers' do not consume, because they are away and the 'autochthonous' do not want to consume, because they do not identify with it.

The globalist and not holistic vision of local specificities, replacing the housing sector with the hotel sector, was a tragedy that suddenly became visible. The city centre of Lisbon, which was loaded with tourists, is now deserted. The previous discourse, where the historic city had a poor, ageing, practically deserted population that needed an economic fit based only on one direction, does not work. The proof in the present time is visible, as the city is empty and the citizens, who now reside in the periphery, make it their new place.

The feeling of local attribute without being discriminatory will have to emerge more in cities, such as in Lisbon, whose ideological orientation has diverged in recent years towards political actions centred on a neo-liberal trend, turned towards rapid and exponential consumption, ignoring the anthropological specificity of its inhabitants (Lévi-Strauss, 1986, p.386) [3]. The city belongs to all and cannot segregate its own citizens. To rethink its web of relationships is to understand and reinvent its heritage, through healthy design, and to stop it being what it is today: an absent non-place, geared towards incessant mass tourism and real estate linked to the economic elite.

The situation has become direr in the present time, due to a viral pandemic that has changed all city habits and conditioned the population's physical mobility. The interaction based on the flows between people was temporarily annulled, making us rethink different creative methodologies for a design in favour of the preservation of public health. However, it is fundamental not to forget what we are going through in the present – as a learning process – for a better adaptation for the future.



Fig. 3: Praça do Rossio, one of the most emblematic and historic squares in Lisbon, with only hotels and restaurants: No longer housing buildings (M. Baptista-Bastos 2021).

5. Conclusions

The massification incurred by the contagion of a 'tourist industrialisation' has uprooted the habits and customs of the 'genuine,' because it has forced the resident to leave his anthropological space of origin.

The appreciation of the concept of 'genuineness' ceases to be felt when it becomes vulgar, because the intensity generated in local specificities cannot have contaminating characteristics. The breaking down of originality does not positively spread the unique folklore of each locality. Rethinking a healthy design, based on a sustainability attentive to local specificities and that can contribute to the return of a lost originality without losing the notion of the present time, is essential for the preservation of Lisbon. This originality starts with the citizens. That is, a policy of local rehousing at low costs in strategic points in the centre of Lisbon, where the middle class that disappeared can re-emerge and thus revive a local economy based on inclusive idiosyncrasies. An education policy where in schools, students from an early age can have the historical memory of their city, without it being generalist, xenophobic, and exclusivist, but rather pedagogical, didactic, and inclusive (Morin, 1999, p. 85-98) [4]. Local organisations that have the support not only of the municipality, but also of the government and the European community, that become strengthened in research and progress of specific habits and customs, and that become adapted to the present day and develop new job opportunities.
Finally, we conclude that a healthy, inclusive and expansive design for citizens (who, by force of circumstance, have had to leave the metropolis and inhabit the periphery), promotes Lisbon's originality – and not an industrialized, repetitive, contaminating and unidirectional design, oriented merely towards tourism and millionaire real estate speculation. The urbanistic evolution requires the encounter with a healthy memory, transposed to an originality promoted by citizenship; otherwise, it is limited to being only an exhibition of historical and eccentric buildings, but without the memory promoted by its inhabitants: the inherited dialogue between the citizen and the city creates benign proposals for the inhabited locality.



Fig. 4: Praça do Rossio, one of the most emblematic and historic squares in Lisbon, with only hotels and restaurants: No longer housing buildings (M. Baptista-Bastos 2021).

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Digitalization strategies as a methodology for knowledge and management of cultural heritage. The "Unfinished" church of Brendola as a reference case study.

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Abstract
The paper aims to analyse the case study of the "Unfinished" church of Brendola, designed by the engineer-architect Fausto Franco in the early thirties of the twentieth century. Economic problems led to the interruption of the church's construction, during the 1950's, and left the church in an unfinished situation that today we recognize as a ruin. The church's study seeks to delineate a new methodology of analysis for abandoned cultural heritage based on data digitization and creation of a knowledge system that concerns the building's conservation status. The push towards digitization, which emerged during the pandemic, plays a fundamental role in the domain of application possibilities, from the survey to the mechanisms for conservation and management of cultural heritage. From this perspective, according to shared procedures, effectively organizing the collected data in an open repository linked to an interoperable Hbim model becomes a helpful digital tool to develop valorisation strategies based on the interoperability and the possibility to share the knowledge efficiently between the actors involved in the conservation process and the community.

Keywords: unfinished architecture, digitalization of cultural heritage, material and intangible cultural heritage, cultural heritage documentation and conservation, theory criticism and history of conservation

1. Object and objectives of the research project.

This paper presents a part of the dissemination of research activities carried out on the church of Brendola dedicated to St Michael the Archangel, today known as the "Unfinished" church (Fig. 1). The church, which has never been completed, appears in conditions of neglect and in ruins, and this identifies it as an urban fragment [1] "suspended" as it was in 1941, the year in which the building activity started to be neglected. After the Municipality of Brendola reported the severe conditions of the building, a Memorandum of Understanding was signed between the Università Iuav di Venezia and the municipal administration, to promote the knowledge and valorisation of the building.
The Memorandum of Understanding (inventory ref. No 77/2020 prot. No 1476 of 20/01/2020) promotes – by means of a financed research contract – the drafting of a programme aimed to identify possible strategies for preserving and valorising the church, by identifying a methodology to study and analyse architectural and landscape heritage of significant cultural interest in conditions of neglect. This research project aims to build a knowledge system of the building, allowing to identify conservation and valorisation strategies that may be shared with the entities in charge of heritage protection and the community of Brendola.


Fig. 1: Overview of the “Unfinished” church of Brendola.

2. The “Unfinished” church of Brendola.

The “unfinished” [2] and “neglected” status makes Brendola an interesting case study, caught between “memory and time”, in which the features of “being unfinished” and “ruined” play a role in redefining the image of one of the first works by the then young engineer-architect Fausto Franco. The building of the church dedicated to St Michael the Archangel, patron Saint of the town, was promoted by the archpriest of Brendola at that time, Father Francesco Cecchin, with the aim to gather the neighbouring communities all in a single place. Set in an important landscape, on a hilly area developing at the foot of the Berici Hills, the church has connections with the Rocca dei Vescovi (Fortress of the Bishops), the old church of Brendola, and with the built-up area around it, as well as with local villas (Fig. 2). It is one of the landmarks of the area called “the gateway to the Berici Hills”.

The commitment to building a new place of worship had a significant social impact for the community of Brendola [3], proved not only by the participation to the creation of the building site, but also by the use of the community’s economic resources. During the construction activities, economic problems arising from the difficult historical period between two world wars, led to modifications of the original project, and eventually, the building site was abandoned. In 1997 the municipal administration of Brendola became the owner of the building and committed to using it for social or cultural purposes, and for public benefit.

Currently, the church has been declared of notable cultural interest, under art. 12 of the Legislative Decree of 22nd January 2004, N. 42 (Code of Cultural Heritage) as the "unique testament of the activity of an architect with an original and eclectic personality, included with full rights in the Italian culture of the 1930’s, and particularly in the architectural debate that was taking shape after the important archaeological campaigns in Africa and Asia”.

2.1 The importance of Fausto Franco in the Italian architectural scene.

The project for the construction of the new church “complying with the noblest ecclesiastic traditions” was assigned on 14th January 1928 to Fausto Franco (1899-1968) who, after getting his degree in Engineering at the University of Padua in 1921, had just obtained his second degree in architecture, in 1927 at the age of 28, at the Royal School of Architecture of Rome headed by Gustavo Giovannoni [4]. Fausto Franco, who is described by Piero Gazzola as eccentric and altruistic [5], was in full rights part of the generation of historians and experts who started to work on behalf of the State in a difficult historical context, marked by the destruction and damaging of monuments due to the tragic events of World War II [6]. The experiences made in his training period as a young architect contributed

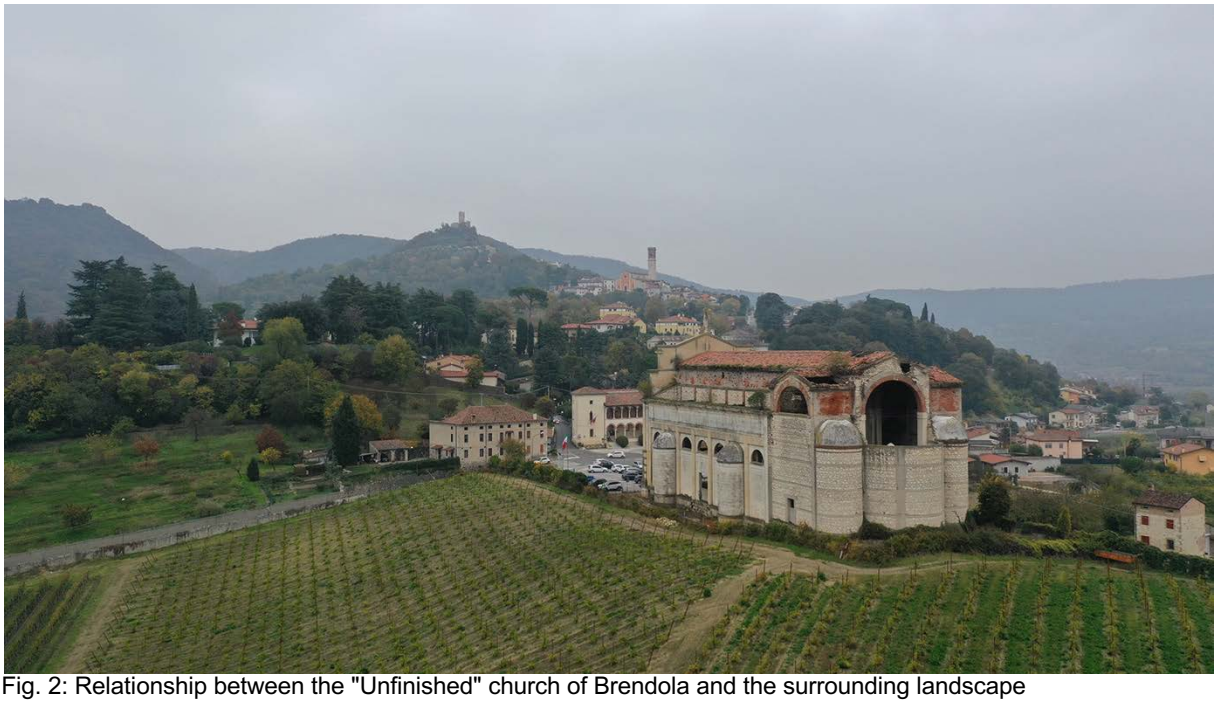
Fig. 2: Relationship between the "Unfinished" church of Brendola and the surrounding landscape

to forging a personality with great technical skills and knowledge. In his professional life, Franco was to be engaged in many different activities, such as a career as public officer, teacher, and his works as a scholar [7]. In the period between his University Degree and his entry in protective associations and authorities, Franco worked both as teacher, in the School of Architecture of Venice[i], and as a professional in several construction sites in the Veneto region and in Venezia Giulia, including the construction site for the new church of Brendola. The teachings of his study period at the Padua University and the School of Architecture of Rome with Giovannoni, along with further studies and publications on the history of architecture, became - for the San Michele Arcangelo church of Brendola – a tool to design a complex framework of building techniques. Such techniques were the result of a cultivated experimentation, not referrable to a local context. After finishing his university studies, between 1928 and 1933, while Franco was drafting the project for the church of Brendola, one of his first assignments as a teacher was the Direction of the School of Arts and Crafts of the Accademia Olimpica of Vicenza. There, he gave an important contribution to the renewal of teaching methods, by introducing studies based on real life drawing. After being admitted to the courses of classical architecture of the Regia Scuola Archeologica Italiana (Royal Archaeological School) of Athens, Franco got to know important persons in the Italian archaeological scene, including Alessandro Seta, Luigi Pernier, and Giuseppe Gerola. Franco also had the opportunity to participate in many archaeological excavation and restoration campaigns with Professor Carlo Anti. In 1930 he was appointed Royal Honorary Superintendent for Vicenza Monuments; in Vicenza, along with his activity as an archaeologist, he started to study the works by Andrea Palladio, a master who was to play an important role in Franco's studies. In 1933 he started to work in the Department for Antiquities and Fine Arts, being assigned to the Superintendence of Medieval and Modern Arts of Milan. After a short period of time, he was assigned to the Superintendence of Venice, headed by Ferdinando Forlati; in 1939 Franco was appointed Director of the Superintendence for works of Antiquity and Arts of Venezia Giulia and Friuli, where he stayed until 1952. Franco's experience in the archaeological sector, his professional activity during the post-war reconstruction, and the work carried out at the Authority of Trieste, where he is still remembered as the "Superintendent of the difficult years" [8], along with the Ministerial recognition of his comparative merits, earned Franco the appointment as First-class Director and he was relocated to the Superintendence for Monuments of Venice, in June 1952.
Along with his professional activity, Franco also worked as a teacher; the following are only some of his most important activities: in 1937 he held a chair in stylistic and construction characters of monuments [9] at the Università Iuav di Venezia (1937-1967). Finally, in 1958-59 he qualified as lecturer in Monument Restoration, and in 1960 he qualified as lecturer in Restoration.

[i] In 1926 Giovanni Bordiga founds the "Scuola superiore di architettura" as a branch of the Accademia delle Belle Arti di Venezia. In 1936, ten years after the school foundation, under the direction of the rector Guido Cirilli (1929-1943), Fausto Franco with the chair in "Caratteri Stilistici e Costruttivi dei Monumenti" (Stylistic and constructive characters of monuments) was one of the first teachers of the school.

2.2 The project. Between architectural hybridisation and historicist eclecticism.

The general look for the new church of Brendola is that of a Romanesque-style architecture, whose classical features are very likely influenced by the many archaeological campaigns the architect carried out in those years. From Franco's project (Fig. 3), it is possible to note that his intention was to build an imposing structure, with proportions that recalled the Roman-Imperial Basilicas, marked by a strong symmetry and a clear tripartition of the main façade. The preparatory drawings for studying the various project proposals show a strong tripartition of the façade; the architect works on the composition of openings, and wonders about the positioning of the bell tower. In the perspective view of the final proposal drafted by the architect, we may easily recognise that the façade is enhanced by wide, symmetrical window openings, by the positioning of the bell tower on the western side of the building. The monumental nature of the church is also expressed in the ratio between the body of the building and the bell tower, whose height is double the one of the church body, and in the presence of big lunette windows on the sides. The planimetric definition of spaces refers to an area of 53,5m x 22,5m described by three symmetric naves, with barrel-vaulted ceilings, ending on semi-circular apses. The space in the central nave, whose width is double the width of the side aisles, is marked by a series of columns on pedestals, made of Vicenza stone, topped by round arches.

Due to economic problems, the original project was reduced; the sacristy area, one of the chapels, and the bell tower were left unfinished. The abandoning of the construction site also resulted in the interruption of the stone and plaster finishing of surfaces, easily recognisable in the absence of flooring and of a clear distinction between the northern and southern part of the church. Making a comparison with Franco's project, we may observe a different arrangement of covering structures, no longer resembling a pavilion, but rather a roof with two pitches. During the construction phase, it is also possible to note the elimination of the openings in the third tier of masonry of the central nave and of the apses. Such a choice may have been influenced by the need to make the church more affordable and easier to build, important elements for the final cost of the work.

Due to its unfinished and ruined conditions, the church currently introduces to a new evocative ability of spaces [10], which create a new relation with the zenith light coming from the original covering.

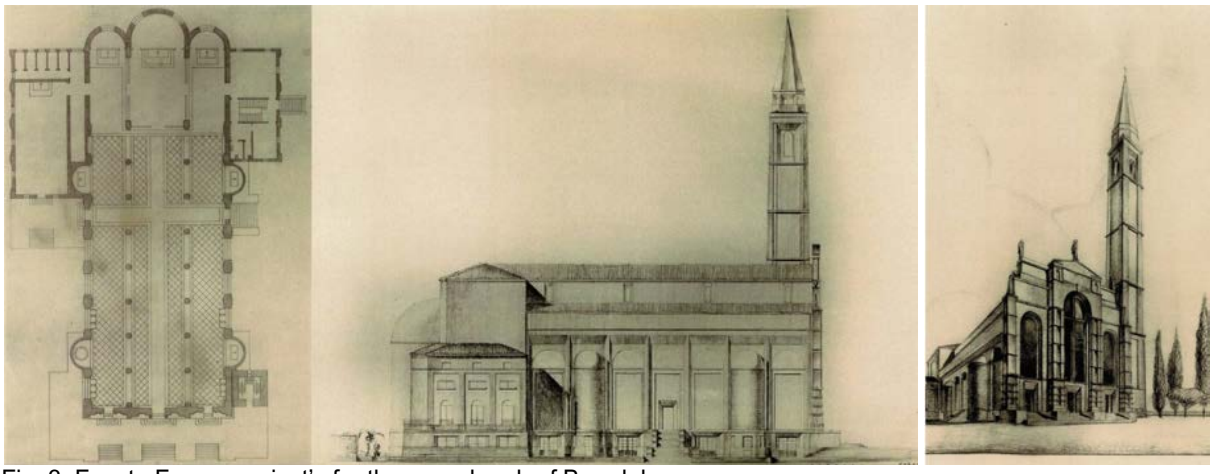

Fig. 3: Fausto Franco project's for the new church of Brendola.

2.3 Notes on the construction site of San Michele Arcangelo church.

It is possible to reconstruct the events related to the church construction thanks to the writings [11] [12] of the archpriest, who took up residence in the parish on 29th May 1921. Not only did he promote the building of the new church, but he also collected, in his writings, the historical events and the construction stages. The construction site of the San Michele Arcangelo church, set in the architectural scene of the 1930's, was officially inaugurated with the ceremony (laying of the stone) on 3rd October 1931, but the works only started in May 1932.

The building activity was carried out in a historic context marked by architectural and technical experimentation; historicist eclecticism was combined with a construction hybridization that was visible in a complex framework of construction techniques and in the use of construction materials considered "modern" or experimental [13], combined with techniques stemming from local tradition. The main construction material was the stone from Vicenza, used as a load-bearing structure and for finishing. The studies and the analyses on the church[ii] show that the building structure is based on solid rubble masonry, 110-120cm thick, on which reinforced concrete frames are laid, accompanied by rubble

[ii] Between 2011 and 2012, the Municipality of Brendola carried out instrumental analyses on the church's constructive elements to identify the building's static behaviour.

masonry with concrete elements. The surface walls of the first part of the building, whose realisation began in 1932, feature an irregular stonework, 40cm thick, made of stones of different sizes. Though the cross connection is ensured by concrete elements with a constant thickness, set in the whole section at a centre-to-centre distance of about 2.80m, the endoscopic and geophysical surveys carried out show there are voids, which may be considered as discontinuity elements in stonework. Externally, the surface walls are lined with San Gottardo white stone ashlars, around 10cm thick. The frame structure of the church is enhanced on the external sides by half pilasters made of Berici yellow stone ashlars and by four semi-circular niches, made of concrete blocks and lined in stone, which give monumentality and plasticity to the composition.
In the realisation of the central nave, we find again the frame structure made of columns supported by pedestals. At the foot of the structures, a 95cm, square concrete base is located, about 1m tall, supporting columns made of stone from Vicenza, three stone drums that presumably have a concrete core. The column shaft ends with a capital, where the vaulted concrete structures are set, to support the wall surface on top. The latter is also made of rubble masonry with concrete elements. Reading the archpriest's notes, we find out that in May 1934 the structures had reached 6m in height. The year 1934 was a breakthrough for the construction site, marked by economic problems that eventually led to suspending work. Five years later, on 20th March 1939, the bishop authorized the resumption of works, but with limited resources, not enough to finish the works. Though with some difficulties, works continued to realise the stonework, where it is possible to recognise – in the top of the masonry of the central nave – the introduction of a new building technique. We note a regular brickwork, made using hollow bricks laid horizontally in regular courses, 22cm thick. This is quite an unusual choice, probably made bearing in mind affordability and simplicity of realisation. In 1940, the architect Fausto Franco advocated work resumption: he turned to the bishop and highlighted the problems that would have emerged in case of work interruption, underlining that a missing cover would have jeopardised the works carried out until then. Despite economic difficulties, in October 1940 the bishop authorized the works for covering the building. The nave space is therefore described by a series of trusses of reinforced concrete, alternated with arches made of bricks, originally designed to support a barrel-vaulted false ceiling. Due to the precarious conservation status, the latter was demolished in 2012 during an intervention aimed at safety assurance. The realisation of covering structures is marked by the introduction of "modern" construction techniques, namely structures without provisional reinforcement (*S.A.P.*) [14]. This patented slab technology, with prefabricated beams of brick and reinforced concrete, was introduced in the building sector in the same period in which the church was built. The composing elements are prepared in the construction site, with bricks laid as headers, joined by steel rods set in flutings and fixed with cement mortar. After seasoning, the beams laid side by side are completed by pouring concrete between the interstices and where the elements lean against the perimeter walls, where the joint with the perimeter walls of the church is ensured by bending the irons sealed in a perimeter kerb.
Unlike the side aisles - made using a system without provisional reinforcement and with thrusting configuration – the structures covering the central nave are realised with a CIREX[iii] system, outlined as a series of purlins laid on a system of reinforced concrete trusses, so that the system appears to be a non-pusher structure. The making of the covering structures of the side aisles, of the central nave and of the apses ended in 1941. The completion of covering structures and the impossibility to receive new funds led to another period of work suspension in the construction site, which was abandoned definitively when Father Cecchin passed away, on 18th May 1949. The role of the reinforced bricks in the building process of the church is particularly interesting: on the one hand, they granted new performance qualities, such as the lightening of the slabs and the rationalization of materials, while on the other hand, they made construction easier in the site, managing to curb the costs of materials and manpower.

3. Knowledge processes and methods.

Choosing the "Unfinished" church of Brendola as a case study, with its unfinished and ruined condition, enables to examine the construction dimension and the project choices, which led Franco to combine different construction techniques with traditional architectural elements. The methodological proposal for the valorisation of the "Unfinished" church of Brendola starts from the definition contained in art. 6 of the Code of Cultural Heritage and Landscape [15], which reads: "Valorisation consists in the exercise of the functions and in the regulation of the activities aimed to promote the knowledge of cultural heritage, and in the guarantee of the best conditions for use and public fruition of the heritage. This also includes promoting and supporting interventions for the conservation of cultural heritage". From these introductory words we can infer that the first purpose of the valorisation action is the promotion of the knowledge of cultural heritage. The proposed study method, which includes techniques and cultural humanism, explains the decision to structure the information on the church into a knowledge system (Fig. 4) that interacts with a HBIM model. This promotes the safeguard and knowledge of the asset in a

[iii] Variant of the patented structures without provisional reinforcement construction system (S.A.P.). In the CIREX system, the structural bricks elements are distanced from interposed brick blocks.

way that is interoperable and may be shared by the various public stakeholders, such as local and national institutions, as well as communities [16].

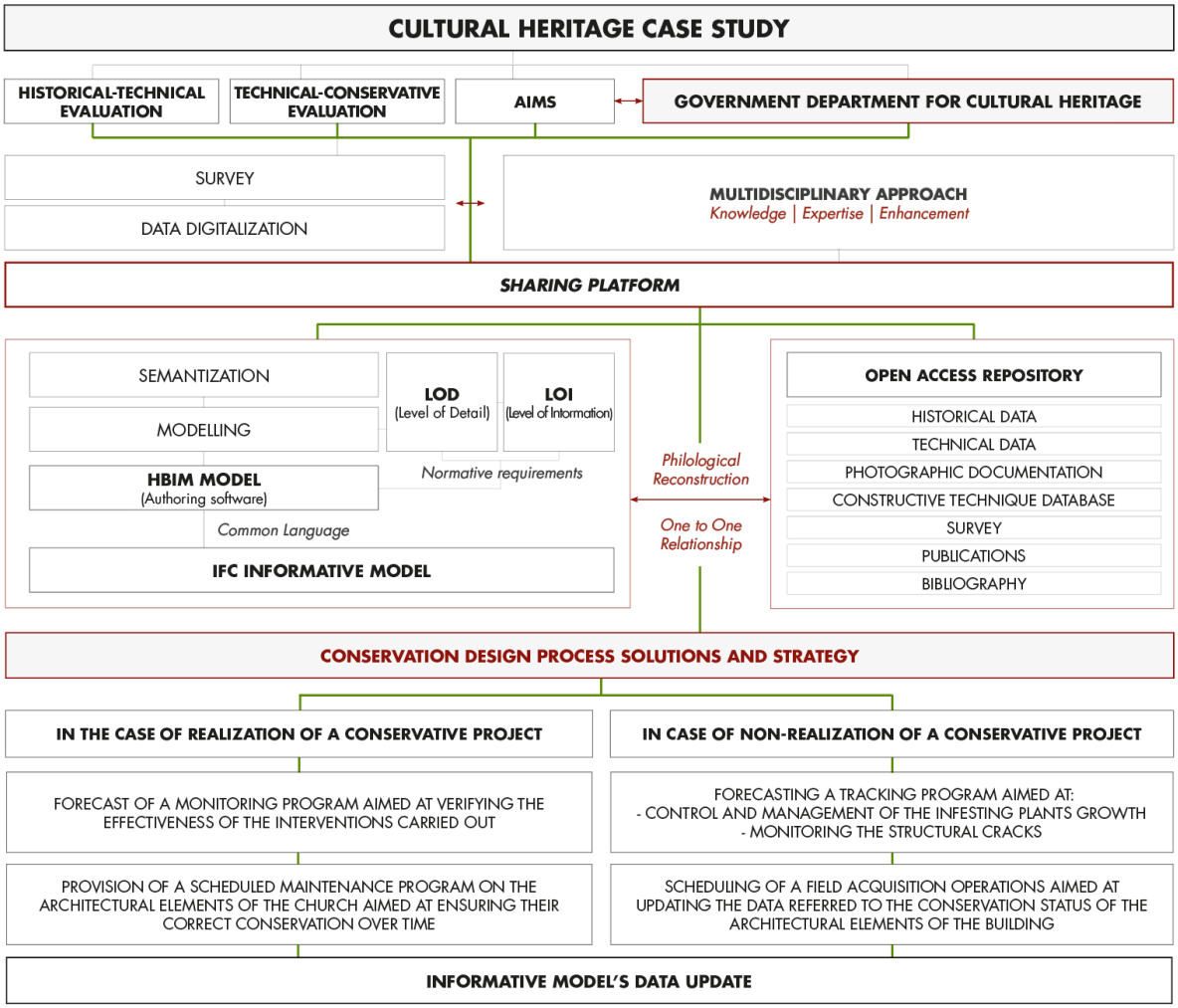

Fig. 4: Scheme of the workflow proposal for the digital research activities on cultural heritage.

3.1 Digitalization and creation of a repository of sources.

The documentation related to the "Unfinished" church of Brendola refers to many topics, ranging from the first debates on building the new church, to the construction and economic-management aspects of the construction site, to the last analyses carried out on construction elements. With this premise, the research activity was aimed at identifying the information that allows retracing the construction phases, testifying to its architectural value. The information obtained from the preliminary investigation phase was collected in an accessible format in an open-access repository [17], which enables to clearly identify all items within a directory structure. As for the database of the Unfinished church, the following structure of the main directories was identified: bibliography, database of techniques, deliberations and acts, photographic documentation, historical documentation, technical documentation, events, HBIM, maintenance, exhibitions, projects, publications, and evaluations. Whenever possible, the documents obtained and entered in the database underwent OCR (optical character recognition), so they became digital and therefore searchable using IT devices.

3.2 Interpolation of historic data with architectural data.

The unfinished conditions and the interruption of construction enable to recognize the San Michele Arcangelo church of Brendola as a ruin, in which the action of time has affected the degradation of the construction elements and the growth of vegetation and weeds (Fig. 5). Over the years, these conditions led to a subsequent damaging of structures, with a loss of their load-bearing capacity. The main vulnerabilities of the building may be seen in the collapse of some portions of covering structure, which triggered a rapid deterioration of the overall conservation status. Exposure to the weather favoured water infiltration in the structure, with a subsequent redistribution of the balance of forces and rotational actions outside the level of surface walls. The precarious conservation status of some portions of the

church, along with the danger of falling elements from a height, represented criticalities for the description of architecture and the ongoing disarray. From this point of view, surveys played a fundamental role as a basis for the construction of the knowledge system of the building. The data acquisition campaign, led by the CIRCE photogrammetry laboratory of the Università Iuav di Venezia, concerned the internal and external spaces of the building, and was carried out using different methodologies, linked to specific theoretical and operational procedures.

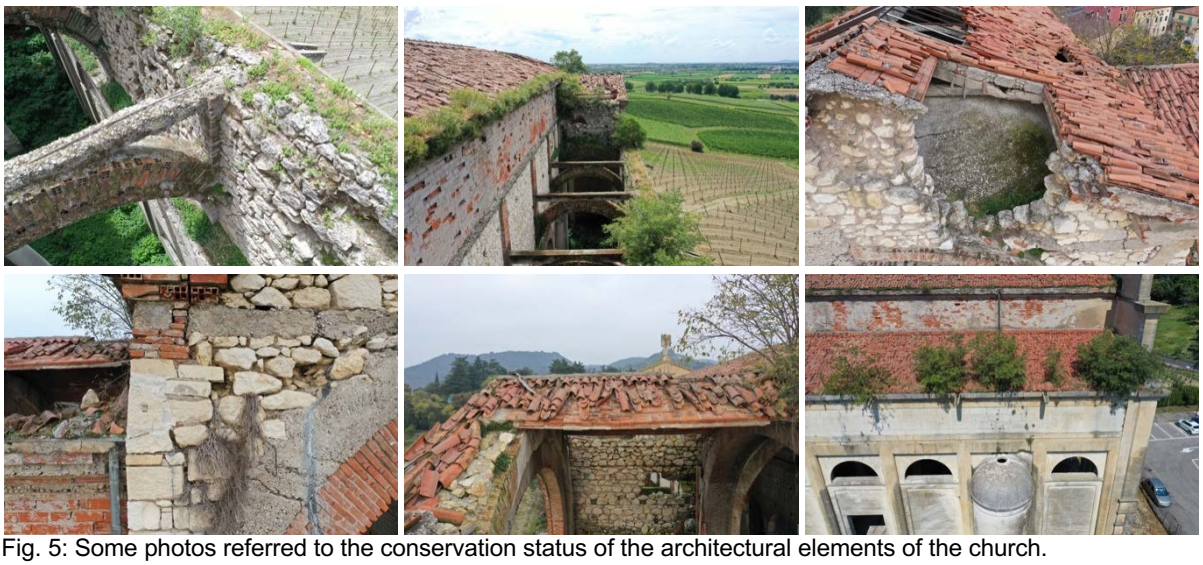

Fig. 5: Some photos referred to the conservation status of the architectural elements of the church.

The instruments and methodologies [18] needed were assessed considering the complexity of the building and the representation scale envisaged for the ensuing multidisciplinary analyses. The operations were carried out though the implementation of topographical, laser scanner and photogrammetric surveys, planned according to an efficient data acquisition campaign.
To analyse and catalogue in charts the materials and construction techniques used to build the San Michele Arcangelo church, the research group resorted to a series of photographic surveys, with the use of digital cameras and RPAS (Remotely Piloted Aircraft Systems). The use of high-resolution digital cameras allowed to obtain an in-depth knowledge and to document the materials used and their degradation and/or alteration. The use of RPAS also enabled to inspect the structures that are not visible from the ground, if no scaffolds or lifting platforms are used.
The complexity of the church is summarised by a series of point clouds (Fig. 6) and orthorectified images (Fig. 7) resulting from the processing of data collected during the survey campaign. Their use allowed to assess the real geometry [19] of the building's components, identifying deviations from the level of surface walls, or subsidence that - with the use of such survey techniques – are described by a continuity of points and not by a discretization operation carried out by the operator. They also allow a significant reduction of acquisition times and the possibility of error. The "unfinished" status and the use of advanced survey techniques also allowed for a reliable mapping of the cracks and the position of scaffolding holes, whose evaluation proved to be useful in the reconstruction of the construction phases of the building site. The high quality of final outputs, besides recognising the signs and transformations of the building over the years, also defines the foundations for a specific computation of materials and construction techniques, resulting in an operational instrument in the definition of aspects related to the building site and the management of the asset.

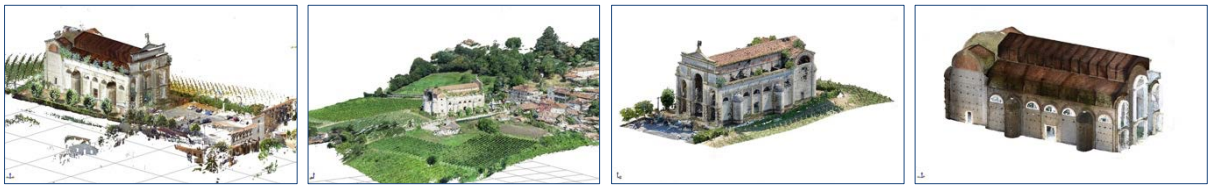

Fig. 6: Points Clouds resulting from survey operations with laser scanner and photogrammetric techniques.


Fig. 6: Some of the orthorectified images resulting from the elaboration of the survey's data.

3.3 Building a relational database of the church.

The final aim of the research activity was reaching a definition of a knowledge system of the asset, that, through an information model developed in the IFC scheme, allowed to obtain a biunivocal correspondence between the information contained in the model and the repository of sources. The digital reconstruction of the church was designed by breaking up the architectural elements according to the building logics of a construction site (Fig. 8) and associating for each architectural element the identity information through synthetic attributes. The associated information enables to query the model and to interact with the repository, where, through dynamic links, it is possible to reach specific directories in which reference can be made to archive documents.

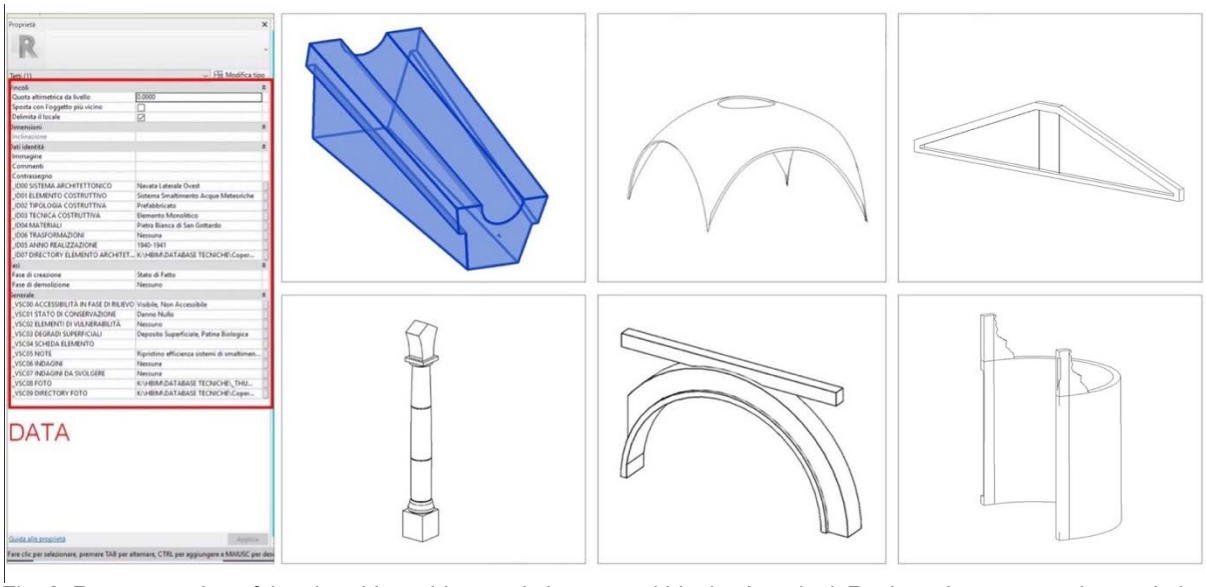

Fig. 8: Reconstruction of the church's architectural elements within the Autodesk Revit environment and association of the information content.

The church information model (Fig. 9) collects the identity data and the vulnerabilities of the construction, thereby becoming an effective tool for outlining guidelines for the recovery and valorisation of the asset. The discretization and semantization operations led to the recognition of 541 architectural elements, which were digitally reproduced [20] within the model, associating for each element the identity information that describes it, as well as the elements aimed to assess its conservation status. A folder in the repository was created for each architectural element identified, having the same denomination given in the HBIM system. This operation enables to obtain a biunivocal correspondence between the model and the repository, ensuring accessibility at various levels of knowledge of the asset [21], freeing the archive documents from applications not attached, but rather connected, so they may be updated in case of a theoretic construction phase, or during future survey and/or maintenance activities.
In building a digital model of the church, the following information attributes were associated: database of the unfinished church, architectural system, construction element, construction typology, construction technique, materials, year of realisation, transformations, directory of architectural elements, accessibility during the survey stage, conservation status, elements of vulnerability, superficial degradations, element sheet, notes, surveys, surveys to be carried out, photos, photo directory, improvement actions.

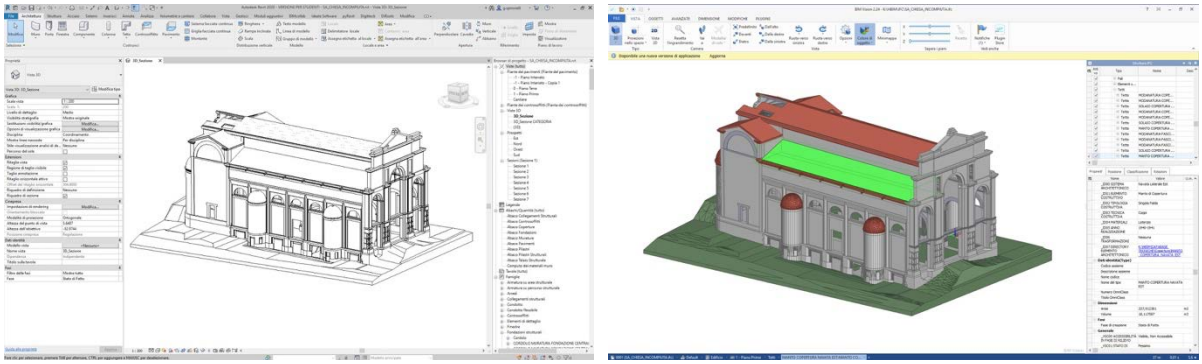

Fig. 9: In the left image, it is possible to recognize the model built within the commercial Autodesk Revit software. In the right image, thanks to the IFC schema, the HBIM model's data are accessible within the open-source BIM Vision application.

4. Conclusions.

The knowledge process on the “Unfinished” church of Brendola allowed to check and implement a survey methodology in which the cross-comparative survey between sources of different nature (direct and indirect) becomes an operational guide for project strategies, in case of studies of buildings in state of neglect or in ruins. The comparison between documentary data and material data enables to visualize and identify the architectural elements, specializing the interventions aimed at conservation. Such method, in case of buildings in ruins, develops a conservative approach aimed to valorise the “non-finished” dimension, in that it describes the assessment of the conservation status of each element, with an attention that evokes the archaeologic dimension. The digitalization of the path of knowledge, given its nature as a tool for sharing, also creates a backbone of information that may be interpreted as a model for future management and protection of assets. Indeed, an archaeological approach to historic buildings enables to lay the foundations for shared knowledge, in which material traces and immaterial data are contained in a survey tool that can also be used to reconstruct and share a collective memory of places with the communities.

This methodological prospect thus manages to intercept – through the digitalization of processes – the main activities related to conservation; documentation, protection, maintenance, and the project, condensing (and revealing) the material and immaterial value of ruins, with the aim to disseminate them to future generations.

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WORLD HERITAGE and DESIGN for HEALTH
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Smart Cartography to know the Cultural Heritage of the Historical Center of Naples

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Abstract
The cultural heritage of the city of Naples is largely preserved in the urban palimpsest of its historic center which, as a large archive, preserves the memories and traces of millennia, as evidenced by the recent archaeological findings brought to light during the new metro line excavations. The dialogue between the places of the historical and the modern landscape results into the interpretation of the complex stratification of the urban fabric. It is possible to understand the history of the urban landscape transformations through the study of the rich iconographic and cartographic heritage preserved. But the complex interpretation of the historical stratification of the urban landscape, achievement of a creative process that has repeatedly been renewed over the centuries, currently needs new and more up-to-date tools capable of representing the geographical space in its entirety. In this perspective, the Geographic Information System (GIS) lends itself well to the dynamic and digital description of geographical space. The *Smart Cartography*, returned by GIS systems, can replace in an innovative way the traditional paper cartographies, manipulating the geometry of the data, by relating them to each other, georeferencing them and creating easy-to-access information flows from multiple users. The GIS, therefore, well suited as a tool for the projects implementation, aimed at the knowledge and enhancement of cultural heritage.

Keywords: smart cities – cultural heritage-mapping GIS- social network- historical center

1. Cultural Heritage between creativity and historical memory.
The building palimpsest of the historic center of Naples is the product of a process of urban transformation that has followed and renewed by the creativity of governance that have alternated over the centuries. The consideration of the Japanese philosopher Tsunesaburo Makiguchi (1871-1944) on creativity, is a path of thought that would be worth undertaking to develop an epistemological framework on the genesis of Cultural Heritage, the result of a creative act that relates physical and empirical phenomena transforming geographical space into landscape. The philosopher states: “When we speak of creation, we refer to that process which, by rummaging through the elements already existing in nature, makes it possible to bring to light all that has a relationship with human life, and to evaluate and strengthen the relationships thus identified through human intervention. Creation, therefore, reworks the order already existing in nature to produce another one particularly advantageous for humanity [1].
For the city of Naples this creative act has been repeated over and over again since its foundation, it can be said that the cultural heritage of its historic center belongs to one of the very few cities in which the palimpsest, originated in the foundation of Greek polis [2], has become layered in a continuous creative process that each time has given its imprint on the future of the historical memory of the city, that has been built and rebuilt on itself, in a relationship often conflicted due to the different cultures expressed by the dominations that have followed [3]. The relationship city-countryside impressed in the urban order was absorbed by the traditional bucolic culture, which tells how Naples, in the course of its urban history, has always shown a natural tendency to conform its urban growth to the morphology of the places, a tendency that has evolved into a natural process of fades and shades where urban and extra-urban landscape have

merged into a spatial continuum, crossing the stone limits of the walls. This rural aspect of the Cultural Heritage of the Historical Center is well preserved in the urban fabric of the villages surrounding the ancient core of the city [4]. The memory of the continuous evolution of urban planning and changes of the city is reflected in several representations made throughout history, the “imago urbis” that is sometimes partial and fanciful views has been the subject of that creative expression proper to an artistic power intended to give to reality a new contribution: very often in these views we find expressed an idea of a city that will never be realized. In outlining the skyline of the landscape has always placed the emphasis on the dichotomy between the thickening of the building fabric within the city highlighted by domes and spires and the extensive countryside outside. Overall, the representation of architecture is, for the Cultural heritage of historical Naples, one of the most significant signs of its civil and cultural peculiarity, its “imago urbis” has always been the object of the project of representation of urban reality, project that was and is expressed in the relationship between physical space and abstract representation [5]. Until 1480, when the cartography of the city was affirmed with the Strozzi Table, the image of the city of Naples was represented by imaginative views inspired by the dialogue between the genius of the places and the human genius, an idea of a city conceived between reality and vision. The topographical choices that have characterized the views throughout history, have always concerned the thickening of the urban fabric within the walls in contrast with the countryside, to this is added another characteristic always present in the representations of the city, that is of the imprint of its ancient past visible in the grid of the urban system of Greek foundation, exemplary model of the old town planning [6].



Fig. 1: The ancient center of Naples highlighted with GIS methodology on Google Earth image

1.1 The Cultural Heritage of Naples in cartography, between tradition and modernity

The representation of cities has always been a theme of great interest in the relationship between reality and image, the design of cities has evolved and perfected with the advancement of science and technology. In the study of cities, cartography is an excellent tool for understanding the development in the different phases of its evolutionary history. In the Neapolitan case, with regard to historical cartography, it can certainly be said from the end of the fifteenth century to the seventeenth century, more than the representation of the topography of the places, the perspective or illustrated, and axonometric-landscape representation was affirmed. The fifteenth-century Strozzi table is attested as the most important representation of Naples, showing the image of a city surrounded by green hills, dominated by the high silhouettes of the Angevin churches. Alongside the realistically restored image of the sacred city, the table also strongly emerges the image of the fortified city, surrounded by its castles, high towers and walls. While among the sixteenth-century views of Naples, the most incisive is the cartography engraved by Étienne Dupérac Lafréry in 1566.

Execute with extreme precision in the relief, the cartography reproduces the territory ranging from east to west, from the Maddalena Bridge to the church of Santa Maria di Piedigrotta highlighting the connection between the hills of Poggioreale and Capodimonte highlighting both the hilly and that of the villages outside wall. With a change of perspective, Lafréry move on an almost orthogonal vision of the city, adopted both in the representation of the plant of the Greek-Roman nucleus and in that of the Spanish districts and coastal fortifications of Castel dell'Ovo and Maschio Angioino, to that perspective, adopted in the representation of the hills behind the ancient core, which makes the best landscape skyline visible from the gulf. In the cartographic representation of the Lafréry (Fig. 2), there are countless elements that can be traced back to the image of the agricultural landscape: rows of trees, dotted lines that refer to the orderly arrangement of crops, forest sectors, farms and rural dwellings. Furthermore, the Lafréry Map is an instrument through which it is possible to know what existed in the medieval city. The legend, with its seventy-five postponements, in addition to indicating the main military, defensive and religious emergencies, indicates hospitals, patrician residences, viceregal and noble palaces, streets, squares and fountains. It is a representation of the city that gives back through a design oriented towards the North, the idea of the shape urbis, in which the coast line of Chiaia and that of the Maddalena Bridge are the extreme points of the representation punctuated by a virtual diagonal.



Fig 2 .The village of Vergini in the Cartography of Lafrery (1566) compared with a GIS cartography

This orientation, which put in the foreground the image of Castel dell'Ovo and the Lanterna del Molo, gave the vision of the waterfront of the city, widely taken up later in much of the cartographic production of the eighteenth century, until the innovation that took place by the Duke of Noja and Rizzi Zannoni [7]. The "Mappa topografica della città di Napoli e dei suoi contorni", drawn up in 1775 by Giovanni Carafa Duke of Noja with the most up-to-date topographical survey procedures, gives a picture of a more varied and complex territory with respect to the view of Lafréry. The map consists of 35 sheets of paper that cover the entire urban area of Naples, from the sea to the hills of the Camaldoli and Capodimonte extending the relief to the Vesuvian and Flegrei territories. As for the city center, the map assigns to Via Toledo the useful limit to divide the Greco-Roman city from that of subsequent expansions. As regard the hilly system, while in the plan of the Lafréry the landscape elements seem to have been added with the aim of obtaining a view effect, following what was the style of the time [8], in that of the Duke of Noja (Fig 3) the numerous "farmhouses", which unlike the villages were aggregates of reduced territorial extent and of small demographic size, are protagonists in the cartographic representation, punctuating the numerous main nodes of the road system. The map also shows the residences in which in the mid-1700s, in addition to the traditional agricultural organization of the territory surrounding the property, was associated the place of residence or holiday, recognized by the presence of formal gardens. This conspicuous system of villas will subsequently be found in more detail in the Map of the City of Naples, drawn up in 1880 by the engineer and geographer Federico Schiavoni.



Fig 3: The village of Cristallini in the Chartography of the Duke of Noja (1775) compared with a GIS cartography

Going back to the Map of the Duke of Noja, in the central part is inserted a scenographic view of the city followed by a legend containing the explanation of the 580 numbers marked on the most important monuments and places of the city. In a completely new perspective compared to those of the seventeenth century, this view gives the opportunity to read the size of the city reached in the eighteenth century, where the bulk of Castel Nuovo barely emerges from the tangle of the dense urban fabric [9].
The comparison between the Map of the Duke of Noja and the one published in 1790 by G. A. Rizzi Zannoni, that is one of the best productions of the Regia Officina in Naples, allows to read the development of the city, having been represented the arrangement of Piazza Mercato and the building increase of the village of Chiaia. In the nineteenth century the first plan of the city taken over and published was “La Pianta della città di Napoli” designed by Giosuè Russo and engraved by Domenico Guerra in 1815. This was preceded only by the drawings of De Fazio-Malesci and Mechese. The tradition of Rizzi Zannoni cartography is found in the map of the city of Naples and its outlines realized in 1828, that shows the exceptional technical level reached by the “Real Officio Topografico della Guerra” in reproducing the appearance of the city during the reign of Francis I [10].
The study of cartographic sources as a document is an essential practice of historical investigation of the city, this approach has evolved and perfected with the progress of science and technology. In this specific case, the study of the reading of the complex historical stratifications of the Neapolitan urban landscape, the result of a millennial creative process, requires new and more up-to-date instruments of investigation capable of representing the geographical space in its entirety. The reconstruction of the urban landscape in different historical periods, in terms of permanence and modifications, traditionally the result of scientific research based on diachronic analysis resulting from the comparison of the different historical sources available, has as its limit to have produced data that have often been neither related to each other, nor compared through the complex territorial dynamics that generated them. For this reason the deduced data have frequently shown the criticality of appearing as fixed in time. Geographic Information Systems (GIS), in this sense, are well suited, as an updated tool, to a dynamic and digital description of geographical space (Fig 4). The smart Cartography, returned by GIS systems, can currently replace in an innovative way the traditional historical paper maps, thanks to their ability to manage manipulating the geometry of data, putting in relationships and geo-referencing them, also creating easy-to-access information flows from multiple users. In addition, methodologies such as the acquisition in GIS environment of historical maps on paper, through digitalization and storage in raster format (Fig. 5), allow both the geo-referencing of data, and the use of historical cartography as a reference basis, to be connected with the new maps, through numerous control points. Using the coordinates or Gcps (Ground Control Points), it is therefore possible to adapt the image to the previously set coordinate system, working and comparing the cartographies simultaneously. The smart cartographies are therefore advanced tools and aid for urban decision-making processes, in particular in planning, simulation, analysis, documentation and management of cultural heritage, particularly suitable in places, such as the historic centre of Naples, where it is desirable to plan future interventions on the contemporary city, taking into account the rooted cultural identity.

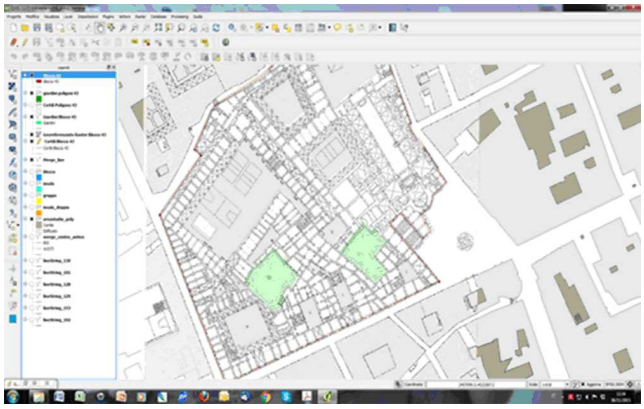

Fig. 4: Naples - The complex of San Domenico Maggiore, overlapping raster containing the topological map of the area under examination.

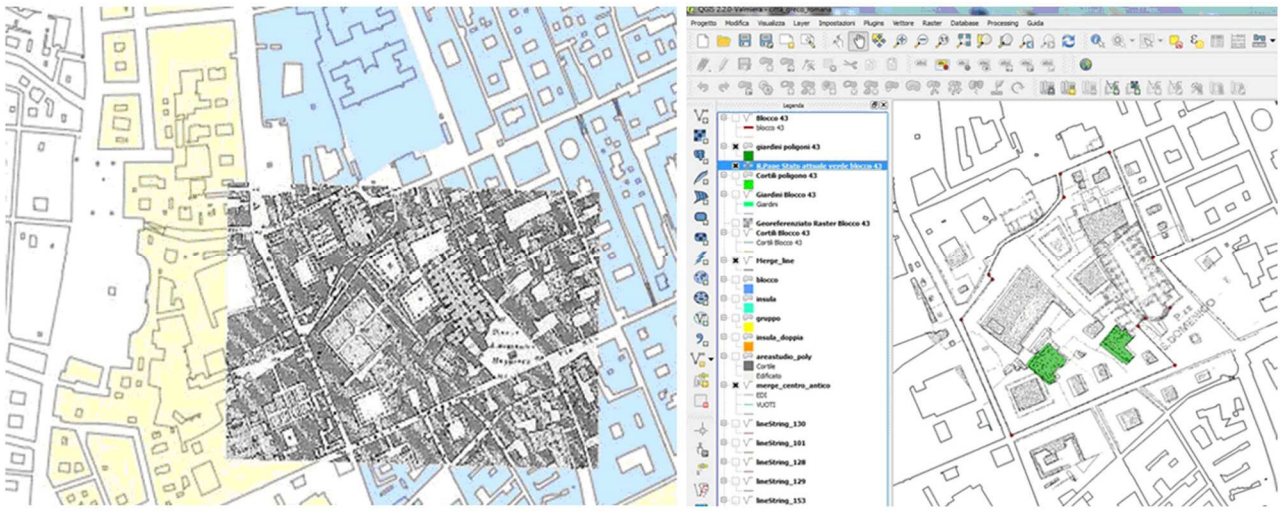

Fig. 5: On the left: overlay in the GIS environment, of the digitized raster and geo-referenced map of the Duke of Noja, on the dwg map of Naples, the area under examination the Complex of San Domenico Maggiore. On the right: The San Domenico Maggiore Complex, from the overlay of the digitized georeferenced Raster taken from the volume by R. Pane, shows that in recent decades the existing green spaces within the Complex have been further reduced.

2. Interactive maps to learn about Historical Naples

The city of Naples preserves within its metropolitan area a cultural heritage whose origins are more than a thousand years, as demonstrated by the recent discoveries occurred on the occasion of the construction of the new metro line. But as far as the history of the City of Naples is renowned, the knowledge of its cultural and natural heritage is fragmentary [11]. To promote the knowledge of the historic center are in place new strategies to represent, organize, disseminate and promote the Cultural Heritage. These strategies are based on technological intelligence paradigms aimed at creating simultaneously Smart cities and Smart environment. Underlying these initiatives are projects aimed at supporting the use of ICT services capable of gathering information from multiple sources. In this approach the methodology used to know the cultural heritage of the historic center is that of GIS. For cultural heritage, the use of GIS systems allows the creation of maps and thematic maps geo-referenced useful to promote the use of Cultural Heritage in smart mode. The GIS systems are of great importance for smart cities because they are able to support a punctual knowledge of geographic space, analyzing and dynamically monitoring locations with the possibility of interacting with IT platforms such as those created by the DATABENC High Technology District for Cultural Heritage to propose in line with the Horizont 2020 Directives the concepts of Smart Innovation and Smart Environment [12]. The use of high-tech information systems for cultural heritage provides a knowledge of the cultural heritage identified at geographical level, this means being able to build models and paths to be used not only for the smart use of cultural heritage but also to create a comprehensive knowledge system aimed at enhancing and making use of online cultural heritage of the historic center of Naples. The idea of territory as a complex historical stratification, like that of the city of Naples, feels the need for an analysis method able to describe the built character of urban structures as stratifications of interventions over time. Cartography as

a design is a endangered tool and therefore needs to be replaced by a new and more up-to-date instrument; it is no longer possible to represent the territorial reality without considering the global dynamic that configures the spatiality. The GIS methodology is well suited to this type of description, as the data implemented in the information system, represent a real world model; it follows that a GIS represents in a personal computer the real world in the same way that a traditional cartography represents the world on paper, but in an innovative way GIS is able to manipulate the geometry of data and the relationships between them to create new information [13]. Geographic Information Systems are therefore well suited to represent the cultural heritage of historical centre, the protection and enhancement of which implies the need to update information not only for cultural emergencies, but also for the historical context in connection with the successive transformations of urban and architectural nature of the urban fabric.

2.1 The ancient nucleus of the Historical Center of Naples

In the regular layout of the ancient center is concentrated the history of the development of the Greek Roman Naples. The oldest part of Naples preserves in its current urban structure the elements of its long and eventful history, that probably begins even before the subdivision of the land in equal parts to be entrusted to the Athenian settlers. In 1959 Mario Napoli supported the hypothesis of two distinct phases of the construction of Neapolis identifying at Sant'Aniello in Caponapoli, in the irregular articulation of the urban Parthenope, the primitive nucleus of the nea-polis that was probably used as an urban sanctuary, as demonstrated by the finding of the votive stipe of Demetra found under the Convent of San Gaudioso. The oldest part of Naples is still preserved in the urban structure of the historic center, archive and memory of the city's ancestral cultural heritage. The ancient nucleus developed within a plant with a geometric design, regulated by a theory of proportion, based on the study of the relationship between the built and the planimetric plant (Fig.6).

Within this space, over time the ancient Greek-Roman nucleus has changed based on complex stratifications that have made it a palimpsest of architectures of different eras, as demonstrated by the Roman theater incorporated into the seventeenth-century architecture, from the Roman thermal baths, from the exceptional archaeological discoveries found under the road level. The richness and the cultural and natural diversity present in the Ancient Center (Fig 7), although characterized by a problematic cohabitation, represent an absolutely unique offer in which to enjoy an extraordinary cultural heritage. The cultural inheritance of the city of Naples finds in the context of its ancient center a particular meaning due to the historical palimpsest that is the main peculiarity. The knowledge linked to such a complex context must be able to be made fluid in its contents and form, through a continuous updating made even by the users themselves. An interactive and geo-referenced cartography plays a role as a dynamic map that offers the user a support that can provide spatial and descriptive information a map at the reach of a mobile phone to navigate and know [14]. Interactive cartographies use open data repositories, and this meets the need to have information in open mode useful to build monitoring systems able to integrate data from multiple sources, in line with the concept of "open government" which involves the use of models, tools and smart technologies.

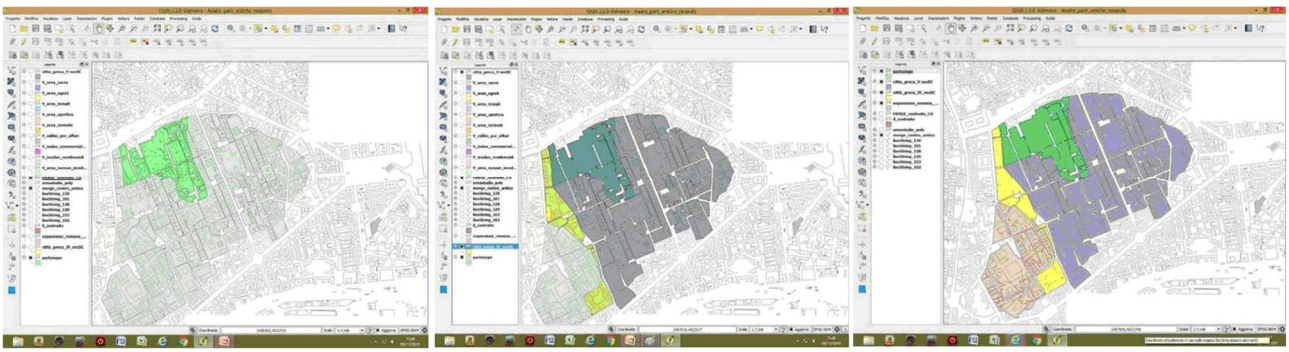

Fig. 6: GIS map for the analysis of the urban evolution of Greco-Roman Naples

The open data tool, in which many types of data are made accessible to all on the web, without restrictions of copyright, patents or other forms of control, allows to enhance and make the information active and interactive. The practice of using data in digital and open format is a fundamental resource for dynamically monitoring environments, territories and landscapes. In addition, in the field of open knowledge, citizens become an active part in the construction of knowledge where additional information is characterized by punctuality and dynamism. Through the use of new digital technologies, the citizen becomes an active and

interactive subject to management and transfer information: from user becomes generator of further knowledge, having the possibility to implement accessible information of new data.

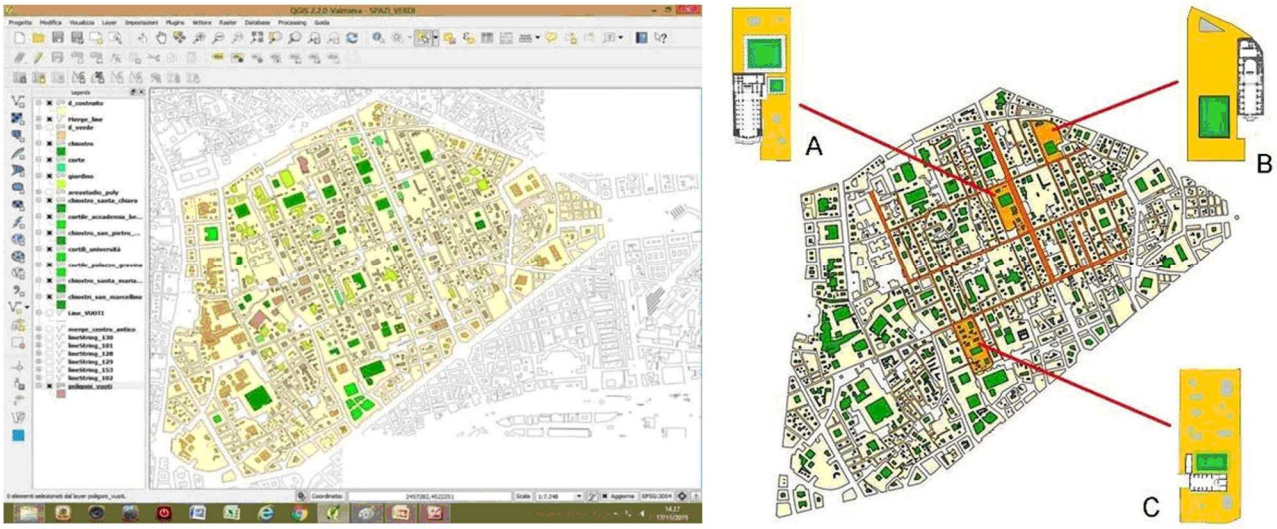

Fig 7: GIS map of the Ancient Center: cloisters, courtyards and gardens.

2.2 OpenGeoData: Historical Center for the Bosco di Capodimonte access

The continuity between city and country has always characterized Naples since its foundation. Throughout history this harmonization of the city to the morphology of the natural space has evolved into a process of fades and shades that have created a spatial continuum between city and countryside, as demonstrated by the Bosco di Capodimonte, created artificially in 1742 at the behest of King Charles of Bourbon [15].

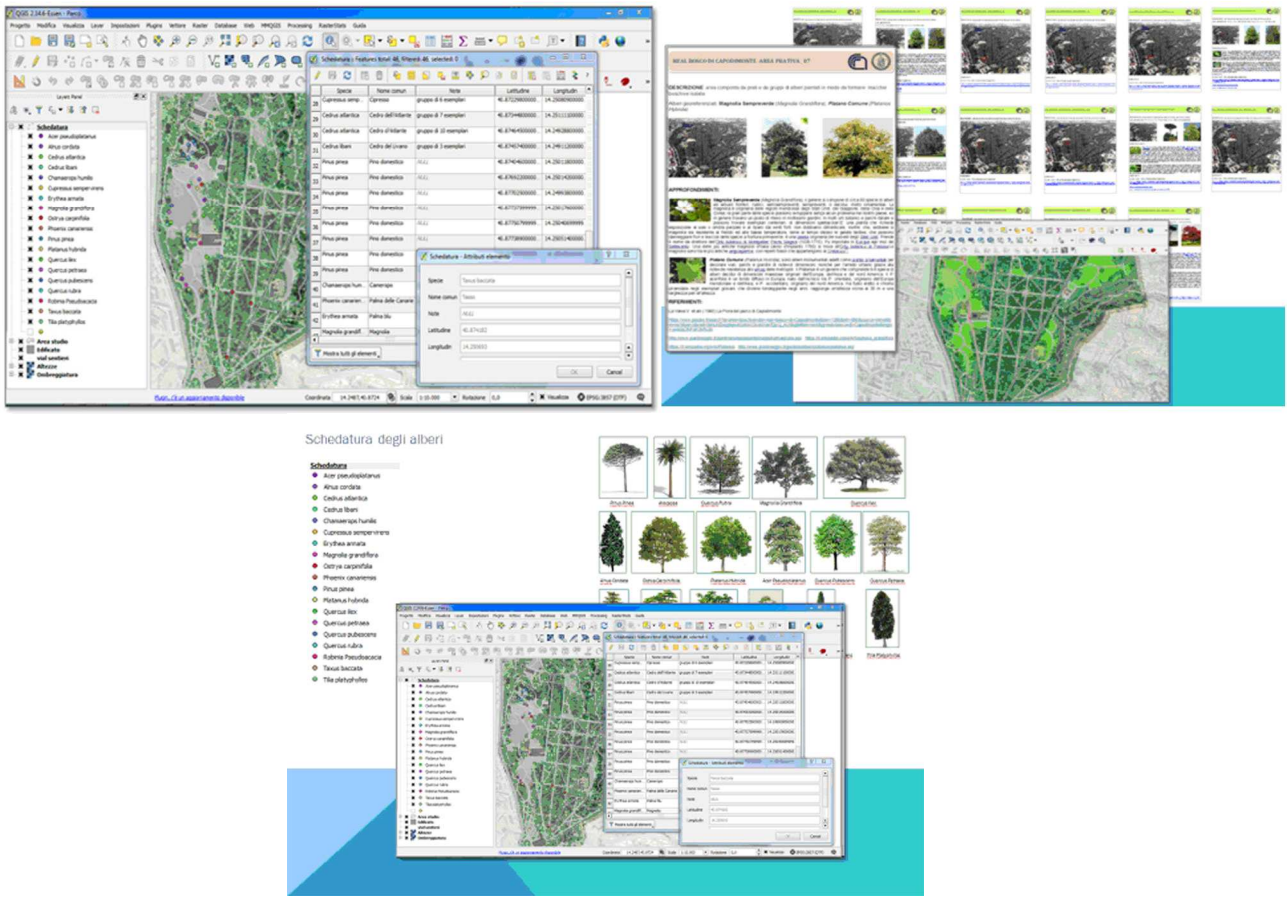

Fig 8: GIS Map of Bosco di Capodimonte with description of botanical heritage.

The valley areas that enclose the perimeter of the Bosco, from east to north, are environments of great natural interest and landscape, characterized by a very uneven orography; for their morphology and location represent the part of the forest less known. However, due to the persistence of environmental problems, the valley areas are closed to public use. In order to make the Bosco known throughout its complex, an experimental open type Geo-CMS infrastructure has been realized [16], intended to support in smart ways activities of enhancement and use aimed at raising awareness of the natural and architectural heritage of the forest (Fig. 8).
The geographical space revolving around the Reggia and the Real Bosco di Capodimonte is the link between the historic city and the hinterland; the environmental context of the Royal Site is characterized by a system of valleys that extend towards the Campania plain [17]. Within the Bosco more than a dozen buildings of great architectural value, functional to the Reggia, are located at the edge of the range of tree-lined avenues. The Real Bosco di Capodimonte, with its 134 hectares, is a site of great historical and botanical interest with an arboreal patrimony that counts 400 vegetal entities planted in the area over the course of two centuries, 150000 tall trees, 10 hectares of restored prairies [18]. The articulation of the green areas is composed of grassy, wooded and valley areas that come from the first northern offshoots of the historic city. IT technologies provide a wide range of tools and methodologies to support communication for the use and enhancement of Cultural Heritage. Also for the Historical Center of Naples the debate on the integration between technologies and BB.CC is particularly developed thanks to the presence of the Meta district for BB.CC DATABENC. However, geographical information is still only marginally used in evolved forms and is often satisfied by resorting to "trivial" solutions, based on frames such as Google maps or similar. For this reason, experimental development research activities using technologies, tools and methodologies specific to quantitative geography should be further stimulated.



Fig 9: Three-dimensional model of the Real Bosco di Capodimonte

In particular, the infrastructure of the open source type are able to support the entire cycle of data, from construction to its use in the processes of exploitation and enjoyment of the property, as was done in an experimental perspective for the Bosco di Capodimonte (Fig. 9), with the help of the most well-known and widespread tools for archiving and modelling spatial knowledge, such as RDMS and GIS, specifically PostgGeSQL, PostGIS and QGIS. The Geo-CMS solution used involved the possibility of accessing geographic context information through a spatial data model using a heterogeneity of multimedia information services and structures. The described infrastructure can be summarized as a content manager where objects, such as users, images, articles, blogs, identified by geographical coordinates are mapped to interactive cartographies. In addition, the cartographies in which objects are mapped contain hyperlinks. These platforms are therefore identified as a solution suitable for communication needs, whether real or simulated, that the use of complex sites such as that of the Bosco di Capodimonte requires.

Conclusions

The formation of a scientific mapping method and the use of mathematical methodologies find their starting point in the theoretical foundations of Leon Battista Alberti and later in Leonardo da Vinci, with the implementation of the theories on topographical surveying-territorial and architectural. Today, with the GIS,

we have a set of tools useful for the description of geographical space and environment; in it we find that component of mathematical thought proper to all the previous geographic instruments and models. Any process of territorial analysis that aims to be transposed at political, social and economic level, as in the case of the recovery of historic centers, must be supported by data and information relevant to the purpose and must be developed taking into account the territoriality of the quantities involved. Modern GIS technologies allow to realize a dynamic cartographic support able to actively monitoring the protective actions. It is clear that the GIS platform lends itself to being a valid and strategic tool to support the dynamic management of cultural heritage, as it is possible to bring in an orderly way a large amount of alpha-numeric data, allowing to manage an information associated to its position. For example, the web application GIS R3 TREES optimizes the characteristics of a GIS, as it allows a potentially unlimited number of users, with different profiles, to access the same database, with the certainty of sharing the same information. Moreover, thanks to the simple and intuitive interface, it is not necessary for the user to have specific skills in GIS. In this perspective, the knowledge of the city's historic center must also be supported by the redesign on smart maps of the building heritage, in order to ensure open data to learn about the Cultural Heritage of the Historical Center of Naples.

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WORLD HERITAGE and DESIGN for HEALTH
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Climate design: a resource for the post-pandemic world

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Abstract

We just have to collect the lessons that this global pandemic in which we find ourselves has infamously brought us. The whole world has stopped and had to reflect and deal with the damage of globalization as never before.
'A primitive tribe reaches a campground one evening and finds the ground strewn with wood. There are two option to use the environmental potential of that timber: either use it to build a windbreak or a canopy against the rain - structural solution - or use it to then make a fire - energy solution. "(Banham, 1993). The structural solution involves a single large investment, while the energy solution involves a continuous loss of resources. Only an ideal tribe would make an estimate of the available wood, an analysis of the climatic conditions of that night and consequently use the wood resources in a rational way.
This parable of Banham dictates the crossroads in which the globalized world finds itself; looking to the past, since ancient times man has spontaneously 'designed' his shelters to find the best comfort (the masonry mass, the movement of air masses and the analysis of the site characteristics.)
The design must focus on the energy independence of the building, with the use of passive systems and the complete analysis of its life cycle.
The hope is that the teaching will lead us to implement new strategies on territorial governance (mobility, quality public spaces) but also to determine the transition to a new modus operandi in architecture and landscape.

Keywords: Climate, design, site, resource

1. Introduction

The paper seeks to address the problems exposed, the choice of the solutions identified and chosen the design process with a comprehensive look, through the multidisciplinary and an overall view of the good act. The main intention is to show that the city of the near future will be able to intelligently use the unused resources while minimizing energy consumption.

2. Climate and sustainable design are born with architecture and with the city

The human species introduces the concept of spontaneous design at the dawn of its history, the first shelters it creates and finds in nature fully meet the basic criteria of climate design. The climate decisively determines the characteristics of the first spontaneous architectures and subsequently the first architectural achievements.
The principles used are the morphological and qualitative analyzes of the site and its characteristics, the use of the mass to be able to contain temperatures, the movement of air masses that guaranteed the natural cooling of the spaces.
These three criteria are the basis of the realization of the ancient man who creates for himself places with the best possible comfort.
Vitruvius in De Architectura explains to posterity"*Circondata, la città di mura, seguita il compartimento di dentro delle piazze, e degli spacii, e il drizzamneto delle contrade, e de i capi delle vie alte parti del cielo. Drizzerannosi, bene, se prudentemente saranno esclusi i venti de i capi delle vie: percè i venti, se sono freddi, offendono, se caldi, guastano, se umidi, nuoceno."* (book I, chapter 6). The indication that Vitruvius said for the creation of new efficient cities is to analyze the winds present in that particular place and draw the route in order to avoid their negative effect.
The industrial revolution and subsequent technological progress allowed man to artificially control climatic factors; the resources initially seemed inexhaustible and consequently the conviction of being able to create any type of artifact indiscriminately from the climatic factors that determines the place in which it is built has crept in.

The impact that climate change, the scarcity of non-renewable resources and the ever-increasing levels of pollution have had in the world in recent years, has fortunately called into question the design methods and the problem of maintaining and sustaining buildings.
The Sars Covid 19 pandemic has highlighted the problems of the contemporary human-centered world and the need for new ideas to design not only the city, but also the countryside. The difficult conditions of this period made universal the ideology underlying the 2016 Architecture Biennale: improving the quality of any built environment, not just the poorest ones as Aravena declaimed, is necessary for an improvement in the quality of life.
The introduction of renewable resources in contemporary cities is proceeding slower than the urgent need to stop the use of polluting resources. To be able to obtain concrete results, design must be guided with optimized design choices and passive systems.
This phenomenon continued over the centuries until it completely lost the concept of climate design and created projects exclusively related to the architect's expressiveness with the use of high-consumption systems and elements to mitigate the heat island.
This significant change, which concerns the world of design, is very ambitious, considering that the analyzes to be carried out to understand the characteristics of the site and the dynamic behavior of the building are complex and linked to specialized figures, but in this sense in recent years the developed technologies have enabled professionals to create integrated real models.
The strategic long-term vision of the European Union provides for a zero climate impact by 2050. In order to achieve this goal, buildings and cities are required increasingly higher standards and energy performances. In this regard, urban ecology is among the renewable resources to be used in the design of the city. This discipline is increasingly indispensable for dealing with climate change and with the continuous increase in the vulnerability of urban systems (see the increasing frequency of anomalous and intense meteorological events). Urban ecology with its survey methodologies and design criteria aims to follow and imitate nature, capturing the profound conceptual and functional analogy existing between natural ecosystems and the city ecosystem. In the vision of the city as an ecosystem, both the transformation processes induced by humans in the environment and the reactions of the environment to human actions play a central role. Urban ecosystems have different peculiarities compared to natural ones, which in the absence of external perturbations, tend towards an optimal and basically stable climax at least in the short term. On the other hand, in urban ecosystems the intervention of man alters the relationships between the components of the ecosystem and causes the evolution of this to be modified by many phenomena, capable of causing great transformations in a very short time. The quality of the urban ecosystem is all the better the more these transformations contribute to achieving general conditions of better livability for the inhabitants; this can be a useful tool for achieving real urban sustainability.
With a view to green urban regeneration, it is appropriate to intervene both at the urban scale and at the scale of individual buildings.
Here are some methods to apply:

- to encourage the increase of green areas and enhance the existing ones from an ecological point of view, connecting them, where possible, to each other;
- to act on the problem of waterproofing the soils of the urban fabric;
- to increase biodiversity, protecting and developing the different habitats;
- to use the principles and techniques of bio-architecture,
- to build roofs and facades with green and permeable elements.

3. Climate analysis and climate design

On the one hand, climate analysis and the intervention environment and on the other, climate and sustainable design are two fundamental steps to be able to create innovative architecture by following both the good construction practices of the past and the principles of landscape ecology.

3.1 Climate analysis

The microclimatic factors and their analysis will indicate to the designer the design choices to be followed in determining the envelope and passive systems to be introduced; it is clear that the place where you design is the central part of the process and the one that definitively marks the revolution in architecture, landscape and territorial governance.
Climate analyzes must take into account as minimum factors the trend of temperatures, with the maximum and minimum peaks and their frequency, the amount and period of precipitation and finally the speed and direction of the wind. The analysis of the wind within the design environment, for example, will allow to optimize the openings to be created in the project and to understand how the site and the surrounding buildings interfere with the project.
Another factor to be analyzed is certainly the path of the sun through the study of solar diagrams over the days for the different days of the year.
This analysis is essential for the correct positioning and rotation of a building on a site.
Still talking about solar analysis, it is necessary to analyze the radiation and therefore the solar energy that impacts on each exposed area of the inserted element, in order to be able to shield it and exploit it as effectively as possible.
In contemporary design, the introduction of the green element widely in the city and extensively in individual buildings is another way of intervening on climate control. The heat island is a phenomenon that today characterizes cities around the world, causing more and more health problems to the population; it is mainly caused by the increase in air temperature connected in part to the increasingly frequent alteration of climatic events, in part to the influence of pollution on the atmosphere. The heat island is defined as the difference in temperature between the urban environment and the surrounding one. This thermal gradient is due to the influence that urbanization and human presence have on the interaction between the Boundary Layer (0-1000 / 2000 m), the Urban Canopy Layer (0-height of the buildings) and the Surface Layer (urban surface). In large cities, the temperature, both in summer and in winter, is higher than in neighboring rural areas; for a medium-sized city it is calculated that between the center and rural areas there are between 0.5 ° C and 3 ° C of difference, with significant variations in the microclimate. This phenomenon, in particular, affects the environmental conditions and therefore the well-being of the inhabitants both in urban outdoor spaces and in the confined environment; related to it is the increase in energy consumption for cooling.
For the use of green technologies it is necessary to know not only climatic but also morphological factors, such as the urban conformation, the layout and size of buildings and natural and anthropogenic factors.

All the data collected to be analyzed in a scientific way, must be inserted into software in order to analyze them, such as Autodesk Revit and its extensions, which are able to simulate all the data collected in the model, in order to interact dynamically with these factors and control design choices.

3.2 Architectural climate design

Climate design is the set of choices and optimizations that derive from the results of the site's climate analysis.
Going through the case of a cold climate, the characteristics usually attributed to the envelope are thick mass and small openings to control the internal climate with systems.
An example of a climatic design choice is instead the transparent envelope with large glass surfaces that increase the amount of light in the rooms and exploit solar energy.
In Northern Europe, this design choice developed in the twentieth century with various experiments such as the Officine Fagus by Walter Gropius which introduced large windows which, due to technologies that were not yet developed, caused high losses with a consequent increase in energy consumption.
At the same time, the idea of orienting buildings to the south with large masses of storage that exploited solar energy was developed.
The first passive house in Germany in the nineties is the real goal of these experiments, the dispersion of the envelope has been reduced to a minimum and the need for thermal energy for heating has been minimized.
Proceeding with the example of a cold climate, the choice of a transparent casing determines a series of climatic advantages, in addition to separating the external environment from the internal one and protecting the building from wind, rain and solar radiation, the transparent casing manages to control and exploit these factors to control the indoor climate.
The envelope is able to control the energy behavior, through the transport of heat inside and the maintenance of the internal temperature by exploiting the greenhouse effect.



Fig. 1: Officin Fagus (1911) W. Gropius and A. Meyer https://www.wikiwand.com/it/Officine_Fagus

The energy purpose of this solution is to cancel the external climatic conditions without the use of plant technology and with a minimum energy requirement.
To achieve this goal, procedures must be carried out with the optimization of the envelope through design choices.
Always following the example of a cold climate, the strategies are: maintaining and obtaining heat by implementing the thermal insulation of the opaque and transparent elements, avoiding overheating through ventilation and shading; the passive exploitation of radiation with accumulation masses, the transparent envelope and the use of photovoltaic systems and the temperature of the subsoil.
Here are two examples of buildings that have implemented these design choices to obtain high energy efficiency buildings.
The first project is the Akademie Mont-Cenis in Germany designed by Jourda-Perraudin, the transparent climatic envelope is conceived for the passive exploitation of solar energy within which the functions are housed in opaque bodies able to function as masses of accumulation.
The roof is equipped with photovoltaic modules that provide electricity but also protection from sunlight.
The openings are placed in the upper part of the casing to ensure the disposal or not of the accumulated heat.
The supporting structure and the skeleton of the facade are made of wood with high thermal inertia which guarantees a release of heat in the dark hours.

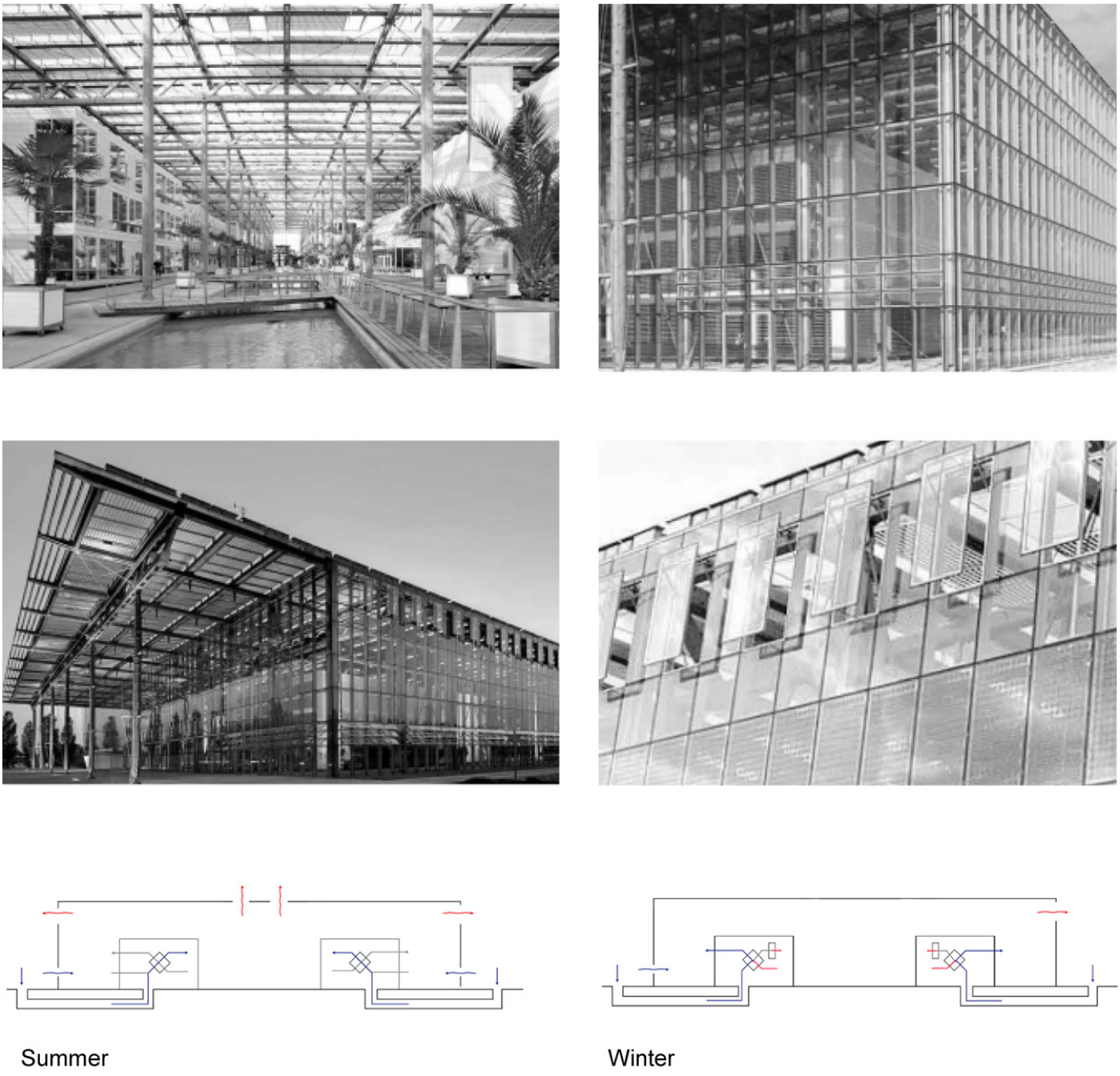

Fig. 2: Akademie Mont-Cenis

Another example is the Institution Building in Freiburg in Germany designed by the architects Kuhn und Lehmann, the strong point of the project is the exploitation of renewable energy: the South-East facade is composed of greenhouses and collectors capable of providing the income at the same time solar power and office air conditioning.
In the winter situation, the preheated air from the façade collectors flows into the rooms and is subsequently extracted and brought to the roof. Heat recovery is carried out through the central ventilation shafts.
In summer, the outside air is cooled in the bundle of underground pipes and flows into the cooled rooms, once heated it naturally escapes from the openings made at the top.



Fig. 3: The Institution Building, Freiburg

3.3 Green climate design

Using greenery as an element of urban regeneration is another tool to master the challenges and to address the problems of the contemporary city, such as the heat island effect, air and noise pollution, increasingly frequent extreme weather conditions and a decrease in biodiversity. The use of plant elements in buildings, such as green facades, roofs with intensive or extensive green roofs, are an increasingly popular method to reduce, mitigate and / or reduce the problems listed above. The ways in which action is taken are different, for example through:

- the decrease in air temperature;
- the increase in relative humidity of the air up to 20%;
- the variation of the hydrological balance of the city.

The use of green elements in buildings contributes to improving the air quality and thanks to the characteristics of high thermal insulation allows a containment of energy consumption, both summer and winter, reducing the use of energy sources for air conditioning, and, consequently, atmospheric emissions in urban centers with a high level of pollution.
The presence of plants, in addition to filtering polluted air, retains fine particles suspended in the atmosphere and further contributes to the reduction of pollution in the city center. Air pollutants are absorbed, thanks to plants, from

both the air and water. The vegetation absorbs fine dust and polluting gases, such as carbon dioxide, nitrogen and sulfur dioxide; carbon dioxide is used by plants for photosynthetic processes, through which oxygen and biomass are produced, while nitrogen and sulfur dioxide are converted by plant species into nitrates and sulphates. Fine particles, and in particular those smaller than 2.5 μm, are those that adhere more to the foliage and are precisely those that have the greatest impact on humans, because, if inhaled, they reach the lower respiratory tract and cause the main Health problems. Other positive effects of the presence of green elements in the architectural structure are: a possible increase in biodiversity by recreating living environments for animals and plants with the identification of new ecological corridors and a positive influence on human psychology with fundamental therapeutic influences for better living in the city, such as clearly demonstrated during the pandemic.



Fig. 4: Green Dip Munich, The Why Factory, University of Technology, Delft

There are two types of trends: intervening on the single building or through the creation of new self-sustainable neighborhoods or parts of cities. Here are two examples depending on the address. The Green Dip case study proposed by MVRDV's The Why Factory is an example of an intervention on a single building to extend over the city. For the latter, green is the tool to master the challenges that our cities currently face, because it has the ability to increase biodiversity, refresh the environment and contribute to water purification processes. Through The Green Dip, a possible answer is provided, through the integration and increase of vegetation in the built environment at a radical and visionary level. To do this, The Green Maker software has been developed that visualizes hybrid city-nature structures, where the boundaries between gray / green infrastructures have been erased and where an attempt is made to create a symbiosis between architecture and vegetation as much as possible. The software combines the knowledge of buildings with that of plants. Its base is formed by predefined biomes from which representative plant species are selected and examined with respect to their properties and performance for a given ecosystem. The resulting database of more than 4,500 plant species contains information on water requirements, total weight, maximum height, oxygen production and CO2 uptake, as well as specifications on the optimal placement of herbaceous, shrubs and trees on any type of surface, in, on or around a building.How this knowledge can be used to transform cities is demonstrated by the visualizations that the students made. Among their model cities are Moscow, Dubai, New York, Munich and Mumbai. If the futuristic visions currently proposed by MVRDV and The Why Factory are realized, urban spaces will soon be covered with a layer of plants.



Fig. 5: Green Dip Moscow, The Why Factory, University of Technology, Delft

An example of an intervention on a part of the city is the case study of Norrebro, a new district in the municipality of Copenhagen, which was designed according to very innovative objectives, including using rainwater to purify the neighboring lake basins, co-designing with local inhabitants and increase biodiversity….
The three complementary cycles, hydrological, biological and social, according to which the whole project of the new district is founded, which includes Hans Tavsen Park and Korsgade, generate a functioning ecosystem with a resilient effect with respect to possible external influences with alterations. The hydrological cycle has the ambitious goal of reusing rainwater throughout the city of Copenhagen. From small to large scale, rain water is seen as a resource where the water is collected, purified and reused. The hydrological cycle optimizes Copenhagen resource consumption, climate-secures the area surrounding Hans Tavsens Park and Korsgade, purifies the water in the lakes and makes Copenhagen even greener. Nature's biological cycles are revitalizing, dynamic and constantly evolving. Hans Tavsens Park will become the birthplace of a biological diversity and variety that will spread to the rest of Nørrebro and Copenhagen. The biological cycle will ensure a diverse, adaptable and unique city nature and natural experiences in the center of the capital. The social cycle is expected to increase well-being in Nørrebro, the most diverse area of Copenhagen, by promoting large and small communities through various social resources. In Nørrebro, the sense of community and tolerance must be preserved as they are the hallmarks of the neighborhood.

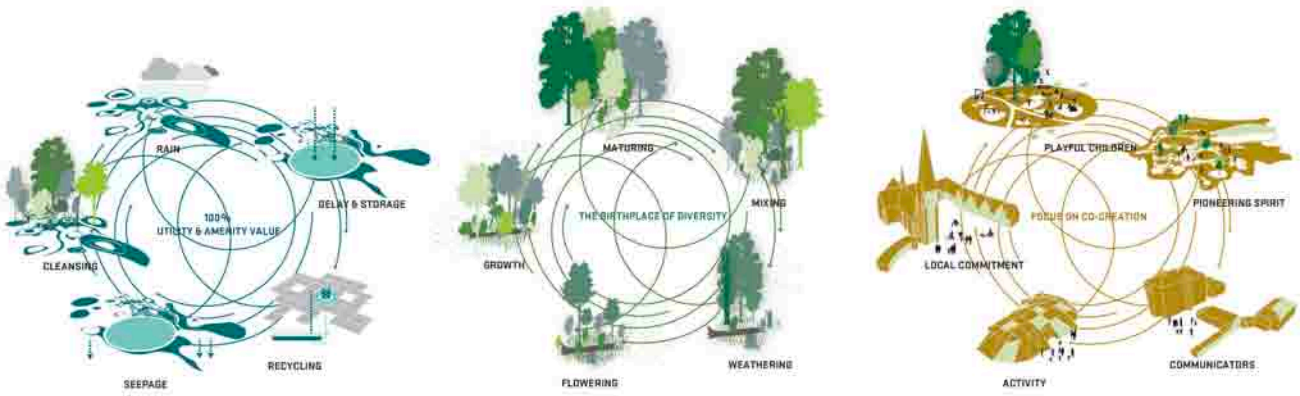

Fig. 6: Norrebro, Copenhagen: The Three Complementary Cycles, Hydrological, Biological and Social



Fig. 7: Hans Tavsens Park after cloudburst, Norrebro, Copenhagen

4. Possible developments

A fundamental step for climate design is therefore to carry out a scientific analysis of the climatic conditions of the place in order to be able to optimize them; passive systems focus on exploiting solar radiation.
The passages examined can be applied, with different technological solutions, to different climates; the goal to be maintained is the creation of a project that adapts to the conditions of the place for which it was designed; the optimization of the energy needs determined by the design choices to make the building independent from an energy point of view. This process described above does not involve the use of particular software but there are many possible developments with the use of more advanced technologies.
The quantitative and performance analyzes allow to face the fluid-dynamic calculation of the project behavior.
The calculation of the energy needs developed with specific software with the insertion of intended uses, stratigraphies and climatic data would allow to quantify the actual needs of the building and therefore determine the real satisfaction of the planned systems, the thermodynamic software instead they are able to simulate the effectiveness of natural cooling, heating and ventilation systems and therefore of thermal comfort.
The modus operandi described above allows for the creation of totally efficient projects independent of the use of non-renewable energy, this philosophy must be applied to new design, recovery and city planning.
Probably one of the few lessons that the Covid-19 pandemic has brought, especially due to the generalized lockdowns it has generated, is that the globalized lifestyle generates serious problems for our planet and our way of life.
The stop of vehicles, especially airplanes, and the movement of people has generated a lowering of pollution, stability inside homes has generated a desire to have livable spaces in which to spend their time, urban dormitory areas without areas green spaces and public spaces have generated suffering in the population. So everyone must stop and think about how, with the tools we have always had, a radical change is possible.
As a conclusion, even if the topic has not been dealt with directly, in designing the smart city it would be important, in addition to intervening with advanced technologies, to involve the citizen in decision-making processes, for example, through a digital engagement platform to perfect solutions. projects proposed by the community of the part of the city on which action is taken.

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A sacred structure in pre-Roman Samnium

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Abstract
This paper is the result of ongoing research at the University of Molise, which aims to identify and connect via the thread of consciousness the most noteworthy examples of historical and artistic architecture in the Molise region.
The objective is to document this structural patrimony and make it known to the wider public and in so doing render known the history of the regional territory, which is too often ignored. Thus, the desire is to facilitate the creation of a conservation programme, as such patrimony is a primary resource for the Molise region, which is also valid as a stimulus for tourist itineraries.
This paper discusses the pre-Roman temple situated at San Giovanni in Galdo, a structure that narrates its time. A programme of wide-ranging exploration in the archives and in the field was developed and when the cultural history and geometries emerged that generated the sacred enclosure, the structure was catalogued and entered into the data base set up at the beginning of this cultural journey in the territory of Molise.
The investigation meant that the known documentation could be updated and added to, in particular with drawings and photographs that provided an understanding of the connections between the structure and the surrounding territory, and more generally an understanding of its historical and artistic value. Studies were also set up that aimed to research the structure's proportions and geometries, providing new digital images of the temple.

Keywords: Temple, landscape, drove-road, survey, representation.

1. Introduction
Archaeological sites represent a complex problem regarding both the disciplines relating to restoration/conservation and enhancement [1]. An archaeological site is both part of the cultural and landscape heritage. This condition would be extremely favourable if it produced, as a logical consequence, dual actions for their safeguarding. Paradoxically however, archaeological sites are not adequately protected, therefore at the end of excavation campaigns they are often abandoned to their fate, especially if in outlying zones and surrounded by vegetation: as in the case presented here.
The problem is perhaps a regulatory one, in the sense that analysis of the laws involving cultural and landscape heritage shows that archaeological sites are never defined as such, in their typology and substance, therefore a specific action of safeguarding has never been foreseen. Perhaps a possible solution to this problem could be to insert into the law the concept of "perceptive contamination" specifying that the cultural site is also to be protected in its visual surroundings. In this way, the principle of integrated conservation of the monument would be fully actualized.
This study is born out of the need to stimulate a wider ranging reflection on the themes of enhancement as a means towards safeguarding, and while waiting for such considerations to take the right path in legislature, as has occurred in other European countries, for example Spain where in Andalusia law 14/2007 on the Patrimonio Histórico de Andalucía was passed, it should be remembered that the first concrete act towards the safeguarding [2] of an archaeological monument and surrounding landscape is the survey and documentation of the monument. As an efficient investigative instrument, survey is an invitation to follow a number of routes of knowledge and to explore the labyrinths of architecture [3], which often provides the answers to questions we ask ourselves about the populations whose monuments stand before us.

2. The sanctuary of San Giovanni in Galdo

Today, the Molise is an administrative region situated in central-southern Italy, and historically characterised by a certain isolation mainly due to the territory's morphology conditioned by the presence of the Apennine mountains on its margin.

The presence of Man is documented from prehistoric times, as attested by the Palaeolithic remains of hunting activities and the exploitation of natural resources found in the locality of La Pineta at Isernia, dating to a period between 700,000 and 500,000 years ago. Through its history, the territory was occupied by the Italic Samnite population, the Romans, a long period of Lombard domination, Normans, Angevins and Aragonese, up until the Unification of Italy.

Although never the theatre of historical events of national importance, Molise is a territory rich in cultural and artistic evidence, situated within a variegated landscape, which passes from the Apennine mountains to a hilly landscape and then down to the coastal zone on the Adriatic Sea.

The Samnite sanctuary of S. Giovanni in Galdo is situated in the territory of this village of medieval origins, in the province of Campobasso, along the road running east-west linking the town of Larino with Monte Vairano and the Lucera-Castel di Sangro drove-road. From antiquity, these transhumance routes were of paramount importance for the economy of central-southern Apennine Italy [4], and Molise has always been a territory of passage [5].

The archaeological site of the Samnite temple lies 1.5 km north-east village, in the locality of Colle Rimontato, at circa 700 m a.s.l. It stands in an agricultural landscape overlooking the valley crossed by the Fiumarello torrent, a tributary of the river Tappino, enjoyable not just visually but with all five of our senses. The structure is a rural sanctuary and transmits the sensation of being a place of peace, relaxation and silence. In fact, when there one has a total immersive sensorial experience. Here there is space for, or rather it assumes a central role, the "haptic" sense of which the American psychologist James Jerome Gibson [6] writes in his original work on the nature of spatial perception, where the sense of touch is revisited and extended to the entire body. In other words, the area in which the Samnite structure stands is a reality in which at one time the activity of men was commensurate with nature and the landscape assumed the form of expression responsive to the relationships between man and nature (Fig. 1).

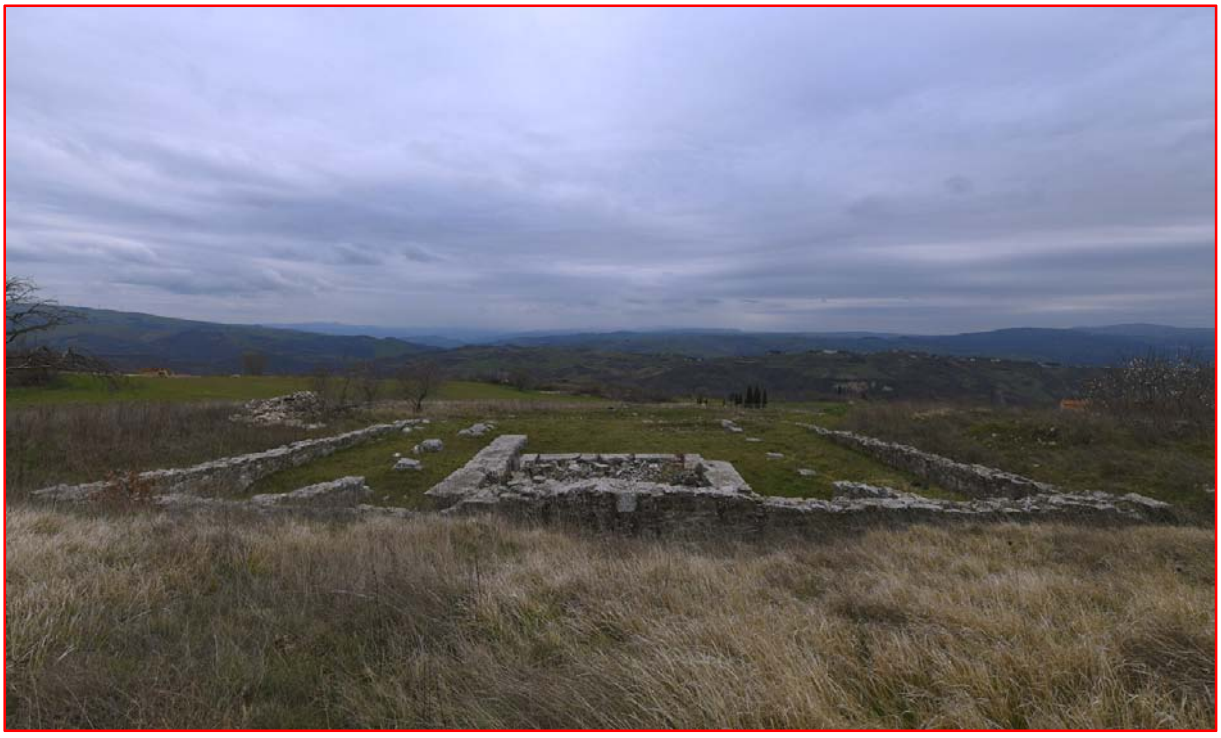

Fig. 1: View of the archaeological area and surrounding landscape.

The temple of Colle Rimontato was characterised by the rustic and severe individuality typical of Italic expressivity. It was at the service of the indigenous population of Pentrian Samnite tribes from at least the 3rd century B.C. onwards, with its monumental phase (the surviving remains) built between the late 2nd century and early 1st century B.C.

The area occupied by the structure extends over an artificial terrace sheltered from the north winds, flanked on three sides by a containing wall at about 1.00 -1.30 m from the remains of the sacred enclosure (Fig. 2).



Fig. 2: View of the archaeological excavations from the north-west corner showing the position of the containing wall and the perimeter of the sacred area.
Fig. 3: View of the archaeological excavations from the south-west corner showing the alignment of large stones delimiting the area in front of the sanctuary.

The space in which the religious ceremonies took place is square measuring 22.00 m on each side, thus reaching an overall surface area of 480 m2. A total of 740 m2 is reached if the area in front of the temple is included. This space is delimited by large stone blocks aligned along the north-west/south-east road (Fig. 3), and it is suggested that there were steps leading up to the temple level. The dividing line between the divine sphere and the human sphere was marked by a stone enclosure, the temenos; as no trace remains of its south-eastern side, it may be suggested that this was where the monumental entrance stood.
Careful examination of the architectural remains suggests that the area dedicated to the divinity was formed by two lateral symmetrical spaces on the south-west and north-east sides. Each was 4.00 m wide and 22.00 m long with six columns standing on stone blocks sunken into the ground, and probably covered by a roof sloping down towards the interior (Fig. 2). It is not possible to identify the floor's make up with any certainty due to events in the past. However, archaeologists suggest that it was a level floor with a beaten earth surface rather than stone paving.
The temple itself abuts the rear wall of the sacred enclosure, flanked by porticoes, and was probably a tetrastyle building with a quadrilateral plan circa 7.00 x 8.00 m. Only part of the podium remains and its reconstructed height is calculated to be about 1.47 m, achieved by assembling three large stone elements one on top of the other: a worked base, a smoothed stone block, and a cyma reversa moulding (Fig. 4). This profile can also be seen in other similar structures in Molise such as Temple "A" at Pietrabbondante, the region's most important archaeological site as regards the culture of the Italic people the Pentrian Samnites.

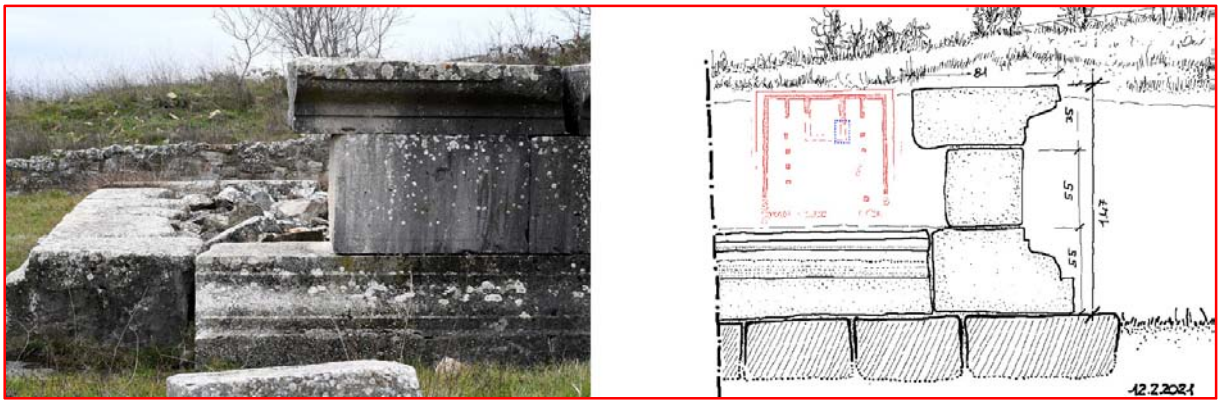

Fig. 4: Detail of the podium base: photograph and eidotype.

The structure probably had a narrow prodomos and a rectangular cella, paved with mortar mixed with crushed tile and insertions of white tesserae forming a geometric decoration, as attested by the substantial pieces currently displayed in the Police Headquarters of Campobasso. On the contrary, nothing is known about the architectural decoration that was certainly present given the fragments from other Pentrian cult sites housed in the Samnite Museum in Campobasso. The temple probably had a pitched roof covered with tiles similar to those of the Italic temples erected in other parts of central Italy. The study of the archaeological material suggests that there was not a permanent flight of steps leading up to the podium. This is a significant structural detail because if confirmed by specific studies it would

add weight to the hypothesis that the sacred structure at San Giovanni in Galdo was not a temple but rather a thesauros, a building to house dedications and votive offerings, which also housed the statue, probably life-size, of the divinity to which it was dedicated (Fig. 5). There are examples of this type in Molise, one of the best known constituted by the statue of Minerva found by chance in 1777 in the territory of Roccaspromonte – a village a few kilometres away from San Giovanni in Galdo. The statue was buried below the rubble of the building that once housed it and is now on display in the Etruscan Room of the Kunsthistorisches Museum in Vienna [7].

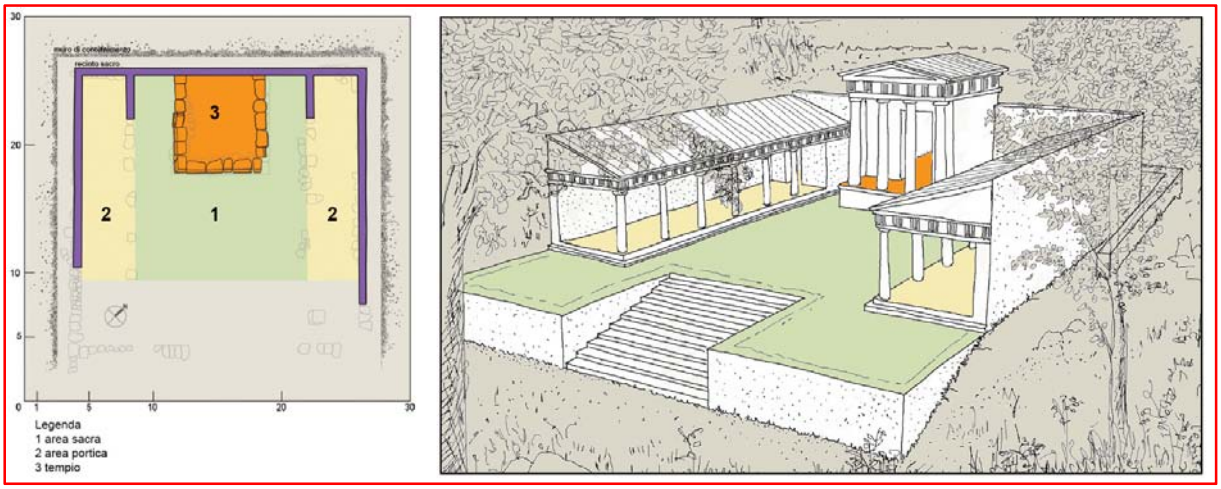

Fig. 5: Image of the temple reconstruction.

3. The architectural survey

A programme of integrated architectural survey was developed for this historical episode made in stone, which can be seen as an impression and symbol of a remote period. This integration involved both the phase of data acquisition and the post-processing and rendering phase in order to increase the operative possibilities and efficacy of the results with the aim of gaining knowledge of and recording the structure. As is known, survey is an efficient research tool that is an invitation to follow a number of routes of knowledge and to explore the labyrinths of architecture [8]. Moreover, a survey is not only a product but a process, thus a sequence of procedures and evaluations to be shared contextually with the resulting graphic output.

As a consequence, our process of getting to know the Samnite temple of San Giovanni in Galdo began with the survey of the archaeological site undertaken a few days before our structural survey, the latter being carried out of the 12th February 2021. This first contact with the walls made it possible to evaluate their substance and position, therefore, the suitability of the approach we had decided to take based on consulting archive documents.

On the day of the expedition, once we had reached Colle Rimontato, the first piece of fieldwork undertaken was the photographic survey, which also covered the area around the site, in order to create a portfolio of coloured images that would document the situation as fully as possible. A reflex digital camera Nikon D850 was used, with a Nikkor AF-S 14-24 millimetre, f/2.8 G ED lens for the general images and a Nikkor AF-S 58 millimetre, f/1.4 G lens for the detailed images. Both sets of images, in total 200, were simultaneously registered in Nef (Raw-Nikon) and Jpg format, dimensions 8.256x5.504 pixels, resolution 300 pixel/inch.

The next activity was the establishment of a horizontal reference plane, which was then used to record the profile of the standing remains using direct measuring and the technique of x-axes and ordinates, placing the points 1.50 m apart. The points were numbered, noted on a photographic eidotype (Fig. 6) using the previously taken Jpg photograms, and put into a database, together with the relative quotes, which were taken with respect to the reference plane and ground level, and the width of the walls.

To make the most of the available natural light, given that the hours of daylight in the winter are fewer, two independent teams were formed, one for the direct recording/survey, the other for instrumental survey.

For the direct survey, the first stage was to lay out a triangle in front of the temple podium, in order to define the horizontal reference plane. A level was positioned on one apex at 1.60 m above ground, constituted by a tripod and rotating Leica Rugby 280 DG laser level, marked on the graphic as 1L. Two small balls denominated 2L and 3L were placed on the other apexes of the triangle, whose levels were taken and marked with high-visibility tape; an expedient that may seem excessive but if the work had not been completed in one day it would have saved time the next morning, given that the reference plane was already established, which when working in winter can be useful.

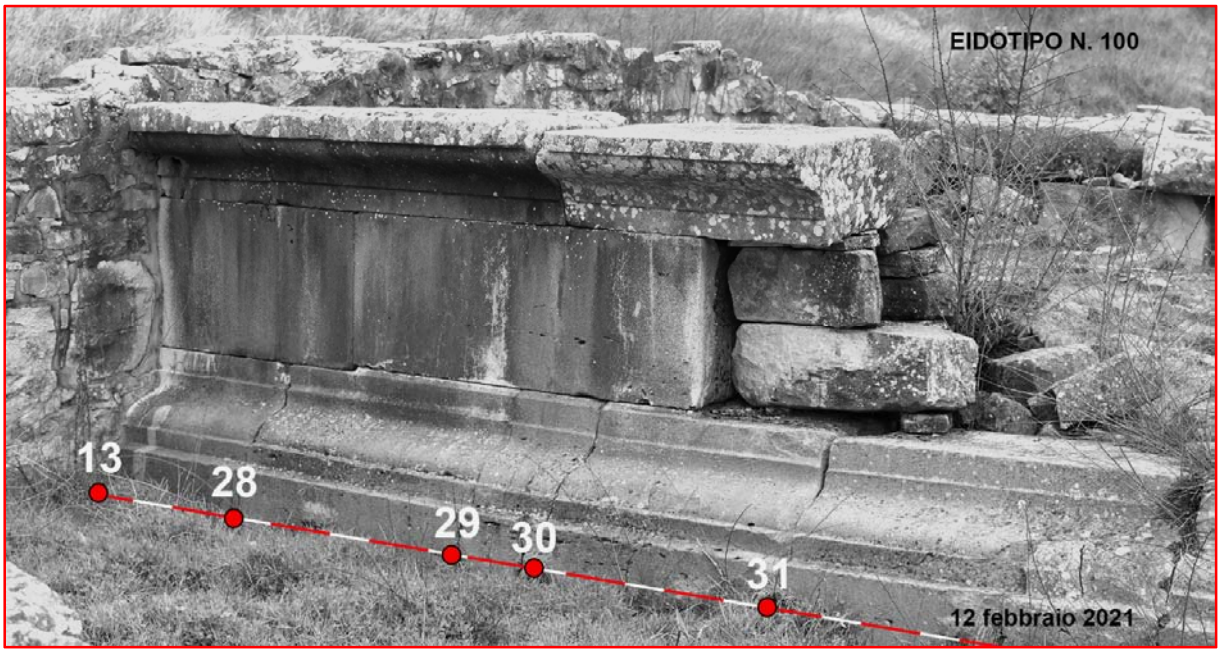

Fig. 6: Photographic eidotype n. 100 of the temple walls.

At the same time, the second team began work on the instrumental survey, for which we used a Leica TCR 703 Total Station. In this regard, as we found the archaeological site free of vegetation, we decided to use two total stations denominated A and B, as a substitute for the canonical closed topographic polygon we had thought to use. They were positioned facing the base of the temple podium at a distance of 5.00 m from the structure and 10.00 m from each other, and then used to acquire the spatial positions of the fundamental points of the significant elements inside the sacred enclosure.
After those of the two total stations, the first points acquired were the apexes of the triangle 1L, 2L, and 3L, as it was our intention to include in the final drawing the entire survey project. The remaining points were taken in a clockwise direction at 1.50 m from each other, in order to have a direct comparison with the direct survey, and recording a good number of points with both total stations. Operations were speeded up through the use of fluorescent adhesive markers, made by us, which were opportunely applied to the walls and removed when the survey was completed.

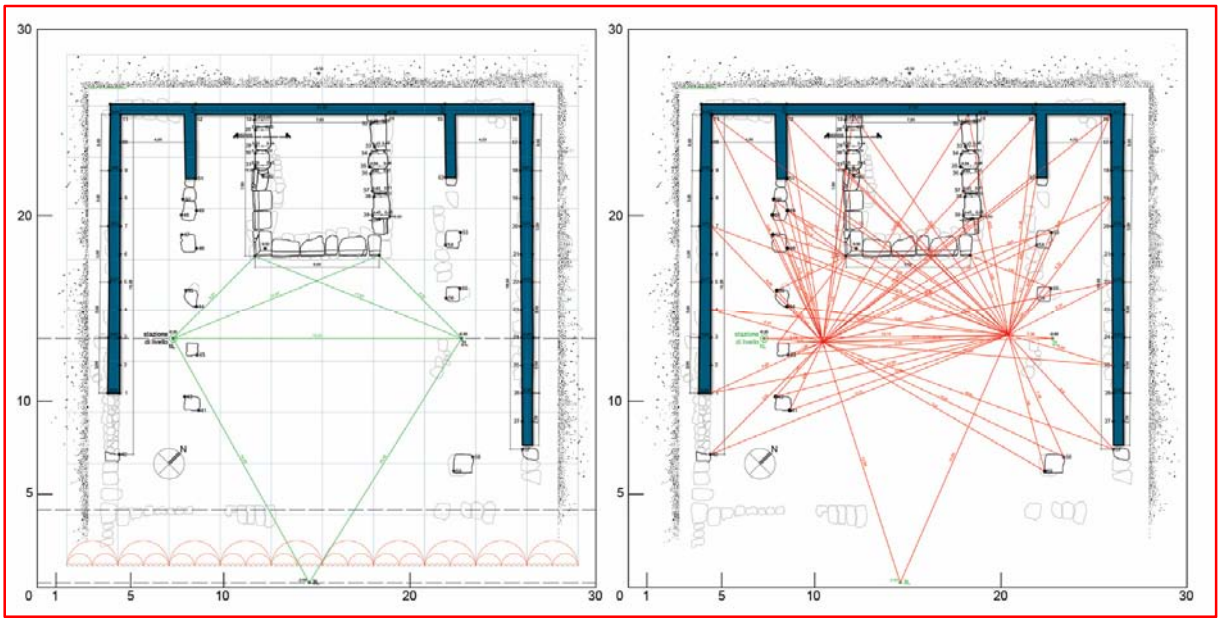

Fig. 7: Plan created from the surveyed points using CAD. In the first drawing the spatial positions of the total stations are shown, metric and altimetric; the second drawing shows the trilateration of the surveyed points.
Fig. 8: Plan created from the surveyed points using CAD with the reference grid created using the Oscan foot as the unit of measurement.

When the fieldwork was completed, work began on processing the data acquired on site. This was first exported from the total station and processed using AutoCAD®, from softhaus Autodesk®, to define the traditional architectural representation, aimed at the documentation and presentation of the Samnite monument (Fig. 7). In addition, by using the photographs it was possible to create a digital model using PhotoScan® software, from the softhaus Agisoft, constituted by a cloud of 4.016.038 points, which when processed generated a mesh of 1.019.042 polygons that was then texturized to obtain complete and partial images of the walls (Fig. 8).
As a result of the reconstructions in metric scale, made in CAD through processing the date derived from the acquisitions, the study looked to identify a plausible system of measurement that could have been used for building this structure. This chapter of research was opened because interpretation as a reading of the monument is a true moment of critical-cognitive in-depth analysis, as the structure reveals itself to who knows how to really see it and examine it with concentrated effort and precision; to who, through empathetic communication, can sense it and decipher it. In other words, emerging oneself in the process that created the structure, mastering the laws that have orientated and guided it and that sustain the form with the coherence and rationality of construction, reveals the characteristic aspects of man's operation in the everyday sphere and in that of architecture.
In our case study, with regard to the particular characteristics of the geographical environment and the period in which the structure was built, it is firstly necessary to note that the measurement used in the Samnite cult buildings was the Oscan foot, which is the equivalent of 27.5 centimetres in our metric decimal system [9].

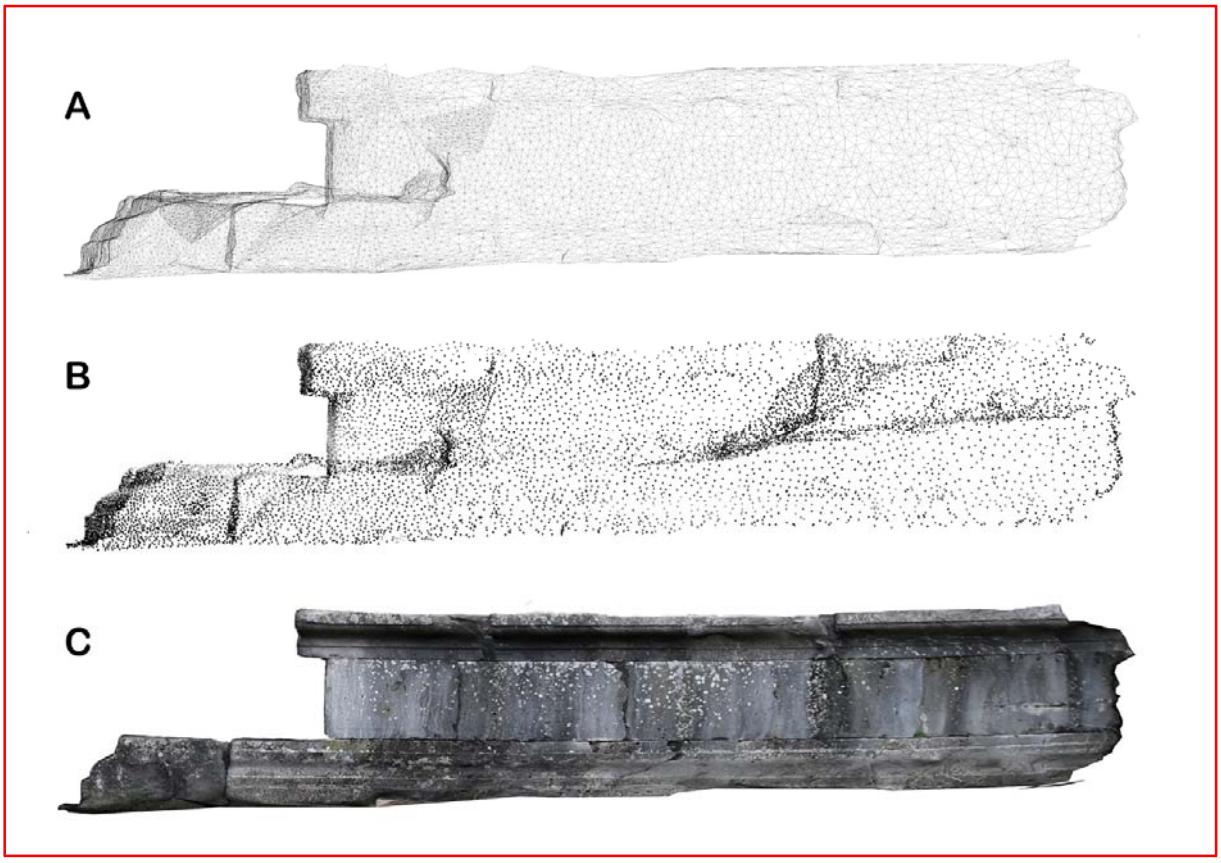

Fig. 9: Digital model of the north-western front of the temple podium obtained by processing photographic images. Image A: representation using triangular meshes (19.042 triangles). Image B: representation using points cloud (16.038 points). Image C: representation using texturised mesh.

Therefore, using CAD, a comparison was made between the drawn plan of the Samnite remains and the Oscan measurement through the creation of a grid of squares, each side equal to ten units. The comparison between the plan of the Samnite temple structure and the measuring grid showed a dimensional correspondence. Thus, in the light of what emerged from the comparison it is suggested that the building was designed and built based on the use of the Oscan unit of measurement (Fig. 9).

4. Conclusion

The walled remains of this Samnite cult building have had the capacity to bring back to mind passages of texts read during our architectural studies, on which we had paused to reflect following a lecturer's

comment. In particular, we found it surprising, and in some ways amusing, to recall that in “Civilisation and Its Discontents” Sigmund Freud talks of ruins, in particular those of ancient Rome, considering the city of the Caesars not as a human habitat but as a psyche with a long and rich past. The Austrian philosopher writes “Since the time when we recognized the error of supposing that ordinary forgetting signified destruction or annihilation of the memory-trace, we have been inclined to the opposite view that nothing once formed in the mind could ever perish, that everything survives in some way or other, and is capable under certain conditions of being brought to light again…” [10]
According to Freud, when visiting the Eternal City a cultured observer, endowed with historical and topographical knowledge, manifests two types of behaviour when standing before the Aurelian walls or the remains of the Servian walls, brought to light by archaeological excavations. At the sight of the defences built by the Emperor Aurelian, which are almost unchanged, he or she observes the walls evaluating the whole by taking into account the individual architectural elements basing his or her reasoning on objective data, while when faced with the remains of the defences built by Lucius Tarquinius Priscus the “psyche” enters into action and reconstructs the configuration of the city walls of the fifth king of Rome. Freud’s explanation for this is that “in the mind the preservation of the past is the rule rather than the surprising exception” [11].
When standing before the Samnite monument we also had a projective psychical experience like that described by Freud. In our case the “certain conditions” were the survey activities and the desire to gain a better understanding of this “Classical” architecture, therefore also of the local community that designed and built it. It is known that architecture helps to illustrate cultural aspects and tendencies, while the projection of the “psyche” guided us in the graphic reconstruction of the religious building’s architecture; drawing on power of expression from architectural studies, from history and published works on this particular topic that were consulted prior to beginning the survey, and also from the surrounding environment.
For each of us interested in architecture, approaching a historical monument is always an stimulating step. In our opinion, this approach is rendered even more interesting if alongside library and archive research we measure and draw the building and in doing so use modern surveying and drawing techniques that not only make it possible to record the geometric reality, but also to extract morphological, dimensional, structural and colorimetric information from the graphic models, which help to focalize research and plan future conservation interventions with greater accuracy. From our point of view, this is not a fact of secondary importance given that today it seems we are faced with the need to re-learn and feel time in order to regain awareness of this nation’s history. While everything contributes to make us believe that history is finished and that the world is a spectacle in which that end is represented, we believe that it is useful to travel the opposite route and find the time to believe in history, as the French ethnologist Marc Augé suggests [12].
In this approach, with the conservation of the historical memory architectural survey becomes the construction site of knowledge and, given that the landscape is measured with architecture, also an indispensable tool for reading the latter. As Giancarlo De Carlo, an architect sensitive to this theme as he is a former lecturer in the survey of monuments at the Venice School of Architecture [13], writes: “measuring an architectural structure means returning it to the dimensions of its original form and understanding it, with the senses as well as with the mind: only then are the dimensions, and also the qualities of a place appreciated; because through measuring one understands the whole through the details and vice versa” [14].
For us, the survey of the temple at San Giovanni in Galdo constitutes an example in this sense. The final drawings of the details of the temple podium (Fig. 9) helped us to identify a possible means of understanding the architectural whole by providing data that is absent from the drawings deposited in the archive of the Archaeological Superintendency for Molise, made in the early 1980s. Furthermore, the measuring revealed differences in the spatial position and metric consistency compared to the data from the archive documents. Some of these values were minimal, as they fell within the tolerance allowed for this type of architectural survey, others were more substantial. Among the latter, for example, is the case of the temple podium where the metric difference were mainly caused by the parts of the wall that were reconstructed during the second half of the 20th century.
In particular, compared to the documents consulted during preparation of the survey project, the north-eastern wall of the temple results as being circa 3.5 m longer as three blocks found on the ground nearby have been replaced, while the north-western wall with the addition of a block is one metre longer. Additional new data provided by the survey is the quoted plane of the archaeological area made in order to identify the nature of the differences in height around the sacred area and the terracing created during the temple’s construction. In the area delimited by the remains of the temenos the difference in height is 0.50 m along a length of over 20.00 m, while outside this area the difference reaches 1.50 m over a 5.00 m length.
To conclude, we believe that although this paper cannot be considered exhaustive, it can however shed light on a possible key to the interpretation of the Samnite monument which, beginning with measurement and continuing with geometry leads towards mystagogy [15], that is in turn a research

instrument but also confirmation of the strictly physical theories. To summarize, we believe our contribution to be a sort of trigger to a cognitive process, which, although formed by continuous changes of idea suspended between the tangible and intangible, between the evidence and latency, was however useful in rediscovering a set of sensations that previously escaped us.

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WORLD HERITAGE and DESIGN for HEALTH
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Documenting the intangible aspects of built heritage: the compared results of international field experiences in Mexico and Bahrain[1]

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Abstract

The paper presents the opportunities of documenting intangible aspects associated with built heritage. Since the first century B.C. Vitruvius, in his *De Architectura,* stated that a current problem for built heritage conservation consists in the growing erosion of maintenance and repair capabilities.
Analyzing the connection between the recovery of the intangible dimensions of built heritage and its maintenance, this contribution stresses the reasons to preserve intangible knowledge and skills associated with built heritage.
Displaying practical international case studies, it is underlined the key role played by traditional knowledge and skills in terms of innovation and community resilience making intangible conservation relevant for local economies.
These considerations are supported by the direct experience of the main author in three international documentation and conservation projects: the Casa Cristo in Guadalajara, Mexico, the Shaikh Isa bin Ali house and the Siyadi majlis in Muharraq, Bahrain.
In these three sites - different for location, period of constructions, building materials, architectural typology, as well as cultural and social-economic context – it is shown the relevance of documenting intangible variables to ensure the preservation of cultural diversity and local identity. Through the proposed case studies, it is explained how the documentation of intangible cultural heritage can support its safeguard, allowing the transfer of knowledge, skills, and meanings. Final remarks focus on the relevance of these issues in the definition of informed management actions for the sustainable stewardship of these sites.

Keywords: documentation, built heritage, cultural intangible heritage, conservation, sustainability.

1. Why is it important to document the intangible dimensions associated with built heritage?

The need of documenting intangible aspects associated with built heritage dates back to the origins of architecture. Some recurring issues show the importance assigned to this theme in the history of the discipline.
The first one consists of the growing erosion of maintenance and repair capabilities: a current problem in built heritage conservation. Already in the first century B.C. Vitruvius, in his *De Architectura* stated the central role of maintenance in good building practice (Jokilehto, 1999), p.2. Centuries later, Feilden recalled the problem, evidencing that the lack of skills needed for conservation and the shortage of

[1] Davide Mezzino wrote the Abstract, Section 1, Sections 2 and Sections 3. Tatiana Kirova collaborated with Davide Mezzino in writing the Conclusion.

craftsmen and materials are two of the main problems in built heritage conservation. The connection between the recovery of the intangible dimensions of built heritage and its maintenance is one of the reasons to preserve intangible knowledge and skills associated with built heritage.
Secondly, the key role played by traditional knowledge and skills in terms of innovation and community resilience makes intangible conservation relevant for local economies.
Thirdly, documentation of intangible variables would ensure the preservation of cultural diversity and local identity. Both these aspects are fundamental to the definition of any promotion and enhancement initiative.
In line with these issues, the documentation of intangible cultural heritage can support its safeguard, allowing the transfer of knowledge, skills, and meanings.
Furthermore, documentation plays a crucial role in any safeguarding measure. Indeed, the recording of diverse contexts and varied circumstances, featuring intangible elements, is necessary for the interpretation, transmission, and continuous evolution of intangible cultural heritage. This concept is underlined by the UNESCO Convention for the Safeguard of the Intangible Cultural Heritage of 2003 that *"includes, in its definition of intangible cultural heritage, the instruments, objects, artifacts and cultural spaces associated with it"*(UNESCO, n.d.-a).
The same document reflects also on the reasons why, and for whom, it is necessary to conserve Intangible Cultural Heritage. Considering the living character of intangible heritage, which is naturally doomed to disappear (UNESCO, n.d.-a). It is possible to agree that certain intangible aspects can, along the time, no longer be considered relevant or meaningful for a community. In this regard, the UNESCO Convention stresses the role of the community in the identification and 'recognition' (UNESCO, n.d.-a) of intangible elements.
Therefore, the identification and recognition of significant craftsmanship and traditional intangible knowledge associated with historical structures should be developed involving both experts and local communities. The contribution of specialists is particularly relevant because relying on the consent of the local community only would not be enough for safeguarding the set of technical knowledge - related to structures, material choices, and combination, the design of the functional spaces, energy design or systems and decorative apparatus - embedded in historical structures.

2. On-field experiences: the case of Casa Cristo in Guadalajara, Mexico, the Shaikh Isa bin Ali house and the Siyadi majlis in Muharraq, Bahrain

The considerations reported above derive in part also from on-field documentation experiences in which the main author had the opportunity to be exposed within his Ph.D. studies.
These included the conservation of the Casa Cristo in Guadalajara, Mexico and of the Shaikh Isa bin Ali house and the Siyadi majlis in Muharraq, Bahrain.
These three sites, different in dimension, shape, function, architectural typology, design as well as historic, geographic, socio-economic and cultural context, have been particularly relevant for the development of the theoretical assumptions of this contribution.
These sites presented heterogeneous technical aspects and social values that oriented the documentation workflows.
In these cases, historical and socio-cultural values influenced and oriented the aims and goals of the documentation.
The first case consists in the Casa Cristo in Guadalajara, Mexico. The documentation of the house, declared National Historic Heritage Site (Patrimonio Artístico de la Nación), in 2004, by the Consejo Nacional para la Cultura y las Artes and the Instituto Nacional de Bellas Artes, was oriented by its significance and its embedded values.
The house built in 1927 for Gustavo R. Cristo, mayor of the city of Guadalajara, was commissioned to the renewed architect Luis Barragán (Mezzino, Santana Quintero, Pei, & Reyes Rodriguez, 2015).
The design and building features of the house are known as Escuela Tapatía, which became a signature characteristic of architects like Luis Barragán, Rafael Urzúa and Pedro Castellanos (Del Arenal Pérez, 2010). This style reflects the substantial influences of Barragán's trip to Spain, particularly the architecture of Granada and Córdoba. Indeed, it is possible to notice these influences in the Moresco style of Casa Cristo, such as the Moorish tower, the entry porch featured by parabolic arches, the silver-gilded door, the textured plaster finishes, the stained glass windows (made from colored blown-glass bottle bases) and the unusual geometry of the back patio.



Fig. 1: Casa Cristo by Luis Barragán in calle de Pedro Moreno, Guadalajra, Mexico. Image source: Davide Mezzino

Therefore, the documentation took into consideration these aspects also focusing on the connection between Barragán's architecture and the local craftsmanship. Such connotation can easily be observed in many elements, such as the stained glass windows (made in the neighboring town of Tonalá), the tiles, the mosaics, the zarpeado texture, the adobe walls, and the cedar wood carpentries.
All of these features connote Casa Cristo as a regional architecture. Nevertheless, it has been strongly influenced also by the Jardins enchantès and Les Colombiéres by Ferdinand Bac that Barragán had the opportunity to see during his travel in Europe. This influence can be noticed in the planning of the garden and patios, as well as in the detailed design of the house (such as the main entrance door).



Fig. 2: Distinctive features of Casa Christo illustrating social values and craftsmanship associated with the house. Image source: Davide Mezzino.

Other distinctive features of this house consist in the connections with the Arabic architecture, particularly the use of water in the design (that became one of the recurring elements of Barragán's architectural production). Furthermore, the building is also a distinctive expression of the colonial architectural language, as evidenced by the corner lamp and by the extensive use of the ceramic (Del Arenal Pérez, 2010).

The close connection between Barragán's architecture (tangible) and the local craftsmanship (intangible) is demonstrated through architectural details throughout the house, such as handcrafted stained glass windows and ceramic, produced by reputable 'know how' of the nearby villages of Tonalà and Tlaquepaque.
Despite their tangible nature, all the identified elements are representative of important meanings and values to understand Barragán's production as well as his historical-cultural and social context.
This information is derived from direct sources (personal communications with local stakeholders and experts) as well as indirect ones (i.e. archival and historic documents). This allowed the understanding of intangible values and aspects that oriented and guided the documentation of the house to gain a full awareness of the work of Luis Barragán. Therefore, the scope of the study was not limited to the building itself but extended to its territorial context, including the city of Guadalajara and the surrounding villages (Mezzino et al., 2015).
These intangible aspects aimed at documenting the house by broadening its understanding, not only to geometry and shape of the building but also to the values and significance of its architectural components. This would support possible conservation choices and ensure the preservation of the integrity and authenticity of the unique characteristics of this outstanding example of modern heritage (Mezzino et al., 2015).

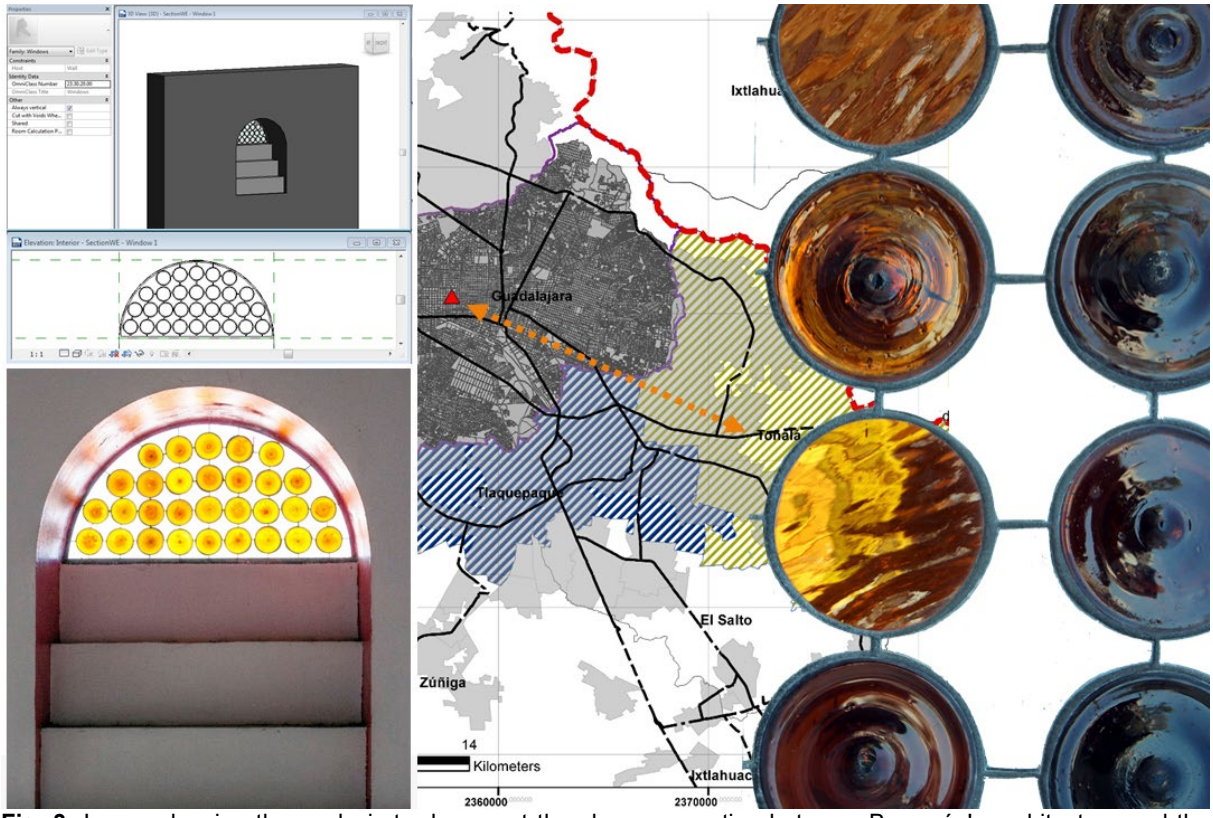

Fig. 3: Image showing the analysis to document the close connection between Barragán's architecture and the local craftsmanship in the surrounding context of Guadalajara. This connection between tangible architectural features and intangible reputable know-how is demonstrated through many building components such as the handcrafted stained-glass windows in the nearby villages of Tonalà and Tlaquepaque. Image source: Davide Mezzino.

Another example is the documentation of the Siyadi majlis and the Shaikh Isa bin Ali house in Muharraq, Bahrain.
These two buildings are connected from the historic point of view since the Siyadi family arrived in Bahrain from Qatar with the Al Khalifa family (the current Bahrain royal family). This also explains the location of the Siyadi majlis, placed very close to the rulers' house - Shaikh Isa bin Ali house (Kingdom of Bahrain Ministry of Culture & Information, 2012)[2].
Both families established their wealth dealing with the pearls commerce. Evidence of this wealth are the huge and articulated residences that they built in Muharraq. These historic houses are a significant and unique tangible evidence of the intangible socio-economic and cultural context associated with the pearling economy.

The Siyadi majlis, built in the XIX century, is a second-family house mainly used to receive and entertain guests. It is part of an architectural complex including other two buildings (the Siyadi house and the Siyadi Mosque) built for the Siyadi family, one of the leading pearl merchants families in Bahrain (Kingdom of Bahrain Ministry of Culture & Information, 2012).
The Shaikh Isa bin Ali house dates back to the early XIX century and has been the residence of the Bahrain ruler from 1869 to 1932 (Kingdom of Bahrain Ministry of Culture & Information, 2012). After that, it was passed down to the Al-Khalifa family and was finally abandoned in 1973 because the dwellers moved to another city, Riffa[3].
The documentation of these buildings to support informed conservation and maintenance actions, as well as the dissemination of their values, included also the identification of the character-defining elements of the buildings employing digital techniques, historical analysis as well as interviews with the main local stakeholders.

[2]The buildings are located in the Sh. Abdallah neighbourhood, in Muharraq urban area in Bahrain.
[3] Even if in the late '70s due to its advanced state of decay it was going to be demolished (1976) to build a public square, the director for museum and archaeology, Shaikha Haya bint Ali Al-Khalifa, at that time under the ministry of education, decided to take the property of the building to later conserve it. The project included several conservation stages. Currently, the Bahrain Authority for Culture and Antiquities (BACA) is taking care of its conservation and maintenance.



Fig. 4: Example of character defining element analysis. Carpentry floral mirror decorations in the Siyadi Majlis, Mashrabiya and decorated roof illustrating the wealth of the Siyadi family (some of the woodwork was imported from Shriraz, Iran (Kingdom of Bahrain Ministry of Culture & Information, 2012). Image source: Davide Mezzino.



Fig. 5: Character defining elements and adaptive architectural building solutions and materials employed in the Siyadi Majlis, Muharaq, Bahrain. Mashrabiya in one of the Maijlis towers to provide indirect sunlight and assure natural ventilation. Traditional floor made of intertwined palms branches and leafs locally available. Image source: Davide Mezzino.

In both cases, particular attention in the documentation was given to the decorative apparatus (such as plaster decorative panels, refined timber paneled shutters, or decorated external timber screens), spatial design and materials employed (i.e. the mangrove beams or the bamboo grids used for the ceilings), innovative building solutions adopted to adapt these structures to the local hot climate (such as ventilation strategies through wind tower, ventilation systems such as the badgir, etc.).
The outputs of this documentation aimed not only at recording shape, geometry and color of these tangible assets but also at stressing and understanding the adaptive strategies and constructive solutions adopted as well as the social values of these historic buildings associated with the Pearls cultivation and trade. The Pearling is indeed a key element that shaped Bahrain economy and consequently the development of the built environment associated with this industry.

The historic structures of Muharraq area, in which the Siyadi majlis and the Shaikh Isa bin Ali house are located provide tangible evidence of developments of the island associated with this traditional sea-use and its related economy. The built heritage associated with the pearling economy is also representative of the traditional uses and functions of these buildings and related specific building techniques and design.
These examples are representative of the role of intangible in orienting heritage documentation in terms of what, how, who and when document.

3. The costs of ignorance: the dichotomy between conservation and sustainability

The term conservation was defined in 1998 as *"the action to secure the survival or preservation of objects of acknowledged value for the future"* (British Standards Institution, 1998).
Sustainable development is instead intended as the *"development that meets the needs of the present without compromising the ability of future generations to meet their own needs".*
Nowadays, the word conservation is associated with the concept of 'permanent' while the word sustainability is associated with the concept of 'change'.
In this perspective, the two concepts are seen as opposing one another, whereby policy choices would lean either towards the latter or the former. A more recent trend looks at the interplay between such notions, no longer conceived of as mutually exclusive. If we consider the two terms together, we may conclude that the concept of 'future' links them in a dynamic relationship.
In fact, the future is strictly connected to the past as innovation and development are strictly connected with history and heritage. For instance, in the architectural field, in the centuries architects, engineers, craftsmen, artisan and all the other professionals involved in the construction process, have carried out trials, experiments, reflections, tests and mistakes to reach always the best results in building practice. These results are based on a continuous process of the creative combination of past and present experience and expertise thus transforming building traditions integrating attention to the climate and the local environment, to construction materials, to cultural practice, to the social context and the technological development to *"meet the needs of individuals and groups,"* (Crouch & Johnson, 2001), p. 25.
The World Heritage Convention (1972) did not explicitly mention the concept of sustainable development concept, which was adopted only 15 years later, but in a way, it implicitly referred to it, by outlining the preservation of the balance between people and nature.
In 2002, the Budapest Declaration on World Heritage recommended to *"ensure an appropriate and equitable balance between conservation, sustainability and development, so that World heritage properties can be protected through appropriate activities contributing to the social and economic development and the quality of life of our communities"*. Art. 3c, Budapest Declaration on World Heritage, (UNESCO, 2002).
It is interesting to notice that, in 2005, the Operational Guidelines for the Implementation of the World Heritage Convention (UNESCO, 2016) stated that the *"protection and conservation of the natural and Cultural Heritage are a significant contribution to sustainable development"* (art. 6) and that *"[…] uses that are ecologically and culturally sustainable […](which) do not adversely impact the outstanding universal value, integrity and/or authenticity of the property […] (must be) culturally sustainable"*, (art. 119).
In 2010, the World Heritage Convention on conservation and sustainable development (UNESCO, 2010) defined sustainable development as a careful balance of environmental, social and economic dimensions to meet the needs of current and future generations. The document also underlined the fundamental role of World Heritage in fostering strong communities, supporting the physical and spiritual well-being of their individuals, and promoting mutual understanding and peace. The Convention stresses the importance of sustainable development as a condition for successful conservation.
The relationship between cultural heritage and sustainable development is an issue of growing interest for municipal, regional and national administration. The technical report Cultural Heritage counts for Europe noted that in 2014 the European Council of Ministers defined cultural heritage *"as a strategic resource for a sustainable Europe."* (J. Sanetra-Szeliga, 2015).
Additional evidence of the close relationship between conservation and sustainability can be found in the Agenda 21 for Culture. This document, signed by more than a hundred cities worldwide, promotes culture as the fourth pillar of sustainable development (alongside the other three fundamental dimensions, represented by the environment, the society and the economy, affirmed at the Rio + 20 UN Conference on Sustainable Development in 2012), (Joanna Sanetra-Szeliga, 2016), p.44.
Another demonstration comes from the Hanzhou Declaration: Placing Culture at the Heart of Sustainable Development Policies. This UNESCO declaration stresses the importance of culture as a source of meanings, creativity, and innovation addressing challenges and enabling sustainable development solutions. The Hanzhou Declaration stresses also the role of culture as *"knowledge capital and a sector of activity - to inclusive social, cultural and economic development, harmony, environmental sustainability, peace and security"* (Joanna Sanetra-Szeliga, 2016), p.44.

The relevance of a *"[…] continuing contribution of heritage"* (Matero, 2003), p. viii for a sustainable stewardship of the built environment has also been underlined by many scholars.
Furthermore, scientific studies demonstrated that ancient buildings are more energy-efficient than those ones built after the industrial revolution (Ratti, Raydan, & Steemers, 2003). Several scholars underscored that the recovery of traditional techniques, combined with advanced technologies, could assure sustainable conservation under the energetic, economic, cultural and social aspects (S. Fai, K. Graham, T. Duckworth, N. Wood, R. Attar, 2011). Significant in confirming the consolidated acknowledge of the relationship between conservation and sustainability is the 2001 US/ICOMOS Symposium. The Symposium considered the role of multiple aspects - such as design, technology, economics, mobility, social feasibility, development, etc. - in defining new paradigms for sustainable conservation of built heritage (Matero, 2003). The Symposium consisted of a moment of reflection, identifying that *"Through the lens of sustainability […] (conservation can) provide an alternative to imported solution that do not relate to or grow out of the existing cultural context."* (Matero, 2003), p. viii.
Further evidence of the relevance of the existing built environment for a growth sustainable from the environmental and economic point of view is provided by the United Nation Energy Programme. It estimates that *"[…] the embodied energy of a building is 20 percent (of the total building energy expenditure) if a building is operational for 100 years. […] The shorter service life, the greater the ration of embodied energy to operating energy is."* (Carroon, 2010), p.7.
In line with these general considerations, this paper attempts to identify possible principles aimed at a sustainable conservation questioning the role of intangible aspects associated with built heritage in this process.
The first principle could be the preservation of the established values of the existing building.
Secondly, following the reversibility of the intervention, new additions should be identifiable and harmonious in color, tone, text, and scale with respect to the existing ones. Retrofitting could be appropriate for historical buildings if the improvement of energy efficiency does not affect the authenticity of the building. However, it is always necessary to study the impact of retrofitting measures on conservation at both urban and building scales to improve the energy efficiency of heritage assets without compromising their character and value.
Thirdly, looking at the urban context, it is particularly important to assess the balance between heritage and energy conservation and the social and economic impacts of conservation. It is also important to explore how conservation can regenerate an area and raise its profile.
In line with these principles, Joanna Sanetra-Szeliga claims that the reuse of existing historic buildings and the recovery of traditional building techniques may help achieving 'green goals', while training and education on the quality of historic structures can *"foster creativity and innovation"* (Joanna Sanetra-Szeliga, 2016), p. 44.
These considerations explain the title of this paragraph - The costs of ignorance: the dichotomy between conservation and sustainability. Indeed, the ignorance of the existing built environment and its associated technical, scientific as well as social aspects has evident consequences on the long-term impact of a conservation project.
Already in the XIX century Ruskin noted the possible benefits stemming from heritage conservation. Even if he identified these benefits as mainly associated with the social and cultural sphere, he claimed that the current generation does not have the *"right to deprive future generations of any benefits, because one of the fundamental conditions of man is to rely on the past […]"* (Jokiletho, 2002), p.179.
The social and economic relevance of conservation in the current context has then be noted by many scholars. Johannes Cramer and Stefan Breitling claimed that "*The shrinking of many European cities at the end of the second millennium is a clear sign that the design and construction of new buildings is in steady decline […] between 50% and 70% of all construction work and about half of the entire economic volume of construction now concerns work on existing buildings"* (Cramer & Breitling, 2007), p. 9.
Conservation of built structures is becoming increasingly important also in its connection with the sustainability challenge. Society is becoming more aware of ecological issues, foreseeing in the conservation and preservation of existing structures a possible solution to avoid the destruction of resources, for instance, due to the thoughtless demolition of old buildings, a waste in both ecological terms and socio-economic values.
Furthermore, the economic consequences of conservation and maintenance of existing structures should also be considered in a long-term planning perspective. Indeed, as noted by Cramer and Breitling, *"The conservation and maintenance of existing values, the possibilities for conversion, further and interim use and finally the environmentally sound disposal of the building substance are key aspects that can become important economic factors. A building can be understood as a non-recurring investment, whose value can be continually increased through appropriate maintenance and clever development"* (Cramer & Breitling, 2007), p. 200.
Nevertheless, the sustainability of the conservation and reuse of built structures should be considered also under other aspects. One of them includes its social dimension. Built structures do not represent only an economic asset but also a whole set of knowledge and skills (in terms of technical and artistic

competencies). This fact is relevant not only to guide maintenance and future conservation projects but also as a starting point to seek environmentally sustainable solutions for new constructions, starting from the study of the existing ones.

4. Conclusions

The relationships among the different dimensions of sustainability and built heritage conservation should be considered within the dynamic interplay between innovation and development.
The connection between invention and conservation can be found in the semantics of the term itself. Indeed, the word 'invention' derives from the latin verb *invenire* that means 'to find' (Dezzi Bardeschi & Gioeni, 2004). Therefore, we can assume that this finding process is based on a research activity that, in the architectural field, can be associated with the study of existing built structures.
Marco Dezzi Bardeschi wrote about the relationship between conservation and innovation underlining that, despite their differences, the two concepts integrate themselves in a continuum, linking the conservation of existing built structures to their promotion and continued use. On this issue, Rosa Anna Genovese stresses that the final aim of conservation is development (Dezzi Bardeschi & Gioeni, 2004) since effective and successful conservation projects are aimed at hosting living functions. This 'living component' can ensure the continuation of a building function and consequently its maintenance, justifying the meaning of any conservation action.

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WORLD HERITAGE and DESIGN for HEALTH
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ECONOMY|TERRITORIAL GOVERNANCE|ARCHEOLOGY|SURVEY|HERITAGE|e-LEARNING
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Landscape and cultural heritage as wellbeing builders. New vision and resemanticizing processes for Precacore

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Abstract
The paper focuses on the implications and relationships between the preservation of cultural heritage and the improvement of individual's lives and the environment through the description of a case study on a experimentation, in a municipality of the metropolitan city of Reggio Calabria.
In recent years, literature on urban features and living conditions of cities related to health and well-being, has shown growing attention to the implications that the cultural dimension has or can have in these processes. The attention concerns the cultural expression understood as a set of environmental and social features, that is, a set of characteristics associated with a specific place, urban or territorial, of human and social development. Today, the relationship between culture and health, obtains an important role. Indeed, a considerable interest growth in sector studies, which unequivocally demonstrate how the smart use of free time is associated to an extension of life expectancy and a reduction of some pathologies. The project presented pursues both aims of safeguarding and enhancing the heritage values of the landscape and supporting the construction of new visions and interpretations by local populations and more generally by all users of this place.

Keywords: Strategies, Cultural Heritage, Urban Health

1. Introduction
It is now a current consideration that the conservation of cultural heritage does not only concern the conservation of material things, but also the safeguarding and sharing of heritage for the improvement of people's lives and the environment. This implies a more responsible view of the heritage itself as a tool for positive change. This type of approach reflects a broader movement that promotes sustainability and well-being, and when applied to heritage, requires decision-making processes that respect what is meaningful to people and their community. This paradigm shift underlines the need for people-oriented approaches to heritage conservation policies, which have often only been assessed in terms of economic profits (e.g. only from a tourism perspective), rather than external-market factors which can have a much more important impact on societies, such as social cohesion or well-being. The problems generated by the relationship between health and urban context and even more with contexts of value and heritage, oblige to provide answers that must take into account the peculiarities and characteristics of the particular object in question (the natural and / or cultural heritage), in a theoretical framework, in which it is necessary to borrow knowledge and tools from several disciplines. Furthermore, the need to enhance individual interventions is primary, with a view to sharing approaches and practices, borrowed not only from existing experiences, but also from the comparison with the communities concerned.

2. Creativity and well-being for the enhancement of cultural heritage
The current use of the terms healthy city and urban health highlights the growing interest in planning innovative policies aimed at protecting and improving health. With them we refer to a strategic orientation that integrates health protection and promotion actions in the planning of the city, favoring conscious and sustainable processes of urban regeneration [1]. The concept of health from which they are inspired refers to its broad meaning, understood not only as the absence of medical pathologies, but also concerning the psychological aspects, natural, environmental, climatic and housing conditions, working,

economic, social and cultural life. of the individual. With this, we aspire to a city that is aware of the importance of health as a collective good and that, therefore, implements policies, planning paths and processes aimed at protecting and improving it[1.]

Attention to the promotion and protection of health consolidates the interest in territorial and social components that promote well-being: from the environment in which you live, to food, to work. The concept of well-being associated with health[2] includes basic physical needs such as the quality of the places in which one lives, nutrition, physical state and the absence of discomfort, including social ones. Well-being understood in this way, therefore, concerns individuals and the creation of a favorable environment that can support physical, mental, emotional, social, cultural, spiritual and economic needs, in order to reach ideal levels of human potential.

In recent years, the literature concerning studies on well-being and health referring to urban characteristics and living conditions of cities [2], have shown a growing attention to the implications that the cultural dimension has or can have in these processes. In particular, the attention placed here concerns the term culture understood as a given set of environmental and social traits, that is a set of characteristics that are associated with a specific place of human and social development, both urban or territorial. The relationship between culture, understood in this way, and health assumes an important role today, which has seen a notable increase in interest, even in sector studies [3]. These studies have unequivocally demonstrated how the smart use of free time is associated with an extension of life expectancy and a reduction in some diseases.

The culture / cultural activity that is generally considered entertainment, therefore referred to the superfluous, today takes on an important value, proving to be an important tool capable of preventing cognitive decline, mitigating stressful conditions and helping general well-being.

In addition, something innovative is added to the framework relating to the implications of socio-cultural and environmental traits on well-being, namely the role of culture in the spheres of individual well-being, namely the importance of cultural participation for well-being psychological. This broadens the scope of policy strategies for well-being and health. Indeed, urban policies focused on art and culture could foster emotional effects such as commitment and social enrichment whose impact on subjective well-being can be substantial. This concerns the ability to forge well-being by improving collective processes of attribution of meaning and promoting new forms of sociality [4]. In the dynamics that lead to the perception of a state of positive well-being, the possibility of having fertile social relations and of making experiences that lead to the structuring of such opportunities, occupies a role of primary importance. The main stimulus for the structuring of these opportunities is, in fact, the culture which, if properly used / exploited, is able to improve not only the conditions linked to the perceived well-being of individuals, but also to create conditions and shared social behaviors that affect the cultural and social development of the population [5]. Understanding the role that active cultural participation can play as a prevention factor for different types of disorders (physical and psychological) in certain categories of the population, means having clear ideas on how articulate the concept of culture in urban and territorial policies, integrating it into the wider dimension of health promotion.

3. Culture in health promotion policies

The effectiveness of cultural and creative activities as a factor in promoting individual well-being and social cohesion, for fostering the access and development of social, individual and local community capital is sanctioned by the World Health Organization in a study published in end of 2019[3]. The idea that culture is the fourth pillar of sustainable development has emerged since 2010 during the world summit of local and regional leaders[4], in which the world organization United Cities and Local Governments (UCLG) draws up and makes all cities and governments that are members of the declaration Culture: Fourth Pillar of Sustainable Development, the final document for the implementation of the 2004 Culture Agenda 21. The latter was the first document promoted by the UCLG Committee worldwide to set the principles and local government commitments for sustainable cultural development. It promotes the integration of the cultural dimension into development policies and recognizes the three-pillar[5] model is no longer sufficient to describe the complexity of global societies.

In 2015, the United Nations General Assembly adopted Transforming Our World: the 2030 Agenda for Sustainable Development, the first agenda drawn up to concretely pursue global sustainable development. Based on those goals and the proposed goals of the Millennium Development Goals (MDGs) (the global agenda pursued from 2000 to 2015) the New Agenda 2030 includes 17 Sustainable Development Goals (SDGs) and 169 specific goals and, although none of the 17 SDG focus exclusively on culture, it includes for the first time several clear references to culturally based aspects of development.

Cultural heritage is explicitly mentioned in the 2030 Agenda in Goal 11, referring to the need to make cities and human settlements "inclusive, safe, resilient and sustainable". In this perspective, heritage can provide interesting opportunities to create new meeting spaces, community hubs, places of social integration and inclusion, which are the basis of identity processes linked to local development.

Obviously, this document is not exhaustive for the issues that the topic deserves, but it is nonetheless a useful tool in progress, which establishes a change in the consideration of the cultural foundations of communities, as fundamental elements of sustainable development. Culture in general, but more specifically cultural heritage, which is considered here in its broadest sense as a testimony of common and shared growth, is recognized as a vehicle for new practices of civil growth and a vector of positive externalities through its effects.
In the health-promoting perspective [6] which instead of researching what makes us feel bad to help us avoid it, investigates what makes us feel good, to encourage us to research and acquire it, many of the assets deemed effective for health and well-being have their origins. in the cultural and artistic activities of individuals and communities. The problems that emerge from the relationship between urbanization and the increase in chronic diseases have suggested doctors, architects and urban planners to focus their attention on the concept of a healthy orientation of urban environments, both residential and infrastructural.
Through regulatory and structural interventions within the urban context, it is intended not only to reduce or eliminate risk factors and protect health, but also to promote and encourage healthy lifestyles. The projects are aimed at creating pleasant environments, usable for walking or cycling, for physical activity, with an increase in green areas and with beneficial effects on both the environment and the health of citizens [7].
Therefore, a "salutogenic approach" to the phenomenon of urbanization and chronic diseases, through the Healthy City Design differs from generic integrated health plans. It is an urban planning and design approach which involves architects, doctors, citizens and, consequently, public and private decision makers and investors. The fundamental infrastructural and urban planning choices in current urban areas and in relation to their future development are evaluated and selected based on their impact on health and the environment.

4. Processes and paths to enhance the territory and local culture

The context is the municipality of Samo, located in the metropolitan city of Reggio Calabria. The place has cultural, environmental and historical resources and attractions, which are, but can become even more, elements of territorial competitiveness not only on a local scale. Also, we can find extraordinary characteristics and territorial values of the landscape context of the Aspromonte National Park and the coasts of the Ionian side of Calabria: rivers, towers, castles and all the historical-identity residences, guardians of the roots of the places. A place characterized by the strong integration and complementarity between sea and mountains, with one of the most evocative and richest heritage of the region, with an attraction potential certainly at international level.
Much of the territory of the municipality is located within the protection areas of the Aspromonte National Park Authority, within which is located also the abandoned village of Precacore. It is on a peak bounded on one side by the shore of the Santa Caterina valley and on the other side by the river La Verde. Precacore has medieval origins and was built when for defensive reasons, the city of Samo, of evident Magna Graecia origins (on whose location in coastal area and / or plain there are no traces) was moved to more suitable sites for the particular historical moment. The village was almost definitively destroyed by the 1908 earthquake (the one that destroyed Reggio Calabria and Messina) and following this calamitous event the town was rebuilt in its actual place, taking back its original name in 1911, Samo, located on the opposite flat side and more easily reachable. Today the Precacore's ruins are constantly visible to the eyes of the inhabitants who, with melancholy, dreaming of a world of legendary riches and hidden treasures, await the opportunity to regain their stone memory.
This place, is a testimonial of a peripheral and subordinate culture, belongs to a difficult and troubled historical past, deliberately forgotten, in which the same value of witness has been disregarded and ignored. It does not belong only to the community of Samo, but it can be placed, due to the significant environmental value it connotes, to the close interpenetration with the landscape, to the coherent settlement arrangement, and to the wise adherence between buildings and nature, in the heritage of the whole Calabrian territory. It presents, through its abandoned ruins, notable sites of historical interest.



Fig. 1: Overall view of the landscape in which the abandoned village of Precacore is located.

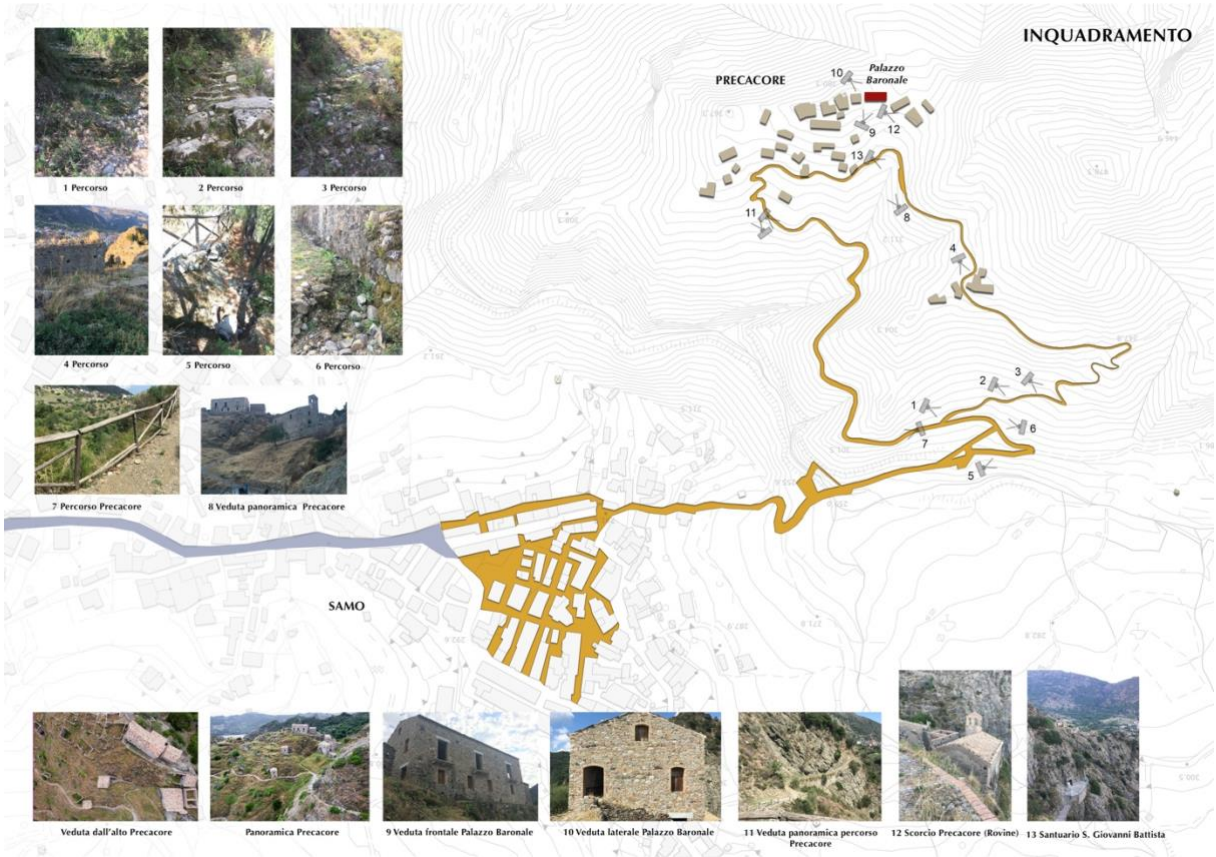

Fig. 2: The relationship between Samo and the ruins of the village of Precacore.

Among these is the Church of San Sebastiano, inside which some seventeenth-century frescoes are preserved. Therefore, Precacore due to its proximity to the modern town of Samo and to its location on the edge of the Aspromonte, has always represented the place from which and in which the essence of that territory rich in history and tradition, emerges far, almost totally uncontaminated but paradoxically with the highest anthropization index in Europe. An ancient anthropic presence, widely present in the territory, and yet respectful of the cycles and rules of nature. It is in these places that twice a year (June 24 and August 20) is perpetuated and takes place the solemn procession in honor of St. John the Baptist, saint patron of Samo. The event carry out along the devotional path San Gianni della Rocca (main path that connects Samo ruins of Precacore).

Furthermore, Samo is the first municipality in Calabria to have joined the "Healthy Cities" network recognized by the World Health Organization. This shows the willingness of the Administration to promote health at the heart of its policies. Being part of the Network means improving the health of the city by looking beyond the borders through the support of an existing network.

Therefore, these places must be understood as new competitive places, which on the one hand orient forms of safeguarding the historical identity and individual specificities, and on the other place the accent on new ways of involvement, activating processes capable of preserving the small communities and project them into the future.

The innovative component is in step with the trends of this design vision that concerns well-being and health, and it is related to a need to adapt to new needs and therefore, in this specific case, to a change in the concept of recovery and enhancement related to the notion of use, function and quality of space and places.

The experience concerns the design of the "San Gianni della Rocca path", an access path to the ruins of the village of Precacore (the stone memory, the identity place to which the inhabitants of Samo and surroundings are very attached). It is conceived as a sort of territorial Landmark, a sign that underlines the identity of the place through innovative ideas of fruition and use. The project of the path represents the common thread around which to think and activate the processes of expanding the usability, which takes into consideration new and / or renewed needs.

We move from a predominantly physical and motor accessibility concept, to one that also focuses on sensory and cognitive abilities through a multisensory design that takes into account the sense of smell, touch and hearing, enriching the experience of all users who come in this place, combining culture with health and knowledge.

The challenge that the project wants to take up is to transform a not very vital village (Samo), with ongoing depopulation phenomena, into a "laboratory of experiential design and cultural innovation",



Fig. 3: View of the devotional path inside the ruins of the village of Precacore.

through the dissemination of an advanced culture, which integrates forms and usual processes of enhancement with healthy design projects capable of correlating the conservation of cultural heritage, understood not only as the conservation of material things, but also as the safeguarding and sharing of heritage for the improvement of people's lives and the environment.

5. The devotional San Gianni della rocca Path in Precacore, a path of health and newfound identity

The experience[6] presented arises from the desire to experiment and deepen the determinants of health in a particular landscape-cultural context, the ancient village of Precacore. Here the problems are not related to the quality of the air, the environment, healthy food and mobility, but rather the possibility of combining Urban Health strategies with the abandonment of a identity place, in the perspective that it can become a particularly suggestive path to health, which leverages these particular conditions to help improve lifestyles and the state of health of citizens. The creation of this path, set in an extraordinary public natural-landscape environment, pursues interesting purposes that represent a strong determinant for health and well-being, because it can stimulate the level of physical activity and the number of social interactions of individuals, enhancing the quality of time.

The project also aims to highlight the centrality of sustainability and integrated sustainable development within the processes of enhancing heritage, enhancing the optimization the hidden potential it possesses. This latent value is capable of triggering virtuous circles that impact on the quality of life of citizens, on the ability to involve and mobilize local communities, on the opportunities of the creative culture sector, on the job opportunities and the managerial and organizational skills of the public and private subjects involved in the process.

The integration of urban policies and enhancement processes is strategic since the promotion of well-being requires interventions capable of involving and mobilizing different resources, seeking the integration of social policies with health policies, but also with environmental and urban planning policies, housing, training employment and cultural, in a vision of health in which the living conditions and well-being of citizens are the result of the action of an entire society.

The final purpose of this initiative is the will / ability to identify and design ideas capable of enhancing the uniqueness of the ancient village of Precacore, through the activation of territorial networks,



Fig. 4: Project Concept. Significant paths and spaces.

investments, intelligence and skills, which create new and lasting job opportunities. The activation of these processes launches a new phase for the future of the ancient village of Precacore founded on networks of economic and social cohesion that develops and spread's ability to be a community starting from people, their needs, the desire to undertake, from work, from their social and family relationships.
The project aims to promote the use of the ancient village of Precacore through the existing path that from the main square of Samo passing by the fountain of the Rocca arrives at the Chianu di Santa Maria a Precacore. The project, in addition to the protection and enhancement of places, aims to create a path for health with many spaces designed to encourage correct and virtuous lifestyles for maintaining and improve good health conditions, and, which allow you to practice motorcycles daily in a particularly suggestive environment.
Among the objectives, the priority is to stimulate citizens, especially the most sedentary, to practice physical activity on the way, as a useful tool for the prevention of numerous diseases. In fact, it is proven that chronic degenerative diseases can be prevented with constant physical activity in opposition with a sedentary lifestyle. But the importance of this design experimentation goes far beyond the pure health and environmental aspect. Walking in this place, that is an integral part of the memory and identity of the territory, as well as enhancing the meeting and exchange between people that promote very important social connectivity in a place where there is a high percentage of the population elderly, it also becomes a way to contrast to the physical abandonment of the places themselves and the relative degradation that follows.
The path is a very interesting relationship space, close to the places of residence in a particularly suggestive and uncontaminated environment. Moreover, it is a historical-devotional path to which the inhabitants of Samo and the neighboring countries are very fond. The combination of these naturalistic, historical-cultural and identity peculiarities concentrated in a single place, represent strengths and qualities that can be enhanced not only through conservation processes, but also through Healthy City Design processes and projects. Creative and / or cultural activities impact on mental well-being, motivation to live and build favorable environments for mutual help by stimulating healthy behaviors. The well-being of the elderly and not only could increase both for the socialization promoted and for the cognitive stimulation activated, but also for the rediscovered belonging to a community and cultural identity. In this context there are precisely those attractive visions that positively influence people's feelings, stimulating the practice of physical activities and relieving stress, factors that foster an active

life.

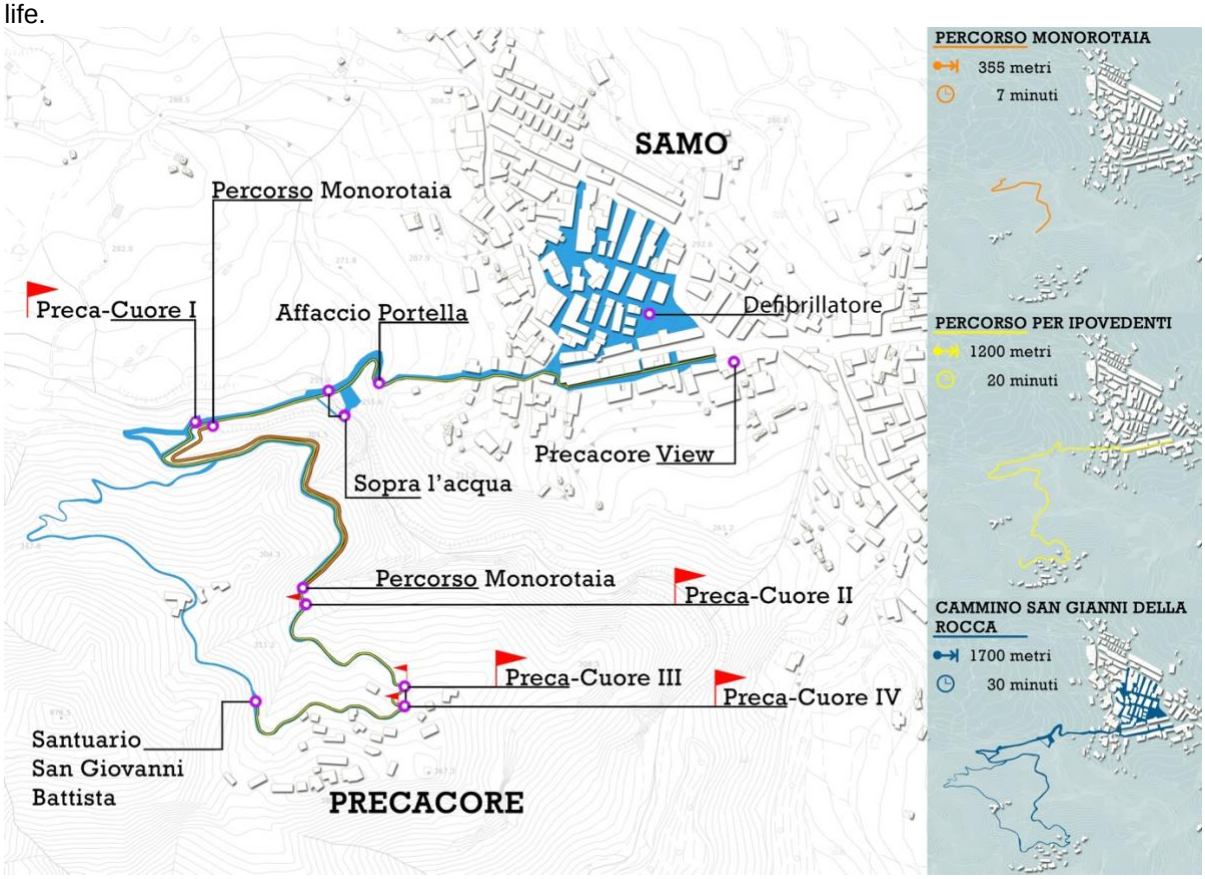

Fig. 5: Project Concept. Details of the paths, stops and equipped stations.

The project of this path, set in an extraordinary natural-landscape environment, pursues interesting purposes that represent a strong determinant for public health and well-being since it can stimulate the level of physical activity and the number of social interactions of individuals, enhancing the quality of time, in the perspective that it can become a particularly suggestive path to health, which leverages these conditions to help improve the lifestyles and health of the users.
The Health path is structured into:
• a path for the visually impaired with horizontal and vertical signs.
• a dynamic cardio fitness course.
Therefore, it is an itinerary of physical activities, a health gym for the practice of free body exercises or accompanied by adequate equipment.
Along the way there are 8 stations (Affaccio portella, Sopra l'acqua, Preca-Cuore I, II, III, IV, Teatro del Tempo, Santuario). Every station is equipped with seats, shaded areas and equipment suitable for the planned activities indicated by explanatory signs that illustrate the use of the tool and suggest the right movements to perform for bodyweight exercises.
To further facilitate the use of the path, in collaboration with fitness experts and doctors a program of use has been developed. It is aimed at the two main types of users of the path: those who perform it for leisure and / or to stay active even in presence of pathologies, and those who perform it in a more professional way as preparation for competitive activity.
Each sign is accompanied by instructions for all categories of users. The different stages allow you to face every physical activity need in a gentle and open-air way. The path is programmable for any user, and it is also designed to be inserted in a particular context. The design is sensitive from an environmental and landscape point of view, using interventions with low environmental impact, sustainable and with the use of materials with natural characteristics are best suited to the naturalness of the place.
This project with the objectives set out above (use and enhancement of the landscape, enhancement and health policies) is an indispensable step for the very existence of this place, for its conservation and its continuous evolution. The project, in line with the objectives, pursues aims both to safeguard and enhance the heritage values of the landscape, and to support the construction of new visions and interpretations by local populations and more generally by all users. In this sense, favoring access in order to guarantee the right to enjoy it and allow a continuous re-semantization by the users of this

identity place, overcoming the standardized visions and descriptions that often imprison entire landscapes, can become an interesting and innovative design key.

Notes

[1] Health in cities: common good is a proposal for a parliamentary initiative at European level. Italian Health Policy Brief Year VI, Special 2016.
[2] Health understood, that is, as a "state of complete physical, mental and social well-being and not simply the absence of disease", or as defined in the Principles of the Constitution of the World Health Organization in 1946.
[3]The reference is to the first scoping review of the WHO, the largest research ever carried out on this topic, available in the Health Evidence Network Report 67. This is one of the results of the project "Cultural Contexts for Health and Wellbeing" (Cultural Contexts of Health and Wellness - CCH) of the WHO Regional Office for Europe. The document summarizes the findings of over 3,000 revised studies that show an important influence of art in the prevention and promotion of health and in the management and treatment of diseases throughout the course of life.
[4]3rd UCLG World Congress, held in Mexico City.
[5]This statement expands the definition developed in the 1980s on the basis of three dimensions or pillars: economic growth, social inclusion and environmental balance, which seem to no longer reflect all the dimensions of our global societies and propose the addition of the dimension of culture to the policies aimed at sustainable development.
[6] The project presented was developed as part of the Action and Cohesion Program complementary to the Culture and Development PON (FESR) 2014-2020 Culture and Tourism Operational Plan (FSC) 2014-2020 - Public notice relating to the selection of interventions aimed at the requalification and tourist-cultural enhancement of the municipalities of the regions: Basilicata, Calabria, Campania, Puglia and Sicily.

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The design activity of Orazio Torriani in the Lazio possessions of the Orsini family

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Abstract
During the first decades of the seventeenth century, Orazio Torriani (1578-1657) worked as architect for Paolo Giordano II Orsini (1591-1656), Duke of Bracciano.
From the studies already done on the Municipal Palace of Bracciano (1630-1641), the essay for the first time performs a close examination of Torriani's design activity in the Orsini family's Lazio possessions. A critical reading of rich and unpublished archival documentation consisting of many *Misure e stime* signed by the artist, has yielded new information on him as a professional figure. It has been ascertained that the relationship the architect established with certain members of the Orsini family was on a continuing basis in Rome, but above all in the territory of Bracciano. The bond between Torriani and his patron may be seen in his interventions in numerous buildings of varying degrees of architectural importance, and in the urban nuclei that during the seventeenth century formed the Duchy's property holdings. Torriani turned out to be a 'modern' professional capable of working in the most diverse fields of building and able to solve construction and structural problems simultaneously with organizational and management issues in the Orsini family's properties.

Keywords: Orazio Torriani, design actvity, Orsini family, Lazio possession

1. Introduction
During the first half of the seventeenth century, Orazio Torriani (1578-1657) was the architect of Paolo Giordano II Orsini (1591-1656), third Duke of Bracciano, his native city.
The territory of Bracciano followed the outline of the lake by the same name north to Trevinano, east to Anguillara, and south to include the village of Castel Giuliano, and incorporated the Roman-era settlements of Vicarello and *Forum Clodii* on the San Libertato hill. In 1560, under the rule of Paolo Giordano Orsini, Bracciano was promoted to a dukedom, and its domains extended all the way to the towns of Campagnano, Aguillara, Galeria, Monterano, Catalupo, San Gregorio, Saracinesco, and Trevignano [1].
Starting in 1615, when he became lord of a vast fiefdom, his grandson Paolo Giordano II sponsored a series of building initiatives, constructed the aqueduct, and reorganized the Porto di Palo harbour, using the economic proceeds from the ironworks, from paper and wool processing, and from silk production [2]. Part of the design and maintenance of the rich architectural heritage may be credited to Torriani's professional activity.
Relations between Orazio Torriani and his Orsini patrons have been studied in relation to the artist's design efforts for the properties in Rome [3]. Only recently has the role the architect played in building Bracciano's Municipal Palace (1630-1641) been defined [4]. On the other hand, many uncertainties remain as to the attribution to Torriani of the drawings for the church and monastery of the Visitation (1631) and the Collegiate Church of Santo Stefano (1638-1652) in the Lazio village, in spite of some research on the subject [5].
Therefore, to the current state of knowledge, there is no study that, based on detailed archival analysis, chronologically reconstructs and typologically classifies Orazio Torriani's interventions in the Orsini Duchy. The objective is to determine Torriani's contribution to the economic development and

building programme implemented by the duke in the Bracciano estates. These were architectural and structural works, as well as finishing jobs on existing bodies and on lesser specialized buildings (cottages, taverns, bakeries, granaries, haylofts, stables, ironworks, powder magazines, and so on); hydraulic works (grindstones, ducts, and pipes) and engineering (bridges and roads), and territorial-scale interventions (vineyards and gardens), in the area surrounding Bracciano.
The unpublished documents that were consulted, contained in the Orsini holding at Archivio Storico Capitolino di Roma, also yielded a great deal of information on work site practice and on the procedure for processing and laying the materials. All the information on this 'minor' architecture in the Lazio area bears witness to Torriani's professional skill in a variety of construction environments and allows his role as architect during the first decades of the seventeenth century to be better defined.



Fig. 1: Bracciano's Municipal Palace (1630-1641).

2. The activity of Orazio Torriani for Duke Paolo Giordano II Orsini in the fiefdom of Bracciano

In the document collections referring to the Orsini family, Orazio Torriani signs as «Architetto dell'Ill[ustrissi]mo et Ecc[ellentissi]mo sig[no]r Duca di Bracciano», in a great many writings such as *Misura et Stima di più lavori* (Measurement and Estimate of several works), *Misura e Conto della spesa* (Measurement and Accounting of the expense), *Lista delli lavori* (List of works), *Conto di Lavori* (Account of Works), *Sommario di tutti li lavori fatti* (Summary of all the works performed), and a number of appraisals from 1624 to 1656.
Torriani therefore played the role of the professional at the service of the Orsini, who managed the maintenance and interventions on the Bracciano estates, following the family tradition. In fact, his father Francesco De Gnocchis was already active for Paolo Giordano Orsini (1541-1585), first Duke of Bracciano [6]. However, it is nearly certain that Orazio Torriani oversaw from a distance several work sites in the many places and did the accounts of the works performed with the supervision of the «Fattore Generale» (General Farmer) hired by the Duke, since during that same period he was engaged in a number of buildings, and not only in the Capital [7]. The only reliable information on the architect's presence in the Lazio village is confirmed by a payment of 7.40 scudi on 6 March 1630, to come to Bracciano and return to Rome in order to deliver to the workers the drawings and the cost assessment for the completion of the Municipal Palace, begun in 1619 [8].
The examined archival material is quite heterogeneous and lacks graphic elements. The individual lists report the working operations, the names of the workers involved, the indication of the quantities, and the prices of several architecture works at the same time, of differing type and interest, and situated in far-flung localities in the Ducal State of Bracciano. Therefore, to be able to identify Torriani's design contribution over time, the manuscript holdings were analyzed chronologically. Similar interventions, moreover, were placed in relation to one another in order to have a more complete vision of how the artist worked.
Between 1624 and 1629, Torriani signed a series of works done in a small palazzo and in the Bracciano tavern; in an inn at La Storta and in the Palo fortress [9]; in the apartment of Cardinal Alessandro Orsini in the attic of the Bracciano castle [10], and in other, not clearly identifiable parts of the fortress [11].
From the study of the documentation, the completed works may be defined as 'renovation' or as 'ordinary maintenance': limited demolitions, the construction, rebuilding, and repair of walls in

elevation and of partitions (in stone and brick); the opening and plugging of door and window spaces; the building of chimneys; brickwork and flooring; plastering of masonry surfaces, and carpentry works. Only in the lodgings of Cardinal Orsini do we learn of actions of a structural nature, such as the building of foundations and of the bearing framework of a spiral staircase, brick arches, and brick timbrel vaults.

But the archive yields not only information on Torriani's construction activity, but also new data on architectural works outside the Roman area. The *Misura e Stima* of 20 August 1628 lists the masonry operations carried out in Vicarello at the thermal (baths) complex and at Bracciano in the fortress and the garden, in the stables and in the prisons, and for the grindstone, the powder magazine, the tavern, and the ironworks. In the final summary of 6 July 1629, Torriani specifies that most of the works were quantified by Guglielmo Oddi, while he himself was in Sicily on 30 June 1628. He also specifies that he successfully reviewed and verified all the calculations [12]. This reference to his stay in Sicily bears witness to the fact that Torriani made an additional inspection of the work site of the mother church of Piazza Armerina which he was supervising during those years, in addition to the already known inspections of 27 June and 20 October 1627, and of 22 February and 20 March 1628 [13].

Of the many calculations for specialist buildings of modest value like taverns [14], the Orsini collection also yields information on some bridges managed by Torriani in Cerveteri, Campagnano, and Anguillara. During his professional career, however, the architect had already contended with hydraulic works, and in 1621 had designed the aqueduct and the Mostra della Bollica fountain in Rieti.

The *Misura e Conto della spesa* of 8 July 1625 reports that the bridge over the Vaccino trench in Cerveteri was already completed. The structure has a single span resting upon a vault supported by stone piers, with a parapet with stone balusters between the panels and brick lining [15].

For the Masciolo bridge in Campagnano, on the other hand, the work's design path may be reconstructed based also on Torriani's attached drawing.

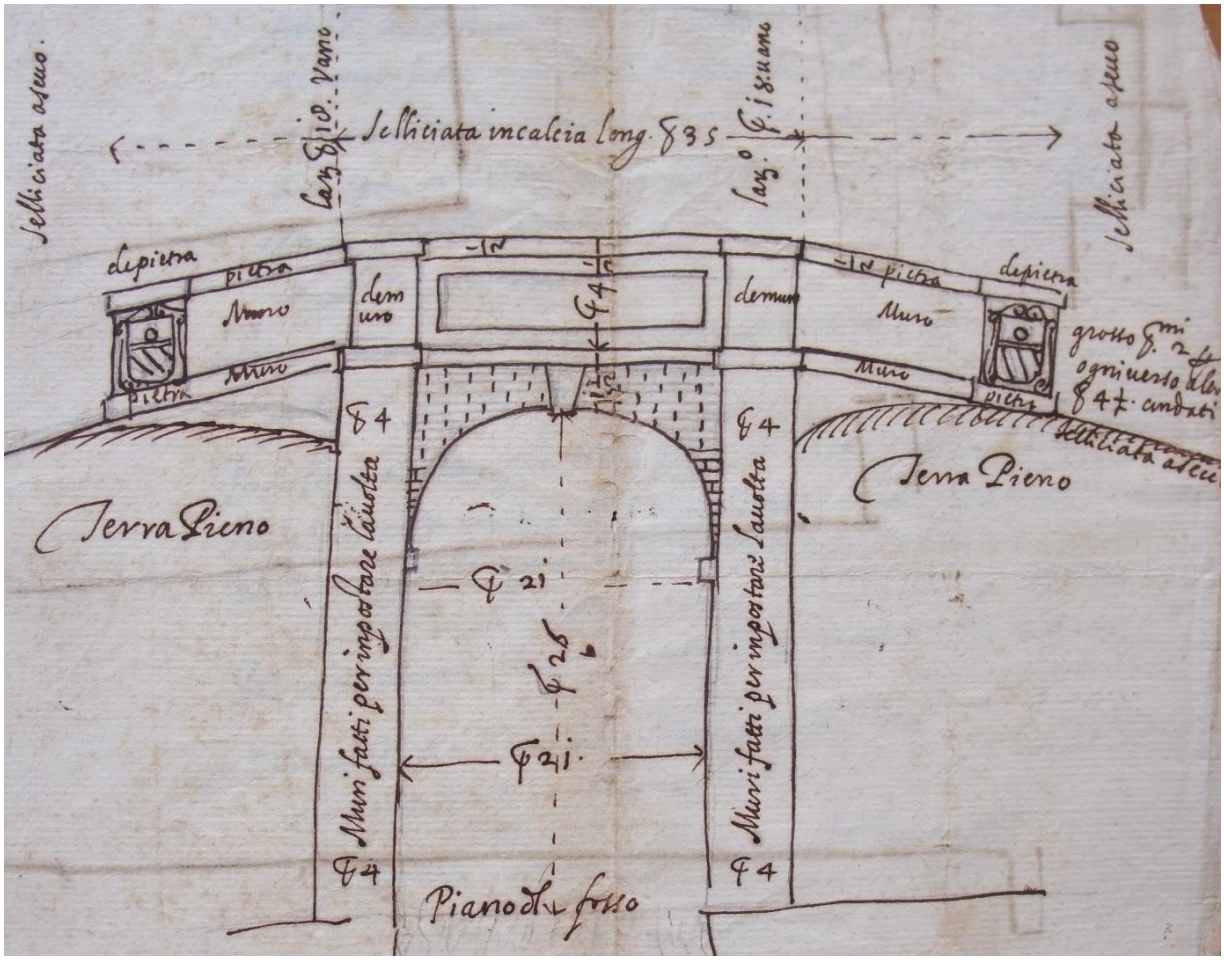

Fig. 2: The Torriani's drawing of the Masciolo bridge in Campagnano (Roma, Archivio Storico Capitolino, *Orsini Serie II,* B. 2395, *Stato di Bracciano. Luoghi Vari,* 1581-1692, 1634-1649, *Misura e stima del ponte Masciolo nel territorio di Campagniano (…),* 20 novembre 1634, f. unico), by permission of Soprintendenza Capitolina ai Beni Culturali – Archivio Storico Capitolino.

On 20 November 1634, an inspection was carried out to verify the conditions of the Bollata ditch in Campagnano, over which the bridge was to be built. Torriani found that the Community had already

erected the two lateral containment walls and the arcade vault and had provided the materials and the duct to be put in place. The architect drew up the design to complete the Masciolo bridge, which is depicted from the lower portion of the ditch to the upper course of the edging, with the specification of the levels, the measurements, and the materials. The bridge has a single span held up by the pre-existing masonry structures four palms thick, upon which the vault is placed, rebuilt in bricks with keystone in stone, corresponding to the straight-line central portion of the channel. The lateral connections, on the other hand, follow the inclined slope of the embankment to overcome the difference in elevation of the terrain, and guarantee easy access to the path 18 palms wide, with pavement ballast and cobblestone. To facilitate the transit of carriages and wayfarers, Torriani also designed the embankment wall at the sides, two palms thick. This resumes the structure's broken profile and is punctuated by four balusters in peperino stone. In alternation with these are the plastered masonry surfaces, with their upper edge and the Orsini coat of arms in stone on the two lateral head pieces [16]. The operations were assigned to Campagnano workers led by the master builder Tullio Quadri, with the commitment to complete the work in five days starting from 25 November [17].

Many lists of works in the Orsini holding indicate the names of artisans who worked at the various sites and were selected from local labour. With the mason Tullio Quadri in particular, Torriani had already initiated a collaboration in the building of the Municipal Palace starting in 1630 [18]. In 1636, he entrusted to the same foreman the supervision of other works in the Bracciano Castle. This circumstance suggests that Torriani used trusted workers for the interventions of greatest responsibility or architectural interest when he was engaged in other activities far from the territory of Bracciano.

On 10 May 1642, Torriani also dealt with quantifying the works for the Crocetta bridge near Anguillara, which was patterned after the two previous examples [19].

A letter from Torriani to Paolo Giordano II Orsini of 20 November 1649 better clarifies the relationship between the duke and the artist in the Lazio village, as relates to certain activities in Rome. In fact, in the text, Torriani declares he worked as «Architetto dell'Ill[ustrissi]mo et Ecc[ellentissi]mo Sig[no]re Duca di Bracciano» on a continuous basis from 1620 to 1649. During this time frame, in addition to the bridges already mentioned, he points out that in 1636 he repaired all the fiefdom's main roads, and renovated the road layouts between Campagnano, Bracciano, and Cesano [20]. Between 1621 and 1636, Torriani had, for Paolo Giordano II, produced three layouts for the Orsini building complex at Monte Giordano in Rome, and designed the connection with the Pitigliano wing, whose interior decoration he had supervised. However, the content of the 1649 letter emphasizes that cooperation in Bracciano was more constant. In fact, the duke entrusted the architect with control over all his properties and with maintaining the system of links for transporting goods between the state's urban centres, making the most of the experience gained in Rome. Indeed, Orazio Torriani, as *maestro e sottomaestro di strade* or 'master and submaster of roads' (1610-1633), had redefined the road fabric around Santa Maria della Consolazione (1609), designed the road layout adjacent to the San Lorenzo de' Speziali in Miranda complex in the Campo Vaccino (1609) and on Via Baccina in the Suburra quarter (1610), and outlined the plan for the new, straight arteries on the Janiculum (1617) [21].

On 6 May 1636, Torriani approved an additional calculation of works completed by Tullio Quadri between June 1634 and May 1636. Compared to previous documents, this one alludes specifically to structural operations, describing, in Bracciano, the renovation of roofs and of the water elimination system at the fortress, and the reinforcement of the lofts, with the brickwork above, in the prisons. At the Cerveteri Palace, the replacement of parts of the roof frame and the masonry courses was planned. At the Vicarello baths, there are estimates for the reconstruction of the masonry at the foundation, in elevation, and of the vaults, and for modifying beams for the consolidation of the wooden horizontal elements. At the Campagnano Palace, the construction of a masonry spur and of brick patches are planned, in addition to roof repair. At the granaries in Galera, the introduction of new beams in the loft and the construction of the stairway vault are contemplated. Moreover, minor interventions relating to the restoration of walls and partitions, demolition, renovation and laying of floors, parapets, thresholds, and small stairways, plastering and refinishing of walls; carpentry works; the opening and plugging of window and door spaces, and small-scale structural actions in the stable, in the vineyard, and in the ironworks at Bracciano, at the tavern, and in the bakery in Anguillara, in Campagnano, in Vaccina, and in the grindstone at Formello are also listed [22]. Torriani relied on Tullio Quadri and his workers between 1637 [23] and 1638-1639 for the management of these work sites and for the working operations in certain cases in the village and in the grindstones at Bracciano, Tevignano, and Anguillara, and at the taverns of Posta alla Storta and Palo [24].

On 5 June 1638, Orazio Torriani signed two *Misure e stime de lavori* for the construction of a hayloft in Baccano [25]. The second account, although referring to a rural building, is of particular interest since it is the only manuscript in the Orsini collection that contains 'site sketches'. The small dossier, consisting of three pages divided into two, transcribes, for each type of working operation, the quantities in Roman palms and the cost in scudi, as in all the documents cited thus far. In this case,

however, there is a drawing with the measurements of the side wall of the shed and a diagram of the roof truss, done in an inspection during the works. But the two details, relatively insignificant from the standpoint of construction, confirm that what the architect signed was not a 'bill of quantities' but the 'site book'. Based on these considerations, it may be supposed that, in the Duchy of Bracciano, Torriani was not only serving in the role of surveyor, but was also taking part in the choice of constructive and architectural solutions.
Torriani's activity of managing and maintaining the Orsini family's properties continued for Ferdinando (? - 1660), brother of Paolo Giordano II and fourth lord of Bracciano, who brought into the family holdings the assets of the Orsini di San Gemini branch. On 7 August 1645, Orazio Torriani drew up the balance for the whitewashing and painting of the Oriolo Palace [26]. On 31 May 1652, he put his initials on a list of chisel works, in one of the last documents the architect signed for the Orsini fiefdom of Bracciano [27].

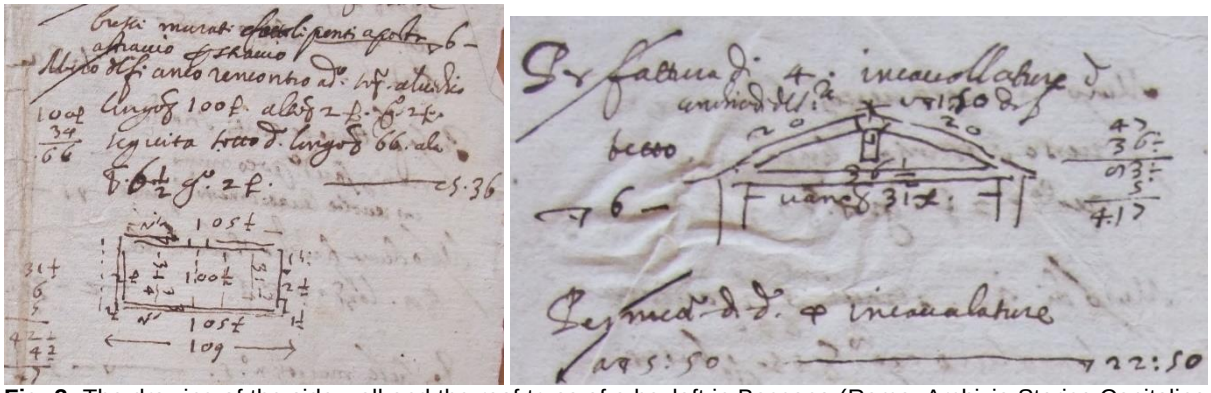

Fig. 3: The drawing of the side wall and the roof truss of a hayloft in Baccano (Roma, Archivio Storico Capitolino, *Orsini Serie II,* B. 2395, *Stato di Bracciano. Luoghi Vari*, 1581-1692, 1638, *Misura et stima de lavori de m[ur]o fatti a manifatura et pozzolana et pietra (…) per servitio del fienile fatto all'ostaria di Baccano (…)*, 5 giugno del 1638, ff. 1-2), by permission of Soprintendenza Capitolina ai Beni Culturali – Archivio Storico Capitolino.

3. Conclusion

To conclude, close analysis of the Orsini documentary material has yielded new information on Orazio Torriani's professional activity in Bracciano.
In the first place, it has been emphasized that the collaboration between the architect and the various members of the Orsini family was long-lasting not only in Rome, but above all in the large Lazio holding. This may also be credited to the bond the architect had with his city where he enjoyed undoubted prestige, serving in fact as Councillor and Prior of the Community even when not permanently residing in the village [28]. Second, it has been possible to identify the artist's numerous and hitherto unknown interventions in a great many buildings, some of which minor and others more architecturally significant, like the Bracciano castle. These works, in any event, are closely related to his output in other Italian cities. Lastly, it has been possible to outline a rather comprehensive landscape of work site organization and of the alternation of workers in the Orsini family's buildings and territorial possessions.
Orazio Torriani the architect emerges enriched from this necessarily brief study, proving to be a highly skilled 'modern' professional capable of working in several areas of construction and of grappling with problems not only of construction but also of management in the first half of the seventeenth century.

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[12] Roma, Archivio Storico Capitolino, *Orsini Serie II,* B. 2395, *Stato di Bracciano. Luoghi Vari*, 1581-1692, fasc. 7, 1629, *Misura e Stima di lavori di muro et di altre cose fatte da m[astr]o Tulio Quadri capomastro Muratore à tutta sua robba eccetto la calcia bianca fatti in diversi luoghi per servitio dell'Ill[ustrissi]mo et Ecc[ellentissi]mo Sig[no]r Duca di Bracciano (…) stimati per me Horatio Torriani Architetto*, 20 agosto 1628, ff. 1-21, particulary f. 21. In the same file we find estimates and payments on 1st July (ff. 23-38) and on 2nd July 1629 (ff. 39-43).

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[14] Roma, Archivio Storico Capitolino, *Orsini Serie II,* B. 2395, *Stato di Bracciano. Luoghi Vari*, 1581-1692, fasc. 7, 1634, *Misura e stima de altri lavori fatti a Bracciano (…) essendo fatti da poi il d[ett]o m[astr]o Nicolò Valli per servitio per ostaria della posta di Bracciano dell'Ill[ustrissi]mo et Ecc[ellentissi]mo Signo]r Duca di Bracciano (…) quali lavori sono stati portati dal d[ett]o m[astr]o per lista a me Horatio Torriani Architetto di S. E., il che ho visto tassato, et agiustato conforme al sottoscritto,* 6 giugno 1634, 1 luglio 1634, ff. 1-2. In the same document on 26 May 1634, the *Misura e stima de lavori di muro fatti a tutta robba eccetto la calcia bianca da m[astr]o Nicolò Valli Muratore per servitio del nuovo condotto della fontana del ostaria di Bracciano (…) misurato et stimato (…) per me Horatio Torriani Architetto*, 26 maggio 1634, ff. 3-4.

[15] Roma, Archivio Storico Capitolino, *Orsini Serie II,* B. 2397, *Misure e stime. Vari luoghi, 1625, Misura e Conto della spesa che è andata per fare il nuovo ponte sopra del fosso d[ett]o Vaccino nel*

territorio di Cerveteri dell'Ecc[ellentissi]mo Sig[no]r Duca di Bracciano mesurato il d[ett]o ponte de lavori fatti da m[astr]o GianAntonio Gabuzze Muratore di S.E. per Horatio Torriari puro architetto di S.E., f. 1; Misura e stima dei lavori di muro fatti di manifattura da ma[str]o GiovanniAntonio Gabuzze capo mastro Muratore in fare il novo ponte sopra al fosso detto vaccino nel territorio di Cerveteri dell'Ill[ustrissimo] et Eccel[lentissi]mo Sig[no]r Don Pauolo Giordano Duca di Bracciano misurati et stimati detti lavori per me Horatio Torriani Architetto, 8 luglio 1625, ff. 1-2.

[16] Roma, Archivio Storico Capitolino, *Orsini Serie II,* B. 2395, *Stato di Bracciano. Luoghi Vari*, 1581-1692, 1634-1649, *Misura e stima del ponte Masciolo nel territorio di Campagniano traversato dal fosso di la Bottata dove al presente passano le carrozze et viandanti et per ritrovarsi le due muraglie latirale del fosso fatte antiche et bisognato refare la volta che era tutta rotta e rovinata (…)*, 20 novembre 1634, f. unico.

[17] Roma, Archivio Storico Capitolino, *Orsini Serie II,* B. 2395, *Stato di Bracciano. Luoghi Vari*, 1581-1692, fasc. 7, 1634-1649, *Conto di Ponte*, 20 novembre 1634, ff.1-2. Torriani also entrusted Tullio Quadri the interventions in the grindstone and in the vineyard in Campagnano: *Lavori fatti da m[astr]o Domenico Dovichelli Muratori in Campagnano*, 23 settembre 1636, f. unico.

[18] Bracciano, Archivio Storico Comunale di Bracciano Paolo Giordano Orsini, *Uscite 1625-1634*, 38, f. 91v.

[19] Roma, Archivio Storico Capitolino, *Orsini Serie II,* B. 2395, *Stato di Bracciano. Luoghi Vari*, 1581-1692, 1642, *Misura et stima delli lavori al ponte (…) vicino al ostaria della crocetta nel territorio dell'Anguillara e strada che va à Bracciano quel ponte a fatto tutto di novo à tutta roba m[astr]o Guglielmo Bolzetti Muratore mesurato d[etto] ponte per me Hotatio Torriani Architetto dell'Ill[ustrissi]mo et Ecc[ellentissi]mo Sig[no]r Duca di Bracciano,* fogli sciolti.

[20] Roma, Archivio Storico Capitolino, *Orsini Serie II,* B. 2395, *Stato di Bracciano. Luoghi Vari*, 1581-1692, fasc. 7, 1634-1649, 20 novembre 1634, f. sciolto.

[21] DAL MAS, Roberta Maria. *TURRIANI, Orazio*. In *Dizionario Biografico degli Italiani*. Roma: Istituto della Enciclopedia italiana fondata da Giovanni Treccani S.p.A., 2020, Vol. 97 online, p. 1.

[22] Roma, Archivio Storico Capitolino, *Orsini Serie II,* B. 2396, *Misure e stime. Bracciano Castello e Rocca,* 1549-1685, *Misura et Stima de più lavori de muro, et altri fatti parte à manifattura et à tutta robba da m[astr]o Tulio Quadri, et da m[astr]o Roncaioli Muratori fatto in diversi lochi dello stato dell'Ill[ustrissi]mo et Ecc[ellentissi]mo Sig[no]r Duca di Bracciano, et nella Rocca di Bracciano misurato e stimato per me Horatio Torriani Architetto di S.E. il tutto mesurato per ordine del Sig[no]r D. Michelangelo Vana Soprintendente Generale di S.E.,* 6 maggio 1636, ff. 1-31.

[23] Roma, Archivio Storico Capitolino, *Orsini Serie II,* B. 2395, *Stato di Bracciano. Luoghi Vari*, 1581-1692, fasc. 7, 1637, *Per Tulio Quadri mur[ator]e di Sig[nor] Duca di Bracciano*, 1636-1637, ff. 1-54; *Misura et Stima de lavori di muro fatti (…) di m[astr]o Tullio Quadri (…) Muratori e compagni per servitio dell'Ill[ustissi]mo et Ecc[ellentissi]mo Sig[no]re D. Paolo Giordano Orsino Duca di Bracciano misurato per me Horatio Torriani Architetto di S.E.*, 2 novembre 1637. The buildings are the fortress, the public stable and the tavern in Bracciano, the iron factories, the Pedicone farmhouse in Vicarello, the Galera oven, the Vigna grande grinstone, the Stigliano baths.

[24] Roma, Archivio Storico Capitolino, *Orsini Serie II,* B. 2395, *Stato di Bracciano. Luoghi Vari*, 1581-1692, 1639, *Misura di m[astr]o Tulio Quadri et m[astr]o Francisco Roncaioli aquistato per scudi 725 per Bracciano et lo stato di S.E.; Misura e stima de diversi lavori fatti per servitio dell'Ill[ustrissi]mo et Ecc[ellentissi]mo Sig[no]re Duca di Bracciano fatti parti à tutta robba e parte con calcie e mattoni del Sig[no]re Duca e parte a manifattura in diversi lochi m[astr]o Tulio Quadri et m[astr]o Francisco Roncaioli muratori e compagni tanto in rocca come per Bracciano e per tutto lo stato come per d[ett]e mesure si vede quali lavori sono parte mesurati e parte secondo le conto datomi da me rivisti et stimati secondo le conventioni e patti (…) quali lavori sono stimati per me Hotario Torr[ia]ni Archi[tet]to di S.E. per ordine e commissione del Sig[gno]r Giuseppe Milio fattore Generale di S.E.,* 25 settembre - 15 maggio 1639, ff. 1-23. Si veda anche: *Misura et stima delli lavori (…)* del 27 maggio 1639; *Sommario di tutti li lavori fatti da m[astr]o Tulio Quadri et m[astr]o Francisco Roncaioli Muratori per servitio dell'Ill[ustrissi]mo et Ecc[ellentissi]mo Sig[no]re Duca di Bracciano (…) quali lavori sono stati fatti in diversi luoghi come apare per il presente Sommario a luogo dalli 22 di Maggio 1634 che si è fatto detto saldo e misure per me Horatio Torriani Architetto di S.E.*, 27 maggio 1636; *Sommario di tti li lavori fatti da M[astr]o Tulio Quadri et m[astr]o Fran[cis]co Roncaioli Muratori per servitio*

dell'Ill[ustrissi]mo et Ecc[ellentissi]mo Sig[no]re Duca di Bracciano tanto per la fortezza di Bracc[ia]no quanto per Bracciano e per tutto lo stato come si vede loco per loco reviste et calculate dette mesure per ordine del sig[no]r Giuseppe Milio fattore generale di S.E. per me Horatio Torriani Architetto di sue Ecc[ellenza], del 2 luglio 1639, ff. 1-63,

[25] Roma, Archivio Storico Capitolino, *Orsini Serie II,* B. 2395, *Stato di Bracciano. Luoghi Vari*, 1581-1692, 1638, *Misura et stima de lavori de m[ur]o fatti a manifatura et pozzolana et pietra per m[astr]o Fran[ces]co Roncaioli et di m[astr]o Domenico Carabella Muratori et compagni per servitio del fienile fatto all'ostaria di Baccano dell'Ill[ustrissi]mo et Ecc[ellentissi]mo Sig[no]re Duca di Bracciano e stimato per me Horatio Torriani Arc[hitett]o*, 5 giugno del 1638, ff. 1-3; *Misura et stima de lavori de muro fatti a manifattura da m[astr]o francisco Roncaioli et di m[astr]o Domenico Carabella Muratore et compagni per servitio del fienile fatto al ostaria di Baccano dell'Ill[ustrissi]mo et Ecc[ellentissi]mo Sig[no]re Duca di Bracciano mesurato stimato per me Horatio Torriani Architetto* di S.E., ff. 1-3.

[26] Roma, Archivio Storico Capitolino, *Orsini Serie II,* B. 2395, *Stato di Bracciano. Luoghi Vari*, 1581-1692, fasc. 5, 1589-1653, *Conto di Lavori fatti per l'Ill[ustrissi]mo et Ecc[ellentissi]mo Sig[no]re Duca di santo Gemino nel suo palazzo a l'Oriolo,* 7 agosto 1645, ff. 1-3.

[27] Roma, Archivio Storico Capitolino, *Orsini Serie II,* B. 2395, *Stato di Bracciano. Luoghi Vari*, 1581-1692, fasc. 5, 1589-1653, *Misura delli Lavori per scalpellino che sono fatti fino al giorno sudetto da m[astr]o Santi Paliari scalpellino per servitio della vigna e fabrica che fa fare all'Oriolo l'Em[inentissi]mo Sig[nor] Duca Ferdinando Orzini duca de Sa[n]to Gemini misurati per oratio torriano architetto*, 31 maggio 1652, ff. 1-4. Sul palazzo di Oriolo anche: *Sommario del Conto di m[astr]o Antonio Mancinetti ferraro in Panico fatti à tutta robba per servitio l'Em[inentissi]mo Sig[nor] Duca Ferdinando Orzini duca de Sa[n]to Gemini fatti detti lavori per tutto Novembre 1653 e furono cominciati dalli 9 di Agosto 1652 sino a tutto Novembre 1653. Detto Conto et Stato tassato per me Horatio Torriani Architetto di sua Ecc[ellen]tia per suo ordine e commissione,* ff. 1-27.

[28] Bracciano, Archivio Storico Comunale di Bracciano Paolo Giordano Orsini, *R. Verbali Consiglio di Comunità 1629-1658,* 5.

WORLD HERITAGE and DESIGN for HEALTH
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Prefiguring the reuse of historic hospitals: an approach methodology to design in the digital age

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Abstract
Italy has a relevant stock of historic hospitals, only partially categorized by care type (former psychiatric hospitals, former sanatoriums, etc.). They are not even listed on the UNESCO World Heritage List as individual buildings.
Since Middle Age, hospitals landmarked our cities and gone through ages with scientific progress, and relevant transformations. They never broke the link with the community and often suffered management issues (higher maintenance costs, new regulations, increasingly high-performance requirements, new health protocols) until they were abandoned or changed to new use, thus often losing historic value.
With the current emergency, we must rethink the role historic hospitals can still play, as receptors of new services for the community.
The theme of historic hospitals is within the general reuse of heritage stock, but with particular attention to revitalisation for new health functions or mixed functions.
This paper describes a methodology to explore the potential of such hospitals in terms of value for enhanced health functions to meet a growing demand for local services other than acute hospitals.
Methodology and tools for the adaptability evaluation of historic buildings as new local health services applies to a sample of case studies to explore potential solutions. This can ensure a right balance between financial and functional sustainability and preservation requirements. Emphasis is on identifying a successful mix of applied design solutions and exploitation of heritage value.

Keywords: historic hospitals, reuse, design alternatives, Decision Support System (DSS) tools

1. Introduction
The theme of the reuse of disused historic hospitals in Europe and especially in Italy is still a current issue, given the systematic abandonment of important hospital complexes in different national contexts, due to the impossibility (or lack of will) to experiment and implement new technologies to adapt to the evolution of health care [1].
The uses of many of them, with large available volumes near the historic centres of big towns, were increasingly mixed public and private. Hospitals with historical value and located in smaller cities were not attractive for new uses, but were often abandoned, thus depriving the inhabitants of a cultural, social, and especially health heritage. This valuable heritage includes architecture, works of art, archive materials, libraries, instruments, etc.
The responsibility of a revitalization plan, while preserving the health use, must come along with a wide knowledge promotion. The first step of this would be a reconnaissance nationwide, currently lacking, except for some specific treatment categories, such as former psychiatric hospitals [2] [3].
Throughout history, hospitals have been landmarks of our cities and towns. Evolving building types and their spatial characterization have come along with scientific discoveries, progress in the biomedical field also through major transformations [4]. Most historic hospitals, because of financial difficulties and

maintenance costs (due to new regulations, new performance models and medical protocols), have been abandoned or changed to new functions, often losing its historical and documentary value [5].
The current health emergency offers the opportunity to reconsider the role that historical hospitals can play as key health hubs and receptors of new services linked to urban life and their citizens.
We can deal the topic of historical hospitals within the reuse of the heritage of buildings/ monuments, with particular attention to a new use and remodelling within the network of local health services. The result could be new health functions and protocols highlighted by the emergency and technological innovation in health (e-health, telemedicine) [6].
Characteristics of this heritage stock (never mapped) include data on ownership, availability, building type and volume, age of construction, constraints of protection, state of conservation. Storage of such data is a prerequisite for any reuse plan. Thus, we need an in-depth knowledge of all those data for evaluation of the potential of the heritage stock and the feasibility of revitalization. A lacking identification of such potential could bring to misuse and disposal, as already happened. In this regard we focus on the case of valuable hospitals in Rome, such as the former Carlo Forlanini Hospital (abandoned in 2015 and a case study in this article), San Giacomo Hospital partially in use since 2008 and San Gallicano Hospital, abandoned in 2007 and now with a different use. In addition, there could be several historical sanitary hospitals nationwide, for long time abandoned because too small or severely cut in the national health system budget.
Differently from abandonment, there are also valuable case studies such as Celio Hospital in Rome. Thanks to a military and independent management, it was revitalized through a faster process, which also preserved historic building features and, at the same time, relevant health function (Fig. 1 – Fig. 2).
Through the reuse of this heritage stock, in view of sustainability and reduced land use, we can tackle lacking local health services occurred in the Covid-19 emergency with a new pattern of the relationship between hospital and local community.
Indeed, the network of local health services and hospitals did not fit for the management of non-acute patients nor for standard services' performance.
The current contingency can be an opportunity to give back to the community a heritage stock while keeping the original function and exploiting uses within an innovative health care system.



Fig. 1: Military Hospital Celio (Rome). Military Hospital of the Italian Army Health Corps built between 1885 and 1891 by Salvatore Bianchi and Colonel Luigi Durand de la Penne. It consists of 30 pavillions on more than 50.000 square meters, connected through iron walkways, still in excellent condition. Today, the hospital is fully functional and all the revitalizations have fully preserved the original features. In 1987 an extension plan (E. Nespega designer) made new connections of outer heads of pavillions.

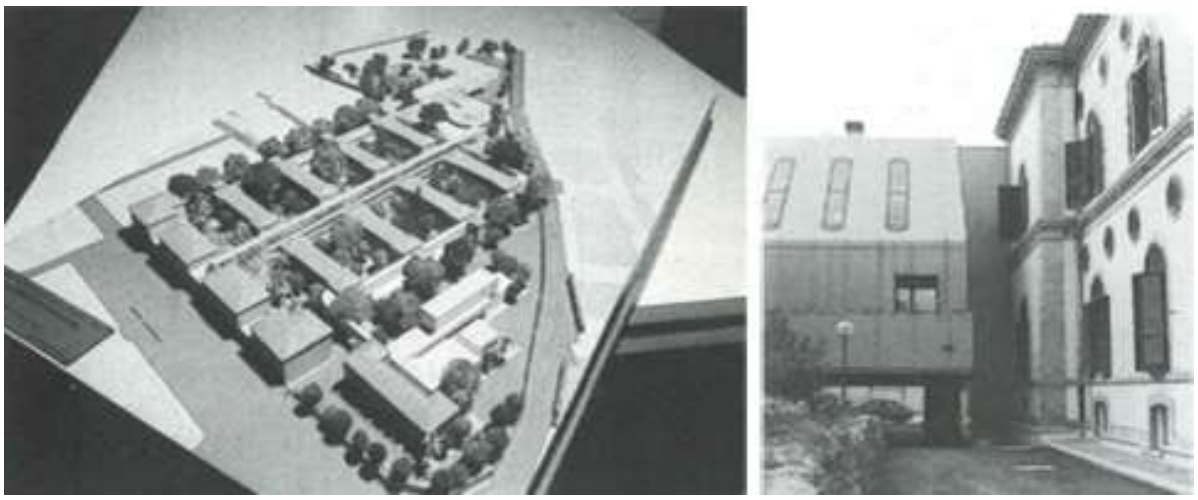

Fig. 2: The new additions clearly highlight a contemporary style and dramatically change the overall hospital re-development, while preserving the historic and monumental features of the whole system.
Record sample of revitalized historic hospitals in Italy by keeping health functions, with focus on solutions of adaptability for an application model. These data records are a preparatory tool for mapping of historical hospitals and for a framework of adopted solutions. This is useful for heritage protection, for the quality of health services, and for new technologies (Step 1 of the methodology).

2. Historic hospitals between testimonial value of hospital architecture and new potential in the digital age

The modern hospital building type and functional model starts at the end of 1700 after a long tradition of mainly charitable and welfare model of religious confraternities. Only around two centuries ago the principle of national health systems was established, for the first time in Europe, although limited to frail categories. Construction of the first hospitals in England started to take place gradually together with national health service financed mainly by tax revenue. From that time, models of public health spread in Europe, while in Italy the rights to health were recognized only after the Second World War in the Constitution act [7].
From the oldest court types of the rare hospital complexes in the Renaissance age, through the pavilion model type of the early twentieth century, and finally to plates, towers and mixed plate-towers types, hospital complexes have passed - faster than other buildings - through innovations, different organizational-functional models and especially many management changes due to different budget fluctuations.
A revived interest to architectural quality of care spaces arose in the middle of the twentieth century, as it started from the hospital architecture in the fifteenth and sixteenth centuries (with Buontalenti in the renovation of the hospital of Santa Maria Nuova in Florence, and Filarete in the design of the Maggiore Hospital in Milan). This started the concept of the modern hospital and focuses on the relationship between contemporary design and history of hospital architecture. Also, this highlights even more the testimonial relevance of historic hospitals and how hospital architecture of the past can help build an identity of the European and Italian hospital. Surveying how abandoned historic hospitals were working, some concepts taken from the current health design can emerge: focus on people, search for a dialogue with the city. Such concepts express a culture that goes beyond skilled knowledge and technical aspects.
Thus, an architectural culture appears to interface with the topics of health in society, in the urban landscape of cities and towns. The study of oldest hospitals also provides us with valuable information on how we pursued the concept of patient as a person, a patient-centred vision (no longer only in-patient), the role of a “caring” environment, the care complexity and rapid changes, and finally to how we can quickly cope with the current emergency.
Historic hospitals can still clarify the link between the hospital concept and the evolution of science, techniques, and health policies, specifying the basic concepts of design that give identity to the hospital architecture also beyond a technical context.
The changing functional concept of the hospital through ages is to be found not only in the literature, but also in the samples still present. These, if thoroughly surveyed, can be a resource to supplement the health network, even though with new functions and use which can revive as innovative health services in relationship with local medicine. This should be a priority [8].

Unfortunately many samples of relevant historic hospitals for the aspects above described have suffered a gradual and irreversible financial downsizing since the 1970s, with a consequent abandonment as a result of health policies of increasingly budget cuts in health building loans and at the same time also in the health performance of receptivity of hospitals: number of beds per patient have been increasingly reduced and the situation in recent decades has progressively worsened also due to increasing ageing population. This trend has deeply affected the mechanisms and principles of national health that the government has guaranteed through the provision of services for citizens.
Thus, the organization of spaces, of activities and health equipment has endured in the last decades fast reconfigurations and this trend is even growing due to the fast expansion of services from remote and telemedicine, together with the extension of home assistance that reduces the need for space. On one hand, we can see obsolete hospitals that are no longer able to respond to contemporary needs, on the other hand the phenomenon of the 'miniaturization' of the new hospital concepts is taking place with a view to a new healthcare and digital eHealth. This would put back the historic hospitals because of the lacking flexibility in space and technology can be contrasted with a flexibility of the organizational model that can accommodate limited technological equipment, outpatient and daycentre services while outsourcing all those services that can perform in the digital era.
The pandemic can be the opportunity for a debate on the exploitation of historic hospitals to give back to the community a new model of reuse that does not break with the original function, but rather can enhance it in the shapes and conditions of contemporary society.
If on one hand, technology and spaces of historic or ancient hospitals cannot comply with the requirements of a new contemporary hospital concept, on the other hand such spaces can still revitalize and build new health functions fit with the current and pressing needs of a local medicine. This urgently needs to be deeply renovated if not completely re-established with new methods.

3. Proposal for an approach methodology to reuse design of historic hospitals as a core of the local assistance network. The aid of digital technologies

The proximity of primary care to the citizens, thanks to funds allocated by a decree for economic recovery in 2020 for the reorganization of the local assistance network, was a key role in the management of the new emergency. This would have meant a relevant role of 'filter' of non-acute covid patients to relieve the strong pressure on hospitals. Instead, home health services (USCA) have been enhanced without identification of the network of physical places where to provide primary care.
Thus, this paper starts focusing on how public decision-makers and health directorates of large hospitals and their technical offices tackled critical issues to assess, among available health buildings nationwide and particularly abandoned historical hospitals, those more suitable to switch from the National Health Service to a local medicine model. This allows assessing adaptability through alternative solutions for an effective health reuse as a response to current emergency needs.
We identified, starting from the new health protocols of medical assistance adopted in the local of first aid centres, an approach methodology of reuse design to assess the suitability of historic hospitals and adaptability to new use patterns and new protocols for patient take-care, assistance and the patient’s diagnostic-therapeutic pathway.
The methodology takes advantage of a structured system of forecasting tools that empower selection among the possible solutions, of those with the largest number of responses to new space and technology requirements that are consistent with the renewed health care modes.
We refer to digital tools with a long-term forecast model, which goes beyond the works completion and the immediate use. This allows detecting a new life cycle of revitalized historic hospitals through a much larger timeframe. Forecasting tools help define reuse strategies by assessing long-term effects.
We use recent decision support methodologies for health design that can manage input requirements by performing multidimensional analyses. These methodologies and tools are consistent with Generative Architectural Design [9] and Design Optioneering [10].
Generative Design is an iterative man/machine design process, running through parametric design software and visual programming-VPL operating in BIM. This allows designers to quickly screen and optimize several solutions, basing on specific objectives. While traditional "passive" computer use is a mere compilation tool, the generative design establishes a closer link between designer and computer, also exploiting algorithms based on Machine Learning principles. This method generates thousands of solutions for a quick evaluation. The results can be optimised according to needs and resources, even anticipating many evaluation phases at the beginning of the process.
Through this relevant opportunity from the digitalisation of design actions, we illustrate an approach methodology of reuse design below to anticipate and evaluate the adaptability of the historic hospitals to accommodate the transformations resulting from use models of new emergency and management protocols, through a continuous digitalisation process also in health care (e-health, telemedicine, Iot).
The definition of the methodology process and the research use of the specific studies of technological culture of design [11] [12]. This allows to analyse the adaptability of the historic hospitals, through efficiency/efficiency-oriented activities and guidelines for public/private decision-makers in functional

evaluation and alternative solutions for acute hospitals. The purpose is to ensure the compliance of building stock with the new health policies while preserving heritage, by adopting an integrated design [13]. To assess adaptability and transformations of the 'place of care' must start from frail users and staff under pressure and from the study of new use models of space redevelopment. We must consider the link among quality, appropriateness and efficiency of care and the space performance level that shall be increasingly adaptable to establish new organizational and technological requirements coming along with changing care methods and emergencies.
The methodology includes phases and activities:
Bibliographic and on-field survey of revitalized case studies of historic hospitals in Italy and Europe with a new health use; elaboration of information sheets (as shown in Fig. 1 and Fig. 2) with details of adopted solutions, based on effectiveness, heritage protection, quality of health services and environmental, technological and management actions.
Start of a reconnaissance on nationwide of the historic hospitals abandoned or partially in use, potentially suitable for a new health reuse.
The selection includes an analysis of the availability of the stock and the ownership status.
Survey and mapping of relevant case studies for the evaluation of the residual building performance as to technical and economic feasibility of works; graphic rendering through BIM methodologies, SWOT analysis (see Forlanini case study) to identify the first planning strategies and alternative solutions in compliance with new health services.
Survey of operational protocols and adaptation practices conducted during Covid-19 emergency to assume new health scenarios in the former hospitals. Identification of flexible health scenarios along with the pandemic trend can use international (WHO) and national (Ministry of Health) documents, reports, recent directives on health protocols and benchmarks on the management of non-serious Covid19 patients from which to identify predominant activities and impact on buildings (flow changes, management of patients, staff, materials, equipment, etc.). On one hand, the result is the development of a use model that identifies new functions, especially while implemented with digital technologies (telemedicine) and on the other hand it is a set of actions for reconversion, compartmentalization, extension, etc. as linked to the constraint system (structure, installations, etc.).
Definition of environmental and technological requirements for adaptability of historic hospitals. Linking to specific activities of the new local health services, we can identify basic requirements of single rooms of the organisational model. The result is a structured system of environmental and technological requirements able to highlight the minimal admissible threshold with the criteria for assessing alternative design solutions generated in the next methodology steps.
First expeditious evaluation of the suitability to transformation of historic hospitals basing on the overall building flexibility and single environmental units. We obtain information to assess adaptability potential through a fast evaluation tool in the mode of automated checklists. These are based on observation/evaluation criteria of technological and spatial flexibility coming from the literature and adapted to the specific case. The result is a system of constraints also of historic-architectural nature, necessary to determine the adaptability level.
Generative Design application and elaboration of the prefiguration/generation algorithm with evaluation of alternative solutions, through the translation of requirements and design constraints into logical-mathematical processes. Using visual programming software (e.g. Autodesk Dynamo) in the BIM environment and Generative Design methodologies, we can transform the information on the use model, on the requirements system and on the constraints system into requirements to be met, by defining the action range of the "program" variables. This allows to start a prefiguration/ generation of design solutions for reconfiguration of a theoretical model of historic hospital to be renovated (algorithm generator). This provides a 'cyclical' replication in search of the most suitable configuration for specific uses in compliance with constraints. The result is the generation of *n* compliant solutions to start the evaluation (evaluator algorithm).
Classification of pre-established/generated and assessed adaptability solutions suitable for identifying the necessary actions. The application of *Design Optioneering* methodologies (e.g.Autodesk Project Refinery Beta) allows a multi-objective evaluation of *n* prefigured solutions to check their compliance with the initial objectives. The first three design solutions identify the actions and a rough cost estimation. The approach methodology to the reuse design is being validated/implemented through the application of some case studies of historic hospitals that can supplement the network of local services.

4. Preliminary analysis on the effectiveness of the reuse methodology: the case study of Forlanini Hospital in Rome

Analysis of this case study highlights the opportunity of an exploitation of the large abandoned historic hospital complex. We check suitability of reuse, transformation and adaptation to new required health and social functions of the local health care district. We can evaluate this based on several structural constraints for the current state of conservation of the hospital, which appears severely damaged after abandonment.

We carried out an in-depth study through applying the first phases and activities of the described methodology. Forlanini Hospital in Rome has recently arisen a political debate of great impact that finally ended up with abandonment and inaccessibility. The hospital complex was built between 1930 and 1934 by the "Ufficio Costruzioni Sanatoriali" (I.N.F.P.S) on design of Ugo Giovannozzi and Giulio Marcovigi Poggi (who was in charge of the Works Direction). The original use was Antitubercular Sanatorium, thus designers chose a mixed morphology between the hospital pavilions type, as a relevant tradition of Hospital construction, and the polyblock type with emphasis on connection areas (Fig. 3).

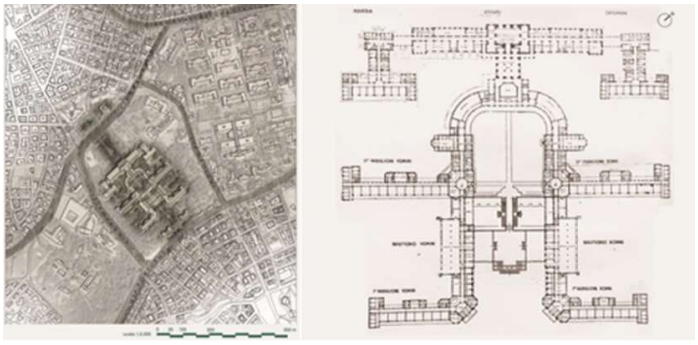

Fig. 3: General plan of Forlanini hospital complex in Rome and floorplan of the first level.

The construction site set-up phase (Fig. 4) was a difficult but well-organized plan, so that the whole complex was completed in only four years.



Fig 4: Construction steps of the hospital complex.

Compared to other health facilities of that age with the same functions, Forlanini Hospital showed features of greater functional and architectural modernity; adopted solutions provided for an optimal mix of different operating models.
For the monumental side, a T-shaped building is used. Instead the U-shaped exedra was the main circulation area. Finally, the linear pavilions are arranged to ensure the best exposure on the elevations (Fig. 5).

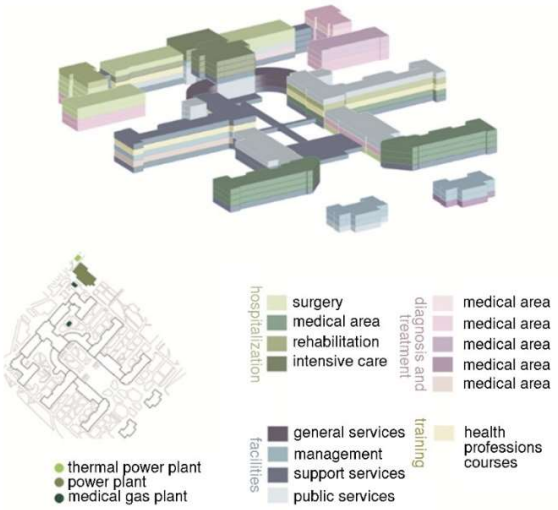

Fig. 5: Reconstruction of the functional mock-up of Forlanini hospital of Rome.

In the 70s the complex was converted into a general hospital under the National Health System management (no longer by INPS – Nation Social Security Agency) with a specialization in respiratory illnesses.
In 1994, the Hospital company of Rome was established from the merger of Forlanini, Spallanzani and San Camillo hospitals. After two years, Spallanzani became an independent branch of research and a new San Camillo-Forlanini Hospital entity was established.
During the regional health system programs of the 2000s, the complex had to undergo several management problems for its complexity and size with increasingly maintenance costs.
In 2006, with the resolution 2145 of 27 October, the company closes Forlanini Hospital and shift activities to San Camillo Hospital (Fig. 6).
In 2008 a final closure was established; in 2010 Prof. Martelli (Special Commissioner of the Hospital company) submitted a renovation plan. In the next years, renovation plans and guidelines have come along without any health/care function.
Today, the complex is totally abandoned and there is no plans for revitalization.



Fig. 6: Phases of abandonment of Forlanini hospital of Rome and areas still in use (green).

Within this methodology, the analysis phase led to highlight the choices about a potential reuse. Considerations from different viewpoints include:
- need to *analyse the motivations that brought to the progressive obsolescence* of the hospital, mostly due to no maintenance.
- evaluation of *strong points of these large hospitals*, which in some cases were a largely spread functional type model reference (the pavilion was a long-lasting hospital building type over 2 centuries).
- many of these hospitals have occupied *large urban spaces* that have strongly affected organization and building expansion in the neighbourhood.
- in the last decades, technological progress has affected many sectors, including construction and technological systems. This would allow to face with more awareness feasibility of a spatial and technological remodelling of the whole complex.
Through this approach methodology for reuse design, we could conduct a preliminary *analysis of the potential*, starting from the analysis of many factors affecting the historic "hospital system" and the context (location, construction history, new user requirements, etc.).
Such factors are:
- the original *welfare function*, which affected location and size;
- the *urban role* of the hospital from the beginning as a functional model in the city; large outdoor areas of hospitals (where present) can be returned to the city for a wider vision of revitalization of the surrounding urban landscape: this can be a large urban enclosure, an extra-urban facility, or a perfectly blended piece into the stratified urban landscape.
- the monumentality of *architectural image* as sign of city identity and memory of the city evolution; this image is strongly linked to the morphological model of the hospital: pavilions and multi-block types.
By transferring one of the most common decision-making tools of this methodology from the planning process, we can proceed to a SWOT analysis that highlights the potential and critical issues of a reuse action (Fig. 7).

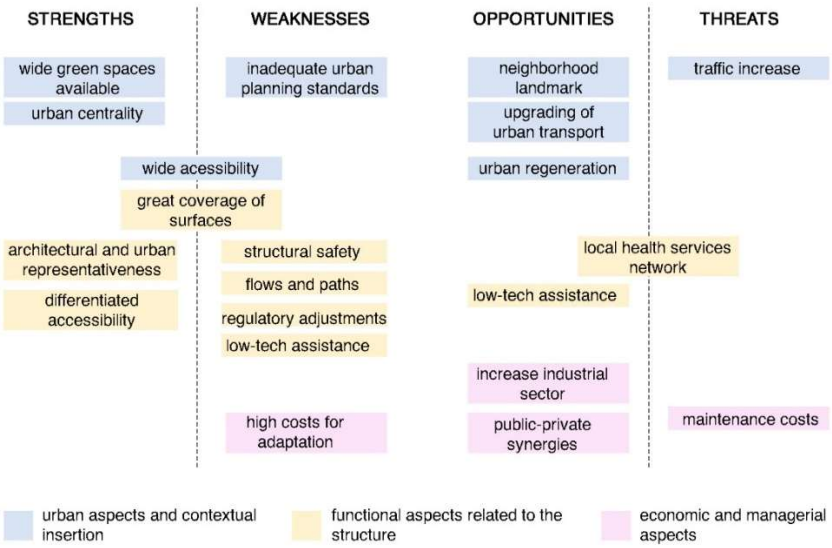

Fig. 7: This scheme shows the analysis areas for assessing the decision opportunities. As all methodological tools, this must always be adjusted with the reference context.

Based on conducted methodology with particular attention to the analysis of building consistency and health and social welfare needs of the surveyed urban area, we can prefigure a first assumption to accommodate different functions: the area of local health services needs further remodeling for the current emergency demand; the area of neighbourhood services open to the public (including a library and an heritage museum of the historic hospital; areas for research and testing, inclusive of areas for university education and post-university training (in the medical sector).

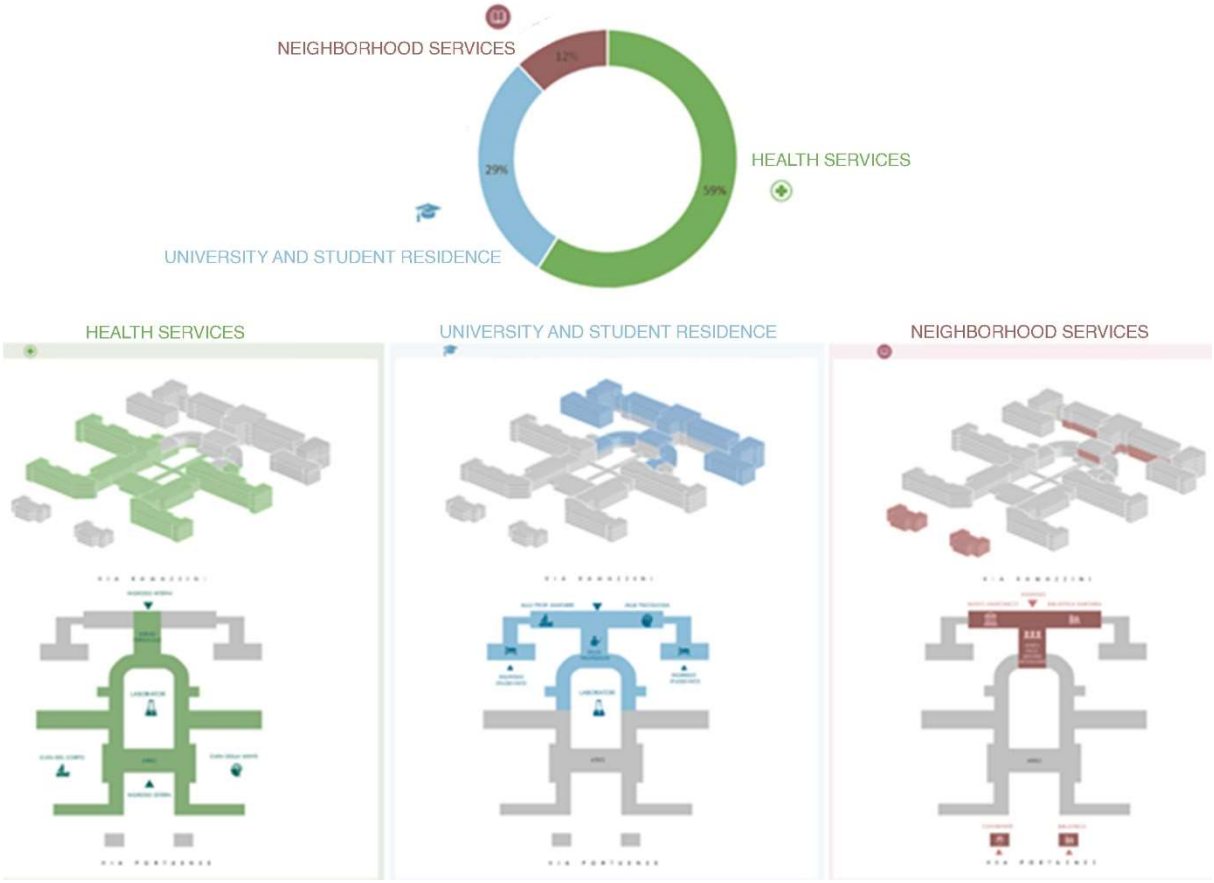

Fig. 8: First reuse and assumptions and functional remodelling of the historic hospital. The main function is local health services, with additional functions to enhance facilities and revitalize the context.

From analyses carried out, the reorganisation plan includes 3 macro-uses:
1) **Health**: a neighbourhood health care service of local medicine that can meet a large demand from the community; also, such local health services can reduce the workload of large high-tech hospitals in the city. Within this proposal 60-65% of the total area is on use for low-cost health activities such as:
- rehabilitation services (cardiological, neurological, post-covid, etc.) open to the public, while connected to low-intensity care areas and and/or daycentres that should be accommodated on the upper floors;
- specialist polyclinics, vaccination and/or prevention centre, which, during the current emergency, could help control and reduce the pandemic.
- multispecialist diagnostic centre (also private) (Fig. 9 on the left).

2) **Education/Training**: this takes about 30% of rooms, due to unsuitable health reuse. In addition, the presence of several health trainees and interns from the close hospital complexes of S.Camillo and Spallanzani gives the opportunity to implement proper education services for different users (classrooms, department rooms, libraries, laboratories, etc.). Areas for analysis and research laboratories should be also considered as a mixed use between health and training activities (Fig. 9 on the right).

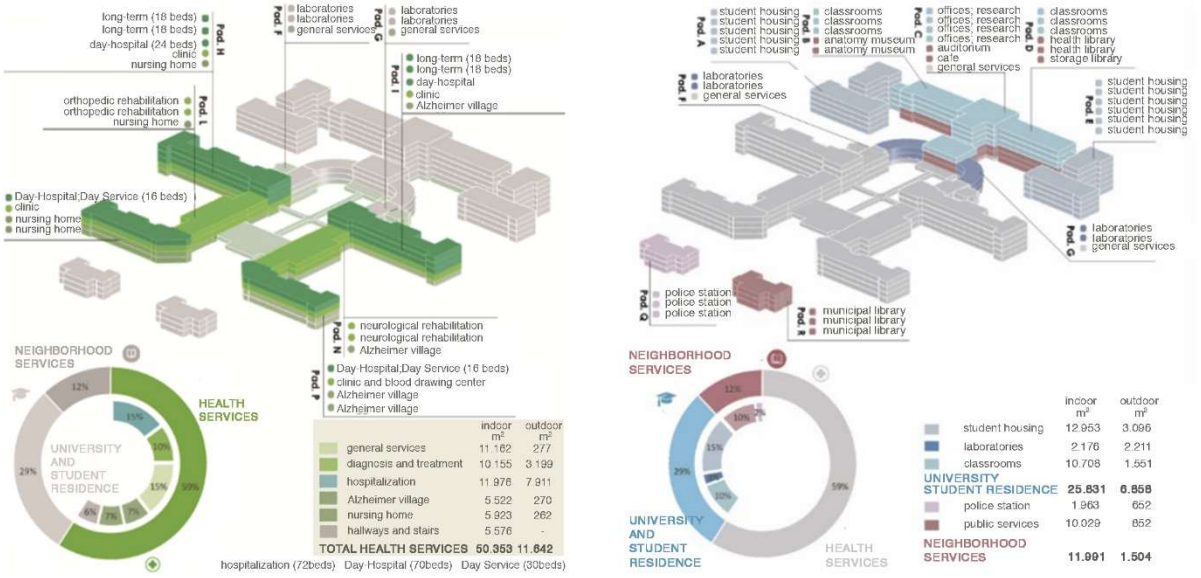

Fig. 9: Left: Functional organization of the complex areas revitalized for health activities. Right: Functional organization of the complex areas of university education and training for different medical and scientific research staff.

3) **Public use**: about 10-15% of the complex is large green areas of value that could be used as open services to the public (Fig. 10): a museum of the hospital history (already partly existing) with a conference centre and neighbourhood library.



Fig. 10: Reorganization of green areas also for therapy services.

The three macro-uses are well combinable and would be a valuable opening to the community.
For a prospective health reuse there are still the rooms in the basement, which were previously used as automated freight of medical supply. The reuse concept of this case study is currently under evaluation through the Generative Design tools to determine further design alternatives for the next effectiveness evaluation

5. Conclusions

From methodology and test applied to Forlanini Hospital in Rome, we identify and evaluate design solutions adapting to new use. The key is to run programming tools which screen all potential solutions and select the best match of the largest number of responses to the new needs of society.

Thus, future development shall increasingly adopt prefiguring power of current digital technologies [14] to help cope with our fast changing social, economic, environmental, and political age. These factors continuously affect the final objectives for identifying reuse decisions. Digital design tools shall support managers of these abandoned hospitals and enhance the impact prediction of reuse layouts in terms of savings for management and maintenance costs of revitalization, but also for better health conditions of the community, which is a fundamental need.

The approach methodology to reuse design shall extensively use predictive tools in different hospital use scenarios with different construction techniques, types, and historic contexts. This is a prompt response to different user models.

Generative Design anticipates for each need the evaluations for specific historic hospitals and specific factors such as the budget of involved parties, the type and number of buildings and the final objective of the reuse plan. Relevantly, the result is an added "value" (cultural, social, economic, or personal) to this heritage. In this way, through timescale optimization, decision-makers shall be able to anticipate the most efficient scenarios, not in a single viewpoint, but in a balanced matrix of requirements.

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Urban regeneration and new welfare. For a reconfiguration of the Network of public services for health

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Abstract
The metropolization processes of the contemporary city show a complex scenario: the contradictions induced by globalization effects, physical degradation, socioeconomic marginality, environmental fragility, new population instances, overlap the genetic anomalies of Italian cities, highlighting a new urban question.
That question underlies generalised conditions of marginality, social inequality and poverty and in the current health emergency require a new urban welfare to guarantee fundamental rights to local communities, including the right to health, becoming the goal of an integrated and inter-scalar strategy.
The regeneration strategy assumes the public city both as a physical matrix of reference, network of tangible and intangible networks, to guarantee a capillary territorial distribution, and as a framework of the coherence for structural choices.
In this context, the paper presents some reflections starting from research activities carried out by the authors, who face, in term not merely emergency, the urgency of a reconfiguration of the public city components structure within the Network of public services for health.
In contrast with the current organizational model and in coherence with the interactive and inclusive connotation of the new concept for urban welfare construction, that reconfiguration considers physical-territorial dimension as a structural framework. At the same time it requires new indicators, tools, implementation mechanisms, to substantiate the urban regeneration notion and implement a concrete policy of planning and production of services.

Keywords: urban welfare, public city, right to health, urban regeneration

1. Urban welfare, regeneration and territorial government. From the right to health to the right to the city
The metropolization processes that profoundly modified Italian and European territories in recent decades [1] [2] [3] have yielded an evolving dynamic of the spread of settlement, with multidirectional flows of private mobility and an extensive distribution of medium-sized polarities.
The outcome of these processes, the contemporary city is territorially unlimited in size, corresponding to high levels of pollution, energy waste, shortcomings in infrastructure, high rates of land consumption, as well as a structural lack of public spaces and of territorial coverage, feeds the sense of insecurity, by cutting the ties between the settled communities and territories [4].
In this setting, the contradictions induced by the effects of globalization, physical degradation, socio-economic marginality [5], environmental fragility [6] [7], extreme climate change, aging of the population, the increase in chronic diseases and psycho-physical stress [8], the changing family structure [9], and in the system of population values [10] [11], the pressure of migratory flows [12], overlap the “genetic anomalies” that, since the ‘900, have characterized the development of Italian cities [13], highlighting the emergence of a new urban question [14].

This question underlying the generalized conditions of marginality, social inequality, and poverty requires implementing a new urban welfare to guarantee local communities the rights to health, education, environment, public mobility, housing, and the city [15] [16].
The development of the new urban welfare raises the need for and constitutes the objective of an integrated and interscalar strategy of public government – corresponding to a central institutional site that performs an effective role of guidance – aimed at urban regeneration and territorial balance [17].
This brings up the eminently social valence of regeneration, a strategy of urban planning, social inclusion and local economic development [18] [19] [20] which takes on the public city – the set of public components, or components of public use, relating to open spaces, green areas, services, mobility, and social housing – as a structure of reference, a network of networks tangible and intangible, guaranteeing coverage and an extensive territorial endowment.
Networks of public and private services, for health, education, and culture; infrastructure networks for sustainable public mobility and for social inclusion; technology networks, waste collection networks; connective blue and green networks; morphological networks for reconfiguring open spaces, abandoned spaces, fabrics, and buildings; networks of integrated functions; networks of communities, of shared management of common goods, public-private partnership; networks of development and of socioeconomic and cultural revitalization, of new urban economies; networks for housing; networks for energy reconversion of the building stock.
The public city constitutes both the framework of the consistencies of the choices structuring this overall and compensatory process of regeneration and rebalancing [21] [22] [3], and the physical matrix and territorial projection of the new urban welfare.
These profound changes characterizing the new urban question lead to significant changes also as pertains to the meaning of the problems related to urban planning, the environment, and landscape [3], emphasizing the inadequacy of certain contextualizations and appealing – now more than ever, in the current situation of global health emergency – to the urgency of reacting with policies, strategies, and tools that provide integrated responses to the demands for environmental regeneration, social revitalization, and cultural and economic valorization of the city, giving priority to protecting the health and well-being of the communities, and combining quality of life with the quality of the urban environment.
Towards these ends, the integrating nature of the regeneration strategy, a central axis of a necessary national urban Agenda, raises the need to bring together and to render consistent not only all the policies that relate to governance of the territory [23], but also the policies aimed at protecting health, local policies and national and supranational policies. This raises the need for convergence and for close interaction between these two matters that are the object of concurrent legislation between the State and the Regions.
In this perspective, the search for a new welfare requires the implementation of a new conception that, through an approach marked by high levels of integration, interdisciplinarity, interscalarity, and iterativeness, might embrace this new dimension of the contemporary city, recovering meaningful relationships between the physical and the socioeconomic components of change.

2. Health and territorial government. Public policies and European community programmes

The characteristic of integration of the regeneration strategy, as defined by the European Community [18], is referred to by the European Urban Agenda [19], which articulates the 12 priority themes aimed at elaborating best practices as reflected in the policies for the promotion of the sustainability and efficiency of cities and territories from a *Smart* perspective [24], promoted by the European Commission, along with the specific financing programmes [25].
Moreover, the public policies aimed at marginal areas' participation in sustainable and inclusive development are a fundamental component of the 2020 Cohesion Policies [26] and represent a challenge for a competitive revitalization of cities and territories, in order to improve quality of life, mitigate poverty and exclusion, and offer employment, services, and accessibility – grasping with this the meaning of the global guidelines enshrined by the United Nations with the identification of the 17 Sustainable Development Goals, within the 2030 Agenda for Sustainable Development [16], in order to try out forms of innovation for improving living conditions, and for the cultural, economic, and social growth of communities.
In this framework, the new 2021/2027 community programme *Horizon Europe* [27] contributes an additional element of integration relating to the introduction of the principle of "health in all policies": with reference to the policies of territorial governance, this principle aims at guaranteeing a smart, sustainable, and inclusive growth of cities, by promoting salubrious environments, healthy life styles, and better and safer healthcare for all citizens.
The 6 Clusters in Pillar 2 have the specific goal of reinforcing the impact of research and innovation in the development, support, and implementation of EU policies.

In particular, the *Health Cluster* aims to guarantee the population's health in a rapidly changing society and territorial context «supporting actions aimed at better understanding of specific health and assistance […] and developing more effective solutions for health promotion and disease prevention», also through new tools, technologies, and digital solutions for greater accessibility and usability of the services that are offered.
The *Culture, Creativity and Inclusive Society Cluster* aims to foster greater understanding of a culturally and socially rich and diverse Europe, in order to benefit most "from adopting new paradigms and policies for change in a context of fast paced transformations and international interconnectedness."
The research activities envisaged by Horizon Europe are marked by a considerable dimension of experimentation, aimed at developing solutions of use for governing change, through the adoption of «interdisciplinary, inclusive, intersectoral, and comparative approaches, making it possible to identify the factors of change while developing innovative theories, specific indications, and policy recommendations».
The purposes of achieving – through cohesion, convergence, diversity, and creativity in the economic, social, cultural, and governance spheres – a fairer and more sustainable Europe are also in line with the recommendations in the EU strategic Agenda for 2019-2024 [28].
The integration between territorial governance policies and health protection policies pursued by the *Horizon Europe* programme finds a reference in the document *Health 2020: a European policy framework supporting action across government and society for health and well-being* [29], which summarizes the European policy model of the World Health Organization (WHO).
The strategic indications of Priority Area 4 "Creating supportive environments and resilient communities", particularly regard improving health and well-being in terms of reducing inequities in healthcare, strengthening public health systems, a focus on the person within assistance systems, the need to pursue fairness, sustainability and a high level of quality of life.
The World Health Organization, with specific reference to the issue of human health and well-being in the contemporary city, raises the need for «urban settings capable of continuously supporting and improving the physical environment and the social context, while encouraging the development of economic and social resources» [30] in the awareness of the multidimensionality of health, dependent upon the context and on the Social Determinants of Health [31].
These include, as incident factors, the living and working environment, and the built environment with its own specific features [32], as well as intangible elements like cohesion and social capital [33].
In the national setting, this integrated vision between local government policies and health protection policies is reflected in the *Recovery found/Next generation EU*, declined in the various countries in the *National Recovery and Resilience Plan* as well as in the main areas and in the research lines identified in the *2021/2027 National Research Program* [34] [35].
The *National Recovery and Resilience Plan* refers to different "missions" (digitization, innovation, competitiveness and culture, green revolution and ecological transition, infrastructures for sustainable mobility, education and research, social inclusion and cohesion, health) with the aim of defining integrated lines of action for rebalancing and modernization to address «the social and territorial inequalities that afflict our country and that the pandemic has helped to highlight» [36].
In particular, mission 6 (*Health*), focuses on the development of a territorial network that allows a radical change in health and social care through an integrated path of "proximity assistance and telemedicine" and the development of "innovation, research and digitalization of health care". In order to ensure «homogeneity in the provision of *Essential Levels of Assistance* (LEA), enhancing prevention and territorial assistance, improving the ability to integrate hospital services, local health services and social services» [37].

3. Urban welfare and "design disciplines": a new conception for an intersectoral and interinstitutional convergence

In the setting of generalized marginality connected with the new urban question, the outcomes brought about by the current situation of global health emergency highlight a worsening of the structural shortcomings of the contemporary city, causing negative impacts on settled communities. They also raise the need to implement policies, strategies, and instruments aimed at achieving the new urban welfare that provide integrated responses to the demands of environmental regeneration, of social revitalization, and of the cultural and economic valorization of the city, in accordance with principles of sustainability, to guarantee the rights to health, education, environment, public mobility, housing, and the city [15] [16].
In the setting of EU policies and of the new community programming, this scenario and, in particular, the demands connected to the need to achieve a new urban welfare, thus raise the urgency of a reflection focusing on the international scientific debate, research and experimentation, in structural terms and not merely from the perspective of emergency. They raise the need for an intersectoral and inter-institutional convergence between the matters of territorial government and protection of health

(letter m) art. 117, co. 2, Italian Constitution), with respect for the essential levels of services concerning civil and social rights, throughout national territory, exclusive competence of the State.
This convergence require an interaction between policies, traditionally characterised by a sectoral dimension: from policies to develop the settlement system and the infrastructure system, to those of protecting and valorizing the environmental system, from healthcare policies to cohesion policies, and on to policies for social inclusion and safety; from local policies of the “territories” to national and supranational policies.
This interaction should operatively require an integration of paradigms, regulatory and legislative apparatus; programmes; forms and contents of instruments; implementation mechanisms; performance parameters and indicators; prototyping; levels of governance; in order to give substance to the notion of urban regeneration, build the public city, and achieve a new urban welfare, while implementing a concrete policy of programming and producing services.
This is a policy that might overcome not only the inadequacy of the traditional tools, the procedural complexity and the conflicts of administrative and inter-institutional competences, and the lack of an overall territorial strategic vision, but also the conception of a standard linked to mere quantification and localizing distribution of areas for public services, in favour of their actual acquisition, development, management, and use [17] [38].
This convergence also require to putting into play a new conception that – through an experimental approach marked by high levels of integration, interdisciplinarity, interscalarity, and iteration – assumes the physical and territorial dimension as structural reference, in order to adopt the new dimension of the contemporary city, taking on both the need for an overall vision capable of interpreting the outcomes and potentials of regeneration after the phase of urban explosion, and the vision of a renewed relationship with detailed and diffuse planning and design processes.
The new conception conveys significant impacts on the social and ethical character of the “design disciplines,” and that forcefully express the need to review their cultural contribution even more than their technical one. This is done by rethinking their positioning within the process of the transformation of the territory, redefining the design statutes and the procedures by which the plan and design are developed, while encouraging them to take on a decisive role for offering responses in relation to the new environmental, social, political, and economic phenomena.
These instances are widely reflected, both in the centrality that the urban regeneration strategies play in the research and experimentation, dissemination and teaching activities of the Department of Planning, Design, Technology of Architecture (PDTA), of Sapienza University of Rome, and in the role it plays as an active and propulsive interpreter of the instances of change, as an interlocutor and pole of attraction, characterized by a capacity for proposal and action, as a place, a public space at the center of interactions with the urban and territorial context.
The reflection conducted by a research group of the Department of Planning, Design, Technology of Architecture, in the context of different research projects (note 1), fits into this framework, which, against with the current organizational model, and in keeping with the dimension of interaction and comprehensiveness of the new conception that requires grasping «the direct link between the productive and social transformations of the country and the repercussions on the cities and the territory» [39], pursues the goal of defining new perspectives and new theoretical-methodological and operative references, which recover significant relationships among physical/territorial components and socioeconomic components of change, between understanding and proposing.
This is with the purposes on the one hand, to achieve – through a global rethinking – a reorganization of the National Health System, for a definition/redefinition of a supply standard, in relation to the population to be served, that recovers a system logic and a capacity of integrated and efficient response within a network of services, capable of effective governance of assistance paths and with continuity of assistance [40]; and on the other, to implement – by grappling with the knot of a reform of national urban planning legislation – a law for territorial governance and for urban regeneration [14].
This is a reform of principles for a new planning system based on a structural conception, constituting the reference – reflected in an institutional seat of central governance performing an effective role of guidance – to join together all the policies relating to territorial governance, integrating them with the demands relating to health protection policies. It therefore guarantees a re-balancing among the various regional and territorial players, also from the standpoint of development and investment opportunities, thus restoring characteristics of homogeneity to urban planning regulations throughout the country.
These reforms have been invoked for years and today they must also deal with the request by some Italian Regions (as Emilia-Romagna, Lombardy and Veneto) (note 2) for further forms and particular conditions of autonomy, pursuant to co. 3 art. 116 of the Italian Constitution (the so-called “differentiated regionalism”) (note 3). It exacerbate the "center-periphery" clash in search of a difficult balance between the need for governance coordination and the regulatory power of the Regions.
A process that has also shown evident marks in the current pandemic emergency, and whose potential negative effects have been highlighted by a recent judgment of the Constitutional Court. The judgment clarified on the legislative power of the State in the matter of epidemiological emergency from Covid-19

stating that «[...] The regional legislator, even if endowed with special autonomy, cannot invade with its own discipline a matter concerning the Covid-19 pandemic, widespread globally and therefore entirely entrusted to the exclusive competence of the State, by way of international prophylaxis» [41].

4. Urban welfare and *Network of public services for health:* the physical-territorial dimension as a structural reference. The contribution of experimentation

From a methodological point of view, the territorial reorganization of the Italian National Health System requires, as mentioned, the adoption of an experimental and inductive approach, characterized by high levels of interdisciplinarity, interscalarity, iterativity and integration.

In particular, the integration, which is reflected in the choice of considering the physical-territorial dimension as structural reference, is made operational using the public city as a physical matrix and territorial projection of the new welfare, configuring it as an *Integrated network of territorial, hierarchical and inter-scalar distribution* to achieve a widespread coverage and territorial endowment, to guarantee the right to health for all local communities, as an outcome of the interaction between four main Networks, whose components constitute localization requirements and indicators.

The *Network of public services for health* (I), which is used as a reference for the other Networks, in keeping with the priority given to the right to health over the other rights, in order to increase the quality of health assistance and quality of life, level of efficiency of system for the community; the *General network of public services* (II), to maximize the performance of the *System of Networks* and to permit synergy among all the components; the *Infrastructural network for sustainable public mobility* (III), to guarantee accessibility, social inclusion, and sustainable healthy lifestyles; the *Connective green and blue network* (IV) for ecological efficiency and for the safeguarding of fundamental resources, for the quality and healthiness of the urban environment.

The interdisciplinary nature involves the use of different, complementary and interactive perspectives, in particular of three *structuring perspectives – urban planning perspective, building perspective* and *product perspective* – ascribable to the "design disciplines".

This structuring perspective are intercepted transversely, with a role of integration and of connotation, from *complementary perspectives*, first of all the *public health perspective*, as well as social, legal, energy sustainability, digital ones.

The structuring *urban planning perspective*, for all the identified planning and design levels, pursues the goal of defining theoretical-methodological and operative references for the reconfiguration of the components of the *Integrated network of territorial, hierarchical and inter-scalar distribution* and for each of the four Networks, mentioned above.

These references are expressed in terms of qualitative-quantitative and performance parameters and indicators that constitute inputs to integrate and innovate paradigms, legislative and regulatory apparatus; programmes, plans and projects; forms and contents of planning tools; with innovative outcome on planning components; on the uses within the existing city (functional mix between uses related to health and other uses, housing, private services, accommodation services); on quantitative endowments and sizing, also with reference to the implementation mechanisms; on the types of urban planning standards (Ministerial Decree n. 1444/1968); on governance levels.

This is with a dual purpose: on the one hand, to achieve a reorganization of the Italian National Health System, and on the other to the reform of national urban planning legislation, to implement a law for territorial government and for urban regeneration, which refers to a new integrated governance model, also with particular attention to the relationship between legislative profiles and administrative organization.

The interscalarity refers to 6 levels of investigation/design (*national, regional, vast/supramunicipal area, municipal, submunicipal/local, product*), responded to by different levels/competences of institutions and governance.

The nature of iterativeness configures a process articulated in phases, such that each phase constitutes a deeper analysis and verification of the previous one, and anticipation of the subsequent one.

The complex, cross-cutting nature of the issue requires an advance on several fronts and through a multitude of fields of investigation; it involves an approach articulated by phases, corresponding to the synthetic recomposition of the issues around 3 disciplinary needs – contextualization, operativity, experimentation – that account for the continuity between comprehension and proposal.

The inductive nature is substantiated through the examination of the contributions of the scientific-disciplinary debate and the research in progress, as well as the national and international best practices.

In this framework, the convergence between the matters of *territorial government* and *protection of health*, operationally declined in terms of integration/innovation of policies, paradigms, regulatory/legislative apparatus, tools, prototypes, and governance levels, finds a logical and methodological synthesis in the search of "*Simple welfare indicators"*, for the 8 *perspectives* and in correspondence with the 6 levels, for each of the 4 emblematic Networks for the achievement of the *welfare*, and operative references. And it finds also a synthesis in *"Complex welcome indicators"* in

correspondence of the components of the *Integrated network of hierarchized and interscalar territorial distribution*, outcome of the interaction between the 4 Networks.

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Notes

(1) Cf. Ateneo Sapienza 2020 Research *“Public city and new welfare. Urban regeneration for the right to health”*, Principal Investigation Prof. Alessandra Battisti, multidipartimental research group Prof. Marco Casini, Prof. Maurizio Marceca Prof. Bruno Monardo, Dott. Irene Poli, Prof. Laura Ricci, with Dott. Francesco Crupi. And cf. PRIN 2020 proposal “*WELCOM. Welfare and Community. Urban regeneration for the Right to Health”,* Principal Investigation Prof. Laura Ricci, Sapienza Università di Roma, Responsibles research unit Prof. Mosé Ricci, Università degli Studi di Trento, Prof. Francesca Moraci, Università degli Studi Mediterranea di Reggio Calabria, Prof. Niccolò Casiddu, Università degli Studi di Genova, Prof. Raffaella Fagnoni, IUAV di Venezia. Dott. Irene Poli and Dott. Francesco Crupi are part of the Sapienza unit.

(2) On 28 February 2018, the preliminary agreement on the so-called “Differentiated autonomy” was signed between the Government and the Emilia-Romagna, Lombardy and Veneto Regions.

(3) Pursuant to co. 3 art. 116 Italian Constitution, Regions with ordinary statutes can be given additional forms and particular conditions of autonomy, limited, however, to certain matters. In particular, for all matters currently under "concurrent" legislative competence, and for a limited number of matters reserved for the "exclusive" legislative competence of the State.

* Paragraphs 1 and 3 is attributable to Laura Ricci, paragraph 2 to Laura Ricci and Irene Poli and paragraph 4 to Laura Ricci and Francesco Crupi.

WORLD HERITAGE and DESIGN for HEALTH
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Built environment for hygiene and energy performances: a comparative analysis between studies at the turn of the 20th century and current literature

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Abstract
The actual pandemic of COVID-19 requires a paradigm shift from Emergency Actions to Risk Prevention. Recent studies have shown that the built environment (BE) could represent a strategic challenge in reducing future risk. In the past, epidemics had an important influence on BE changes. The hygiene studies on the "healthy environments", published at the turn of the 20th century, are particularly interesting: doctors, engineers, and architects worked together, focusing on light, ventilation, solar gains for new BE solutions. During the 20th century, the studies on BE systems turned the attention to the energetic issue of resources control. Today, the pandemic shock requires researching BE topics that could respond to hygienic and energetic issues. Considering hygiene studies published in Europe, we present a comparative analysis with current literature on the relationship between the BE and the spread of infectious disease. Focusing on air and sun effects, this paper aims to identify the BE parameters which influence the hygienic and energy performances, from urban to material scale. This work highlights that the past investigations can contribute to the current debate on new sustainable BE, considering innovation as historical continuum phenomenon.

Keywords: Built environment, Health benefits, Sustainability, Virus Transmission

1. Introduction
The current pandemic situation due to the spread of Covid-19 is causing essential changes in our societies and economies. In the first phase of the virus development, numerous emergency actions have been taken worldwide to reduce the spread (quarantine, social distancing, and closure of economic-commercial activities ...). Having overcome, if we can say so, the shock of the first spread, today the need for a new planning phase is increasingly clear, aimed at defining medium and long-term strategies to prevent the risks of the spread of new viruses. It is necessary to theorise a substantial paradigm change to ensure that the emergency-phase culture passes to the risk prevention-phase.
In this context, global data on the propagation of the Covid-19 virus show the close relationship between the spread of the virus and the built environment conditions [1]. It has also been shown that the high population density, which facilitates the accumulation of microorganisms related to indoor activities, and the hygienic and sanitary conditions of the environments, favour the spread of the virus [2].
The current crisis involving the poorest urban areas reveals not only the limitations of numerous buildings but also the weakness of a system that has too often forgotten the sustainable regeneration of the built environment [3].
This awareness leads us to consider the built environment as a crucial field to take up the strategic challenge of preventing the spread of future infectious diseases. The built environment, especially buildings, regulates the interaction between natural external parameters (sun, air, water, soil) and internal parameters, linked to the occupants' behaviour and how space is inhabited. This role of interface between the environment and the inhabitant brings the central question of good design of the built environment, be it urban, architectural, or constructive.
In this contribution, our attention is placed on two natural elements: the air and the sun, which significantly affect what we could define as the "passive intelligence" of buildings. With this notion, we

mean the building's ability to respond to the needs of comfort, energy performance, and healthiness through a series of natural principles and processes. This paper aims to identify geometric and construction parameters and technological solutions that contribute to the definition of the passive intelligence of the built environment as a key strategy to respond to current and future needs.

2. From the hygienic to the environmental instance

Tracing the history of the spread of epidemics, we can find, at different times, recurring social measures, such as quarantine and social distancing, which are once again very topical today [4-5]. The spread of epidemics has often had a significant influence on the definition of programmatic actions on the territory and solutions for the built space [6-7]. Past explorations and researches on the question of the healthiness of the built environment are numerous.

Particularly interesting are the first approaches to the issue of hygiene and healthiness at the turn of the 19th century. In this period, the early studies on the *milieux favorables à la santé* (healthy environments) [8] met with great success. The unhealthiness denounced by hygienists throughout continental Europe, — as well as the impulse of the medical discoveries of Koch et Pasteur on the bacterial origin of certain diseases such as turberculosis and cholera — have favoured the research on the contribution of architecture and engineering to the healthiness of homes and cities.

This transdisciplinary approach to the question of the health of buildings was already present in Roman times if we think of the works built by the romans to preserve the health of citizens, such as aqueducts and sewers. Several Roman authors, including Tacito and Varrone, report in their writings some prescriptions on the width of the roads, the sun exposure, and the need for ventilation [9]. In the first century BC, in his *De Architettura*, Vitruvius wrote about the knowledge that the architect must have (*medicinae non sit ignarus)*. For Vitruvius, the architect did not have to have "necessarily" the knowledge of Hippocrates (*nec denuo medicus ut Hippocrates*), but he had to know "the inclinations of the sky" and what the Greeks called "climate and influence of the air, healthy and use of water" [10].

Although there are numerous studies from the medieval period on the question of the healthiness of buildings, the period that most characterises the creative fervour of research in this field is certainly the end of the 19th century. During the period of *Hygiénisme*, doctors, engineers, and architects worked together on projects for the transformation of cities that would respond to the health concerns of the time. France, and in particular Paris, pioneered this attention to the health of the city and the home with the establishment of the first *Casier sanitaire des maisons* in 1884 and the creation of the first academic courses in hygiene and health of the building in the *Ecoles des Arts et Metiers*. On December 6, 1902, at the amphitheater of the *Ecole des Beaux Arts* in Paris, a conference was held on the theme of the "fight against tuberculosis, its relationship with the art of the architect, engineer, and technical industry". During this conference, the need for a porosity of knowledge from the medical field to the architectural field was affirmed for the definition of intervention strategies for reducing the risk of epidemics [11]. Emile Trélat, professor at the *Conservatoire des Arts et Metiers* was among the few architects to actively participate in the work of the *Societé de medicine publique et de génie sanitaire* [12].

Italy experienced great development in research on hygiene and healthiness in the last decade of the 1800s. In 1888, the *Scuola di perfezionamento d'Igiene pubblica* was inaugurated in accordance with the law on the protection of public health, known as the "Crispi - Pagliani Law ", which was the first major Italian health reform [13]. In January 1890, the magazine *Ingegneria Sanitaria* published its first issue in which the engineer Donato Spataro wrote the editorial entitled "On the institution of health engineers in Italy". Spataro claimed the rights and aspirations of the "Health Engineering" discipline, highlighting the separation of competencies from "Hygiene Medicine". At the same time, the author looked with satisfaction at the opening of the "sister" sciences (Architecture, Agriculture, Hydraulics) to the question of the "rehabilitation of inhabited places, understood in its broadest meaning" [13]. Reading the research and scientific articles published in Europe at the turn of the 19th century allows us to retrace the debates of the time on the ability of the built environment to fight against the spread of epidemics and prevent risk. These studies present not only the short, medium, and long-term strategies but also the solutions and interventions to achieve the goal of city rehabilitation and healthiness in the home.

The hygienic question linked to the built environment remained a major concern until the discovery of penicillin (1920) and its mass use in the 1940s. The post-war socio-economic context and the need for economic construction for rapid urbanisation have determined the decline of the reflection on the correct management of natural factors 'favourable to the healthiness' of the built environment. We have to wait for the oil shock of the early 1970s and the energy crisis that followed for the issue of managing natural resources in the service of construction to become topical again. Even if the levels of reflection on the control of natural resources for the built and the city seem very similar over time, starting from the 1970s it is no longer the hygienic request that moves the reflection but the energy one. While in the period of the hygienists, the goal was to heal cities and homes, from the 1970s the main issue became the control of resources and the reduction of energy consumption in the construction sector.

In this historical continuum, today, the health emergency caused by Sars-Cov-2 virus directs reflection on a double track, the hygienic-sanitary one and the energy and ecological one. Starting from these

considerations, the question of this study is how these two instances can convince in the coming years. Which strategies and measures related to the built environment are the most suitable to satisfy them?
To answer these questions, our analysis develops on three levels:
- The urban scale, which deals with the problems inherent in insulation and ventilation, depending on the width and orientation of the streets with respect to the height of the buildings;
- The building scale, which concerns geometric factors, such as the shape and arrangement of the openings in the building envelopes;
- The scale relating to materials and construction systems, which deals with the materials used from a physical, hygienic, and thermal point of view.
Through a compared analysis of hygienists and current literature, in the following paragraphs we will highlight which parameters of the built environment have an influence on the spread of infectious diseases, and what are the consequences on the energy performances.

2.1 Urban Scale

“Air is the great provider of life. Breathe is live; Expire is die. I don't surprise you by calling the air the first factor in health” [8]. With these words, today more relevant than ever, Emile Trélat began his speech presented on 19 July 1889 at the international universal exhibition of the same year in Paris [8].
Gaston Trélat, the architect of the superior council of France, dedicated a contribution on “Atmospheric health in the city” published in 1907 to the theme of ventilation in the city. According to G.Trélat, the cause of the spread of infectious diseases in urban areas is to be found in the lack of freedom of movement of the air [14]. The ventilation promotes healthiness: the movement of the air can be vertical and horizontal; the first promotes the purification of unhealthy air, while the horizontal air currents maintain soil contamination and promote the propagation of germs. G. Trélat identified the cause of the lack of "fresh air reserves" in the city in the process of agglomeration of the inhabited centres and in the "fragmentation of parcels" in progress at this epoch. The explanation is purely geometric: on a ground surface of the road, we can build an imaginary volume delimited by the vertical walls of the buildings and by a horizontal plane defined by their height; the healthiness of the air is proportional to the surface of the ground and inversely proportional to the height of the buildings. The geometric parameter considered is the ratio between the height (H) and width (W) of the buildings. The higher this ratio is, the more vertical surfaces are offered to “conservation of contaminated elements” [14]. Today this relationship is defined through the concept of urban canyon, a geometric abstraction of urban space used in climatology to describe how urban spaces create particular environmental conditions. The measure indicated by G. Trélat for better healthiness of the air and a reduction in the spread of diseases is a new urban spatial organisation, with the creation of green spaces. He proposed the increase of "empty surfaces" to allow "the intervention of the atoms of pure atmosphere and, thanks to the winds, the purification of the terrestrial air".
On the issue of exposure to prevailing winds, the Italian engineer Spataro in his manual *Architettura Sanitaria* published in 1908 gives us the principles of good exposure: the building had to be oriented in such a way not to be touched by winds perpendicular to the longer walls but tangentially. This orientation ensured the intake of internal air and ventilation thanks to air flow on the walls [15].
If we analyse the order in which "hygienists present, according to the importance they attribute to them, the healing factors capable of ensuring the healthiness of habitations" [16], sunshine is always mentioned among the top positions. The sun “acted on health” in two ways; on the one hand, through the beneficial action of the light from a physiological point of view and visual comfort, and on the other, with the bactericidal power of solar radiation. The specialist literature shows the fervour of the debate on the numerous rules for calculating the right distance between the buildings in relation to the orientation of the roads and exposure to sunlight. E. Trélat prescribed two different values for the W / H ratio, depending on whether one considers “access to light in buildings” or "access of walls to solar radiation " [17] (Fig. 1). In the first case, the W / H ratio had to be equal to 1.5 to ensure “a beneficial portion of the sky”, including, according to Trélat, between 30° and 70°; in the second case, the factor had to be equal to 2 for the meridian streets (east-west orientation) and 4 for the equatorial streets (north-south orientation). These values refer to the rule of the German doctor Vogt who was the first to deal with the issue of solar radiation in homes, calculating the W / H ratio as a function of the angle of incidence of sunlight and the orientation of the streets [18].
The Italian Passaro, in "The sunlight in the house" published in 1893, in the magazine *Ingegneria Sanitaria*, proposed a formula for calculating the "minimum unit distance", defined as the distance that, in a given place, is necessary between the obstacle and a point considered, so that the sun's rays intercept it. Using this parameter defined as a function of latitude, Passaro calculated the minimum width of the streets to ensure the sunshine of the ground floor of the buildings facing east and west at the winter solstice or the most disadvantageous moment [18].

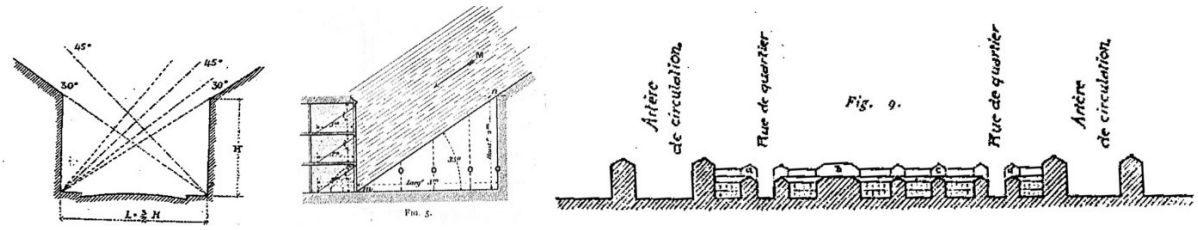

Fig. 1: Studies of the relationship between building height (H) and street width (W) by Trélat [17].

In this way, Passaro demonstrated that the prescriptions given by Trélat and Vogt on the W / H ratio were too severe to be applied. The Vogt rule and the measures proposed by E. Trélat were also strongly criticized by the engineer Raddi, who published three articles in *Ingegneria sanitaria*, dedicated to the W / H ratio [19-20]; "Eng. Trélat who formulated this conclusion, however, does not tell us that its realization must be the ideal plan for the city in the future". "The fact is that some scientists, who can combine mathematics with hygiene, have become too carried away by the seduction of numbers. The calculations are of irrefutable correctness; only they cannot always solve all the elements from which the problem to be solved is constituted" [19].

Urban areas are the focus in the most recent specialist literature on the spread of infectious diseases. The urban structure, the high population density, and the pattern of mobility (public transport) are the key factors for the increase in contacts between people and therefore the spread of infectious diseases [21-22]. Data on the spread of the Sars-Covid virus report that metropolitan areas, such as Milan, New York, Paris, London, have been the most affected by the virus, especially in densely populated areas. In addition, there is the issue of air pollution in cities, initially considered one of the causes of the greatest spread of the epidemic. The increase in covid-19 mortality supported this hypothesis, with a world average of 15% in urban areas with a high rate of pollution [23]. In reality, there is no certainty of a cause-effect relationship between urban pollution and mortality, but some recent research proves that prolonged exposure to pollutants would aggravate the comorbidities, causing the highest mortality. On the other hand, a recent Italian study has recently shown that atmospheric particulate does not favour the spread of covid-19 into the air [24].

2.2 Building Scale

The building is the built habitat where we spend most of our time. A large part of the hygienists' studies is dedicated to the "house", to the morpho-geometric characteristics of the spaces and constructive components (windows, perimeter walls) in relation to their hygienic performances. The explorations made on the possibility of reducing viral agents in closed environments are particularly interesting. Among the reported causes of the unhealthy houses, the stale air inside was the focus of research.
The belgian professor Knapen identifies two main causes of alterations in the air in closed spaces [25]. On the one hand, he cited the number of occupants who they produce "carbonic acid" with respiration and transpiration, on the other hand the "fermentation of building materials" during their life cycle [25].
In Contribution de l'architecte à la salubrité de la ville, E. Trélat wrote, "The small portion of the atmosphere that houses close quickly becomes deadly. It must be continually renewed, and this implies permanent communication with the outside" [8]. In *Questions de Salubrité* he dedicates a paragraph to the "Temperature and air regime" in which he reports the conditions for ensuring the healthiness of domestic spaces. "To feed the inhabited rooms with healthy air, it is necessary to put them in direct communication with the external atmosphere and arrange things in such a way that this communication is proportional to the consumption of air that will be made inside, or to the number of inhabitants" [17]. This need to exchange indoor air "always hot, or unhealthy" with "dense, or healthier" external air leads hygienists to seek innovative technological solutions capable of ensuring "free ventilation", called today "cross ventilation". This type of ventilation is based on the arrangement of the openings on the envelope in order to create the pressure difference necessary for the movement of air.
Although the good positioning of the windows on opposite walls to ensure cross ventilation was considered a good practice, both Trélat and Knapen highlighted the limits of its effectiveness, caused above all by the incorrect behavioural practices of the inhabitants. In fact, if in summer, "when the weather is mild, it takes neither great science nor long experience to open the windows and put the room in relation to the outside air" [17], in winter "open windows would provide an exaggerated cooling with an intense loss of heat " [16]. Knapen also criticized the prescriptions of the time on the ratio of 1/6 between the surface of the openings and the surface of the floor; he believed that "these methods of aeration, considered sovereign" were imperfect in functioning and insufficient in efficiency. In addition, the positioning of the windows on opposite walls created a "storm of air" that harms comfort, while the positioning on one side of the house did not ensure the right exchange rate [25]. The literature presents us with numerous technological solutions proposed to ensure proper ventilation (Fig.2). Knapen

criticized such systems because of the small volume of air exchanged and the annoying currents they could cause. The solution proposed by Knapen, patented on October 26, 1921, was based on the principle of "differential horizontal ventilation". Each room must continuously remain in contact with the outside through air intakes; the latter have different sections depending on the level, they must be positioned at different heights, they must not be aligned vertically and preferably they must be on different orientation walls [25] (Fig.2-g).
Another aspect considered essential for ensuring hygiene in the home was the way in which sunlight penetrates and spreads indoors. The first element taken into consideration was the orientation of the buildings. In general, it was agreed that the east-west orientation of the buildings was to be preferred in the cold climate areas, while the north-south orientation in those with a warm climate [26].
A second factor taken into account was related to the distribution and shape of the openings on the envelope. Trélat dedicated a chapter in *Question de salubrité* to the "Window, as a source of light in the house", because "it puts a good mood which is the moral health of man" [17]. He considered two types of "progressions of light", the zenithal one that "falls vertically along the walls and does not penetrate into the houses" and the "celestial" one, coming from the horizon that penetrates deeper". According to the morphology of the rooms, he enunciated the rule "principle of maximum elevation of the lintel". Trélat argued that for the same window area, it is more convenient to increase the height rather than the width in order to capture the zenith light, more useful for its bactericidal action [17]. Knapen downplayed the importance of the "bactericidal power" of sunlight in the house mainly due to the "bad habits", the numerous curtains and shutters, and all the obstacles that the inhabitants put up because "they defend themselves from the sun as from an enemy" [16].
In Italy, the architect's manual, published by Donghi, reported the regulations of the time established to ensure proper light penetration into homes. Three geometric parameters were considered: - the opening angle, formed by the tangents to the lintel and the tangent to the ridge of the opposite building; - the elevation angle formed between the tangent to the edge of the lintel and a horizontal line; - the free opening angle formed by the tangents to the lintel and the base of the window [27].

As in the period of the hygienists, recent literature dedicates an important space to the building as a vehicle for transmitting Covid-19 to humans. A determining factor, today as yesterday, is certainly the population density. The high occupancy rate and indoor activities facilitate the accumulation of microorganisms associated with humans [28-29]. The architectural design of interior spaces greatly influences human behaviour and interactions between individuals by encouraging their closeness or isolation [30]. Recent research on the spread of Covid demonstrates the close link between the spread of Covid and some elements of the built space [31]. This is considered a vehicle for the transmission of infectious diseases: when individuals carry out activities in closed spaces, direct and indirect contact with the surrounding surfaces facilitates the transfer of viral particles. These can settle on surfaces or remain suspended in the area and then resettle again on the fomites [32]. In continuity with the studies at the turn of the 1900s, indoor air ventilation and sunshine are two aspects on which some current research concerning the spread of Covid is focusing [32].

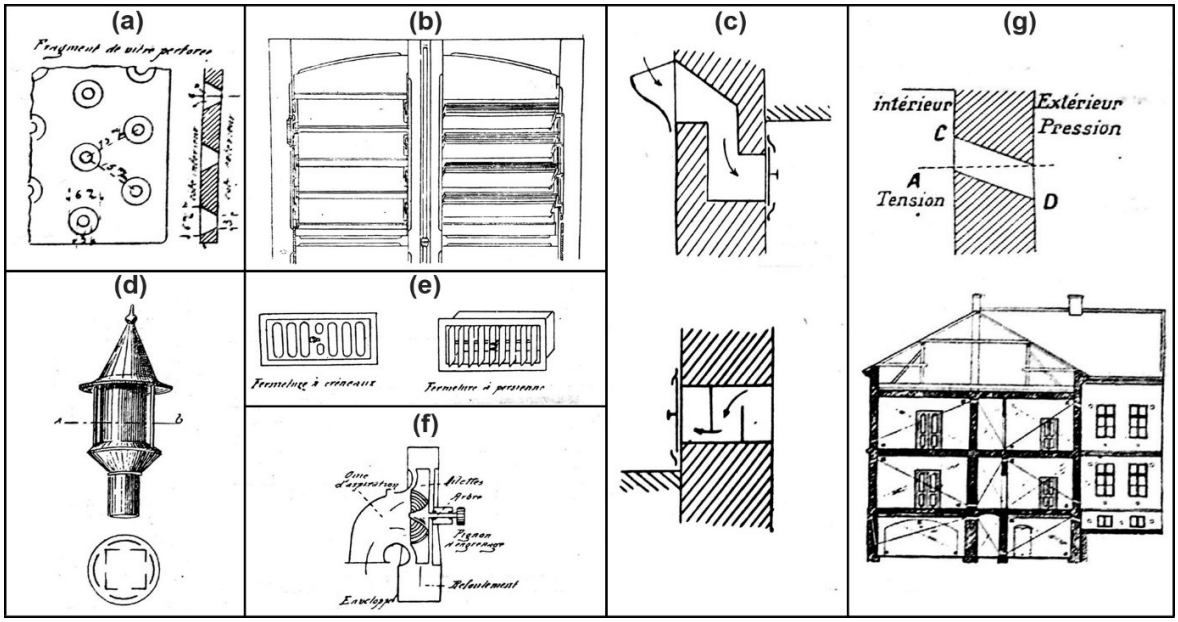

Fig. 2: (a) Perforated glass (Trélat), (b) aerators or shutters with movable blades (Guzzi),(c) air intakes in the ceiling (above) and in the floor (below), (d) extractors (Trouvay and Cauvin), (e) types of closures, (f) centrifugal fan, (g) “differential horizontal ventilation” device (Knapen). [16]

In fact, ventilation is considered a fundamental variable for reducing the risk of virus transmission, reducing the residence time of the virus inside buildings [1]. The exchange rate of internal air with external air in buildings can facilitate the dilution of viral particles present in the air [1]. Ventilation can be ensured by properly designed HVAC systems to ensure adequate internal air exchange by increasing the external airflow. Although it has been shown that the filters present in HVAC systems do not allow blocking too small viral particles, the literature reports that a reduction of the risk is possible, taking some precautions to avoid the possible risk of cross-infection caused by convection cells, and the lack of frequent replacement of filters [33]. On the other hand, increasing the flow of incoming external air to ensure proper exchange could increase energy consumption. Opening the windows is one of the most repeated recommendations during this pandemic. The natural ventilation through the building envelope ensures the exchange of the internal air volume per hour, thus eliminating any viral particles present [34]. The World Health Organization also published in 2009 guidelines for the control of infections through the application of systems based on natural ventilation [35]. Some recent research investigates the effect of sunlight on reducing the spread of covid. It has been shown that, in addition to the physiological benefits related to visual comfort, daylight in both ultraviolet (UV) and visible spectral ranges has the ability to reduce the vitality of viral agents [36]. Although the World Health Organization has declared that there is still no evidence of the effect of sunlight on SARS-CoV-2 [37], some studies on influenza viruses have shown that the latter is sensitive to sunlight [38].

2.3 Material Scale

The study of building materials from the sanitary-hygienic point of view constitutes an important part of the research of the period of the hygienists. For the first time, the ability of a material to be a means of transporting heat, humidity, and pollutants was studied with experimental methods. The intrinsic characteristics (physical, chemical, and biological) of building materials made it possible to define the ability of a material to maintain a healthy environment or, on the contrary, to favour its unhealthiness. Among the parameters taken into consideration were porosity, permeability to air and water, thermal conductivity.

Donato Spataro dedicates several articles to construction materials published in *Ingegneria Sanitaria*. He reports the main physical and technical characteristics of the materials and analyses their empirical and numerical methods for quantification [39]. He paid great attention to porosity, defined as the relationship between the apparent volume and its actual volume of a material. The air capacity, or the volume of pores, is linked to it. Starting from the assumption that “any building material permeable to air must be porous; but not all porous building materials are permeable ", Spataro stated that air permeability "depends and concerns porosity not absolutely in the sense of the quality and degree of the same, but mainly, in the sense of the homogeneity of the porosity itself " [39]. Trélat dedicates a chapter in *Questions de salubrité* to the study of the “Porosity of materials”. Starting from the research of the German Petterkonfer, who in 1851 experimentally demonstrated the existence of porosity in relation to air and water permeability, Trélat focused on the action that the porosity of the walls exerts on the healthiness of homes [17]. The debate concerned the possibility of air exchange between the internal and external environment, defined at the time as "interstitial ventilation", thanks to the air permeability of the materials [26]. The question was dealt with in several international congresses without however reaching a conclusion. Trélat wrote: "Having proved the porosity of the walls, some (researchers) think that we must fight its effects by doubling the waterproofing of the internal surfaces; others believe that our walls must preserve the communication they ensure between the internal and external atmosphere. Where is the right idea?" [17]. By calculating the volume of air exchanged through the walls of a room, Trélat, while downsizing the importance accorded to interstitial ventilation, defended the use of porous materials. “Even if the cubic ventilation of the internal (spaces) does not bring significant advantages to exchange of internal stale air, in porous walls, the external atmosphere penetrates from one face of the wall, while, at the same time, the internal atmosphere enters from the other face and deposits all the dirt of the air inside. The meeting gives rise to a cold combustion that fights and ceaselessly cancels the infection of the wall " [17].

Water permeability is also linked to the porosity of the materials. In 1908, Knapen published a manual dedicated to moisture and its effects [40]. He explored the characteristics of the materials, the constructive solutions of the walls and the consequences on healthiness in the home [40]. Strongly critical of some technological solutions against humidity of the time, Knapen particularly hurled himself against the horizontal insertion of an insulating material in the wall to prevent the rise by capillarity [41]. He insisted on the need for the thermo-hygrometric characterisation of the materials and construction components, as well as the knowledge of the hygrometry of the environments to determine the health of a building and identify possible solutions. In addition to the negative effects related to the development of fungi, condensation, and other pathogens, for Knapen, the presence of moisture in the building elements and in the ambient air has a negative effect on the possible bactericidal action of the sun's rays. "In certain sunny environments, when red sun rays (long wave) penetrate instead of ultraviolet rays (short wave), these infrared rays make these environments sensitive to infection, favoring

fermentation and the development of bacteria or microbes. The factor that causes this development is a simple saturation, caused by humidity, to a slightly higher degree than the ambient air ". To sanitize the materials, Knapen indicated the removal of moisture from the walls by detailing the description of different proposed techniques [40].

The issue of ambient humidity and the role it has on the survival of viruses, including the Cov, has also been studied recently. Some research has shown that at certain temperatures, high relative humidity of the internal environment, higher than 40%, reduces the dispersion of viral particles in the air [42-43]. The hypothesis is that moisture can change the membrane morphology of lipid-enveloped viruses, such as covid, causing their rapid inactivation [44]. At the same time, humidity above 80% could lead to the creation of molds that are harmful to health [45]. Some researches propose the maintenance of relative humidity inside the houses between 40 and 60% to limit the spread of virus, reducing the risk of mold and ensuring the comfort of the occupants [46].

3. Discuss

In the previous chapter, we highlighted the intimate relationship between the analysis of some parameters of the built environment and health benefits. Among the parameters, there are the conditions of exposure of the buildings to prevailing winds and solar radiation, the ratio between the height of the buildings and the width of the streets, the arrangement of the openings on the envelope, the ventilation systems, the physical characteristics of the material, the composition of the walls...
Since energy needs have forced construction actors to act to reduce the energy impact, these same parameters have formed the basis of the principles of bioclimatic design. Bioclimatic architecture can be defined as an architecture consistent with the needs of environmental protection, whose objectives are the reduction of thermal losses of buildings, the control of natural thermal inputs, and the reduction of environmental impact. The possibility of reducing energy consumption and CO2 emissions motivates the growing importance given to the optimisation of the morpho-geometric and material-construction parameters in relation to natural factors. Many researches link the compactness of the building, the solar access, and the exposure to winds of urban fabrics with the increase in the intensity of the heat islands, a phenomenon of temperature rise in the city, which also has an impact on the energy consumption of buildings [47-49]. On an architectural scale, there are numerous researches that investigate the possibility of using passive systems, such as the correct arrangement of the openings to favour natural ventilation — by cross or chimney effect; the correct distribution of internal spaces for the control of thermal inputs; the use of technological solutions capable of controlling solar gains... Increasingly powerful and accessible digital simulation tools have allowed an ever-greater development of research on the optimisation of the parameters of the built environment, with respect to energy and environmental objectives.
In Figure 3, we wanted to bring together the identified parameters, highlighting the measures and benefits from a sanitary and environmental point of view. This table is certainly not exhaustive, but it represents a basis for reflection for the determination of strategies inherent to the built environment capable of responding to both health and environmental issues.

4. Conclusions

The current pandemic questions health, as the essential objective of the reflections concerning the definition of strategies for its preservation. In this context, the analysis of the morphological, construction, and material factors that characterise the built environment can be essential for identifying precise solutions capable of improving the quality of the built spaces — existing and yet to be bult — in terms of comfort, energy performance, and healthiness. By reading the scientific publications of the period of the hygienists in Europe and the recent publications on the correlations between BE and the spread of the virus, we were able to identify, albeit in a non-exhaustive manner, the parameters that influence the hygienic-sanitary and energy performances of the built environment from the material-constructive scale to the urban one. This journey through time has allowed us to explore very similar reflections in history, contextualising them with respect to different needs and socio-economic conditions.
Below we limit ourselves to highlighting some fundamental conditions for defining intervention strategies in future BE:
- The development of innovative technologies. The revolution brought by digital technologies, just think of BIM and parametric tools, allows us to imagine innovative solutions for BE, guaranteeing an informed process for the design and control of their effectiveness over time.
- The need for collaboration between different skills in order to implement a transdisciplinary approach for the definition of strategies, with a view to a sustainable and ecological system;
- The awareness of the need for a change of paradigm by the community in order to define a new "participated" way of building durably.

	Built Environment parameters	Health Benefits	Sustainability
Urban Scale	Streets Orientation (wind)	- Increased ventilation and air purification in the city	- Reduction of the heat island - Good bioclimatic and energy performance
	Streets Orientation (solar radiation)	- Bactericidal action (Hygienist Literature) - Visual comfort (natural sunlight)	- Reduction of the heat island - Good bioclimatic and energy performance
	H/W (ratio between building height and street width)	- Possibility of setting up cycle and pedestrian path - Increased ventilation and air purification in the city	- Good bioclimatic and energy performance - Increase mobility and reduce carbon emissions
	Green Areas and urban open spaces	- Public health - Increased ventilation and air purification in the city	- Reduction of the heat island - Biodiversity
Building Scale	Bulding Orientation (wind)	- Increased air exchange rate - Reduction aerosolised particles inside	- Good bioclimatic and energy performance (Passive ventilation systems)
	Building Orientation (solar radiation)	- Bactericidal action on facades (Hygienist Literature) - Visual and thermal confort	- Good bioclimatic and energy performance (Passive solar systems)
	Distribution and shape of the openings on the envelope	- Increased air exchange rate - Visual and thermal comfort	- Good bioclimatic and energy performance
	Floor space per inhabitant	- Preventing the transmission of infectious disease between occupant	- Well-being and comfort of the occupants
Material Scale	Air permeability	- Interstitial ventilation (Hygienist Literature) - Reduction residence time of pathoges	- Good bioclimatic and energy performance
	Water Permeability	- Moisture prevention - Reduction of the formation of pathogens	- Good bioclimatic and energy performance
	Surface texture	- Reduction residence time of pathoges	

Fig. 3: Potential benefits (health and sustainability) of built environment parameters

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WORLD HERITAGE and DESIGN for HEALTH
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Enhancing the consolidated public space for social well-being. Interventions on the historic centre of Trecastagni, Sicily

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Abstract
Enhancement means taking actions aimed at giving value. It is a cultural operation that can promote conservation interventions, reserved for the maintenance of the place. In smaller urban contexts, the value is represented by the whole and the enhancement has objectives focused on public heritage.
Today, enhancement connects the past with the future and provides an occasion to highlight the tangible and intangible resources safeguarded by such heritage.
Public space is the social space; it exists in any urban, suburban or rural reality. Public space is able to influence the psycho-physical well-being of man, but also social well-being, made of meetings, distraction, socialization.
The study aims to highlight how the enhancement of an existing public space can positively affect the well-being of man. The spasmodic search for places outside the house, where to spend peaceful hours, makes the public space the perfect element for social well-being. The case study is Trecastagni, a small town near Catania, Sicily, Italy, at the foot of Mount Etna. The city has an interesting old town consisting of small palaces built almost all after the earthquake of 1693 and beautiful churches even older.
This research is aimed at retrieving the urban space in the existing place, to bring out the memory and identity that time has made us forget, but also to create an attractive and inclusive place, but also to give life to a community and its heritage, promoting sociality, well-being, relaxation but also life, the economy.

Keywords: recovery, sociability, community, materials.

1. Background

1.1 Enhancement

Enhancement concerns actions that increase value. These are cultural operations that can promote conservation interventions on cultural and building assets. Enhancement deals with the physical data and its transformations, its functionality and usability. In general, valorization means increasing the value of a cultural asset, but above all "putting an asset into value": it wants to improve the ways of perceiving the cultural value and it is an activity destined to increase the public use of the good. The Italian legislation, the Cultural Heritage and Landscape Code in particular, writes that «exploitation shall consist of a set of functions governing all activities, promoting knowledge of the cultural heritage and ensuring the best conditions for the public use and use of the heritage, including by persons with disabilities, to promote the development of culture. It also includes the promotion and support of measures to conserve the cultural heritage, to redevelop buildings and protected areas which have been compromised or degraded, to achieve new, coherent and integrated landscape values» [1]. It is necessary to increase the actions of valorization towards the use of Cultural Heritage to recreate, revive and promote a conscious cultural identity; for this reason, it is essential to stimulate the sense of belonging in the citizenship. It is a matter of awakening the value of belonging to individual communities and of considering it an identity value for the territory. The actions supported by the Enhancement are the protection, the usability, the management. These actions must preserve the asset from harmful actions. The birth of a sense of belonging, of identity, of community leads to treat the good with particular

sensitivity, without economic and building speculation. The community protects the asset from transformations and improper uses. Economic processes of rebirth can manifest themselves only after the creation of a sense of belonging.



Fig. 1: Trecastagni old town and the Matrice church.

The usability of the property provides for actions to recover the cultural asset (redevelopment, reuse, regeneration); the recovery project must consider the will of the community, its desires, its aspirations. Today, we choose economic strategies that promote the self-sustainment of cultural heritage.
Management is the last stage of the enhancement process and it is also the most delicate. Laws encourage private entrepreneurship which is more dynamic and faster and can create original and innovative active forms.
The enhancement has different objectives depending on the scale to which you work. The context of the research is Trecastagni, a small country on foothills of Etna territory, in the Catania district; its value is represented by the whole of the building and landscape assets and the enhancement gives importance to a well-defined and circumscribed architectural heritage.
Today valorization connects the past with the future and provides an occasion to highlight the tangible and intangible resources safeguarded by such heritage.

1.2 Public space

Public space is every place of public property or public use, accessible and usable by everybody, free and non-profit. Each public space has its own spatial, historical, environmental, social and economic characteristics. Public spaces are a key element of individual and social well-being, places in the collective life of communities, expression of the diversity of their common cultural and natural heritage and foundation of their identity, in line with the European Landscape Convention [2]. The community recognizes itself in its public places and pursues the improvement of their spatial quality. Public spaces consist of open spaces (such as streets, sidewalks, squares, gardens, parks) and covered spaces for the benefit of all (such as libraries, museums).
Public space is «a privileged place of relations, both social, economic, productive, both physical mobility and communication» [3] and allows the meeting. Public space is a social space, the space that exists in any urban, suburban or rural context. In the past, the public space was the space of representativeness and community of intent: often a square overlooked by the most important buildings.



Fig. 2: Sicily, Catania District, Trecastagni old town.

Today, public space represents the improvement of citizens' quality of life. it can influences the psycho-physical well-being of man (think of the urban parks where you can do sports), but also social well-beiung because it creates meetings, distraction, socialization.
Without these convivial spaces, cities and villages are only groups of buildings that do not allow the meeting.
The importance of public space, which has gradually grown during the transformations that the city has undergone, is expressed in the improvement of the quality of life of those who frequent these places. Public space is able to influence the psycho-physical well-being of man (think of urban parks where you can do sports), but also social, made of meetings, distraction, socialization.
Public space is also a place of information, of exchange of news, of knowledge of other realities, of participation in community life; it is recognized in public places and seeks the improvement of spatial quality.
For several decades now, a big problem is giving back to man the space he needs, is using a space without becoming a passive victim; It is necessary to bring back to the very heart of our culture the creative strength and autonomy that have been lost many times in the history of architecture. We must rediscover a human model, a human measure, a human rhythm and above all a human purpose; these must transform our activities and enrich them with values and meanings.
Today the idea of public space in the contemporary city is more fragmentary, composed of empty spaces[4] while the meeting places are the shopping malls. In the consolidated city, however, the public space is still appreciated, admired and chosen as a meeting place.
Public spaces are places with particular spatial, historical or social characteristics, they are places of memory, spaces representative of the urban landscape, with a determining role in the image of the city [4].
Today, the desires of communities are strongly directed towards the public space, on which is poured the desire for collective life, leisure, distraction from the stress of working life. There is a desire for the so-called urban interiority, consisting of a set of ways of seeing spatial configurations, to produce well-being.


Fig. 3: Trecastagni old town and the Matrice church.

An interesting model of public space is the model of sociality, designed by Jane Jacobs, based on the presence of people who are different from each other in terms of culture, origins, habits, who are committed to accepting each other [5]. In it and in its evolutions prevails the perspective of the user, the human-oriented approach in which the presence of the citizen is fundamental for the success of the intervention. Architecture must go hand in hand with the social sciences in order to be able to design with the inhabitants, to bring attention to the human scale, to the user, to the one who knows how the space wants. And it's not just about aesthetic opinions, it's about satisfying the needs of citizens in a given context, stimulating them with innovative elements but always starting from their desires, to make them feel good, for social well-being.
In this sensitive context, there are some very precise demands related to the class of safety requirement; they concern the safety due to traffic, the need for accessibility for all people, including those with disabilities, to which is added the demand for spaces of aggregation and relationship with attractive qualities and comfort (urban).
In general, being reunited in the same place gives rise to socio-cultural relations that are the essence of the city [6]. The urban space is defined, therefore, as a large area crossed by flows, in which different social groups meet to define their own cultural, political, religious and social identity. A space that is part of everyday life and that is strongly identity.

1.3 Social well-being

The influence of social context and social factors on health and well-being has long been recognised as important for overall well-being. According to the World Health Organization (WHO), health is «a state of complete physical, mental and social well-being and not simply the absence of disease or infirmity»[7].

The study focuses on social well-being, which can be defined as «assessing the quality of the social relations of the individual within their own community and society and their own functioning within them» [8].
Mcdowell and Newell (1987) define social welfare as the totality of the relationships between one individual and the others, between one individual and the institutions, between one individual and the social rules. The relationships that can be established produce social adaptation and adaptation to the environment [9].



Fig. 4: Trecastagni old town, areas of interventions.

Another important concept is the sense of community, it includes:
• the sense of belonging that is the sharing of ties with others,
• influence, that is the conviction of being a vital member for the community,
• the integration,
• the shared emotional connection.
Keyes (1998) paid more attention to the social well-being of the individual within his own community. According to the author, social well-being is "the assessment of one's own living conditions and one's own attitude in society"; this is how social integration is carried out, this is the assessment of the quality of one's relationship with society, social acceptance, this is the feeling of trust in others and the feeling that people are capable of kindness, the social contribution, this is the evaluation of their social value, or of being an important member for the community, finally, social coherence which refers to the perception of quality and the organisation of the social world [10].
Another important concept is the sense of community [11] which includes the sense of belonging, that is the sharing of ties with others, the influence or the conviction of being a vital member for the community, integration and satisfaction of needs, and the shared emotional connection.
The search started with these components.



Fig. 5: Trecastagni, through time.

2. The case study

The case study is Trecastagni, a small town near Catania, Sicily, Italy, at the foot of Mount Etna, a volcano declared a World Heritage Site.

Trecastagni [12] has an ancient past whose traces are now lost. Sources of archive mention a town, called Tres Castagnes, since 1357. For a few hundred years Trecastagni is under the control of the Bishop of Catania and subject to periodic visits. The reports of these visits, in particular one in 1640 and one in 1655, describe Trecastagni as a populous and rich village with 3400 inhabitants, grouped into 770 families. The town developed along the north-south directions and went from the district of Santa Caterina to the church of S. Alfio, with winding streets and jumps of altitude, typical of the medieval plant. There is the presence of the majestic staircase of the cobbled Matrix among the useful information. In 1640, the territory of Trecastagni was sold to a wealthy merchant from Messina, Domenico di Giovanni, belonging to the Giustiniani family, for the sum of 30,000 scudi. He settled in Trecastagni with the title of prince.



Fig. 6: Trecastagni old town, 1901 and 1935.

The earthquake of 1693 destroyed most of the buildings, causing at least 500 deaths. The reconstruction, starting from 1700, is impressive: religious and civil buildings are built in the areas of greatest travel. The nineteenth century marked great changes: monastic orders were abolished and many religious buildings were ceded to the administration. Mayors control the town and carry out works of improvement on streets, squares, public buildings. In this period is finally realized the first cemetery. Precious churches and a large population make Trecastagni a pleasant place to live, even for short periods. The town is wealthy, mainly for the cultivation of wine grapes, for chestnut woods that produce excellent timber for barrels and carpentry. Soap is also an important source of income for a period of time.



Fig. 7: Trecastagni old town, portals in lava stone and white stone.

Since the fifties of the last century, Trecastagni is a destination for second-home tourism; this phenomenon has led to the development of many plots of land and the construction of a large number of villas with gardens; these are located in the southern part of the town, where there is an unparalleled view of the sea, and on the road to Pedara and Monterosso. Despite construction speculation, green is still present, private gardens are a feature of these places.
Today Trecastagni still has a beautiful old town; the seven-eighteeth century buildings are in fair condition and create a remarkable historical view. In the foothills of Etna, Trecastagni is, perhaps, the only municipality to be so rich in history, architecture and culture. It has beautiful churches with sumptuous portals carved in lava stone, a beautiful viewpoint over part of the town, to the sea and large public spaces.
Trecastagni is considered a "cultural, natural and architectural landscape" and reflects the combined works of nature and humanity.

3. Research objectives and methodologies

The study aims to highlight how the enhancement of an existing public space can positively affect the well-being of man. The spasmodic search for places outside the house, where to spend peaceful hours, makes the public space the perfect element for social well-being.
Social well-being expresses a positive condition of the human soul; its aspects mainly concern the stimulation of sociality. Sociality must be sought in specific places, public places.
The research applies the results of established sociological studies to the project of public space, starting from the demands of the community.



Fig. 8: steps of the research.

It shall consist of the following phases:
1 – identify the main sources of social stimulation (established sociological studies);
2 – establish the community's requests;
3 – search for application spaces for requests;
4 – transform requests into requirements;
5 – select the characters of the intervention and identify the type of intervention on public space.
The components of social well-being can find fertile ground to take root in a territory and in a community. The project of intervention on public space becomes a sensitive project, conveyed by the demands of the community, but evaluated according to a sociological approach.
The social well-being can be realized in the public space, improving it with interventions of valorization/communication. Accessibility, usability, comfort are the elements on which to work.


Fig. 9: Trecastagni old town, via Principe di Giovanni.

4. The research

The state of the art on the theme of social well-being and public space identifies the various and existing relationships in a public space [6]:
- Passive contacts (watching, listening);
- Meetings and knowledge;
- Meetings between friends;
- Meetings between lovers or partners.

Thus, defining the possible interpersonal relationships in public space (phase 1), you need to find the community's demands. Every community has its interests, its values, its habits. Eight meetings were organized with an audience of about 30 users with different ages, professions, educational level, all

closely linked to the territory to identify the requests of the community of Trecastagni (phase 2). They discussed the city's possibilities, its historical, cultural and social values. The lack of cultural aggregation spaces has emerged, as well as the absence of aggregation spaces for every age group, the absence of strategies to valorize the material and immaterial patrimony. The open-air public space needs interventions. In Trecastagni, the central square welcomes the community and leisure activities, mainly for the elderly and children. A pleasant and welcoming environment in the midst of flowers, where citizens walk and chat. Other age groups pass, but do not stop. What is missing? An area for outdoor shows, an area for young people, for sociality but also for recreation and entertainment, a pedestrian area safe and quiet, where you can enjoy the cool of the beautiful summer evenings. Where can we place these functions? There is a large green space, with a playground and some trees, practically abandoned, that would need intervention: Piano Pucita. There are also places of historical and architectural interest, such as the beautiful Corso Vittorio Emanuele and the district built around the palace of Prince di Giovanni. Around there are small spaces of relevance, rest, empty, some fenced. They are places of great charm, unfortunately not used except for transit. The demand for spaces for all age groups was accompanied by the desire to rediscover the past of Trecastagni.
Once the requests were defined, the study analysed the existing public spaces and identified two main areas of intervention, plus secondary areas (phase 3).
Areas to be returned to the community:
- the di Giovanni district;
- the warehouses in di Giovanni palace;
- Piano Pucita.

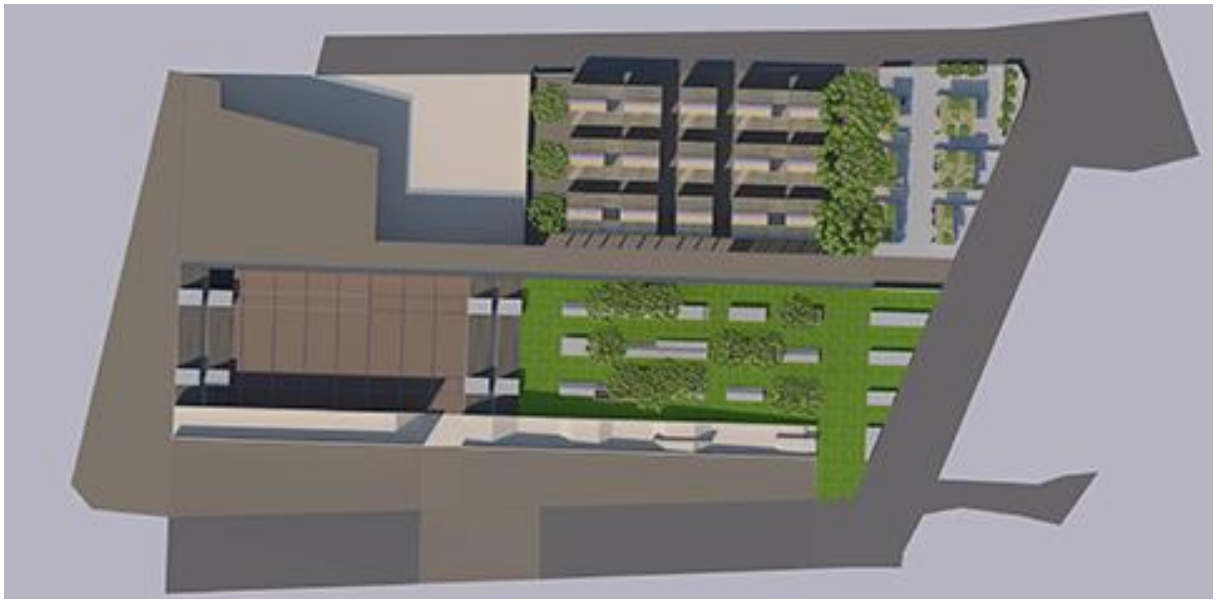
Fig. 10: Piano Pucita, enhancement project of a park.

Areas for secondary functions:
- Retraining of the former Court;
- Redevelopment of the former Casema dei Carabinieri;
- Parking areas in strategic points (for visitors).



Fig. 11: Piano Pucita park, well-doing project.

For the project, the community requests are transformed into project requirements (phase 4) and the

simple request of aggregation spaces is transformed into a series of services entrusted to the new aggregation places:
- demand for comfort;
- request for accessibility;
- request for safety.

Social space in the di Giovanni district: the district is characterized by the presence of the palace of the princes di Giovanni, some warehouse and a few houses. The area is poorly lived. The project, meeting the community's demands, proposes a social space with sunshades, benches and greenery. The project involves the establishment of commercial activities within a five-minute walk radius. The intervention uses little frequented spaces and places, not experienced, and enhances the artisan/ productive character that the area had in the past.

Perceptively, the set of small roads not frequented is distinguished from the rest and push passers-by to enjoy them. Once you enter these roads, you are in a rarefied environment, quiet, equipped with rest areas, some of which provide for the maintenance of large existing trees. A space that opens to the city and welcomes it. In particular, the access to the district will be realized with a series of light structures in corten on which lies a sunshade or greenery. A particular illumination perceptually marks the places, at night.

The project involves the renovation of existing pavements and their integration with storm drains for the collection of water at the center of the carriageway, removing water from buildings. The traditional division into lava stone squares is maintained but inside the old irregular stone will be replaced by a cocciopesto mortar, for better practicability.



Fig. 12: Trecastagni old town, di Giovanni district, well-doing and social project.

The palace of the princes di Giovanni, one of the few buildings left standing after the earthquake of 1693, will house a museum of contemporary art (already financed) that will shift the interest to this area. The project pays attention to the practicability and accessibility of places that are improved through interventions on flooring, using traditional materials in a contemporary way, through better lighting and through the placement of commercial activities, including those in the catering sector, attractive for all age groups.



Fig. 13: Warehouses of di Giovanni palace, project section.

Warehouses of di Giovanni palace: the warehouses are located next to the palace and define the court. They were not included in the contemporary museum project. Instead, this plan will use the warehouses for meeting places, study places, aggregation places, also provided with bars and restaurants. An elevator will remove any barrier and allow convenient access to the two floors above ground. The project establishes a new coverage and a second floor for an archive, classrooms, a small conference room and studios for restricted meetings.
Meeting place in Piano Pucita: it is a large green area near the church of Sant'Alfio and the homonymous square. This space, once in front of the municipal villa (now private and converted into a school), has a football field, trees and driveways. In this context there is an oddity: a sports field in the historic center; it would be necessary to centralise the sports facilities in a specific place and put on Piano Pucita activities not in conflict. The project includes a skate park for children, terraces for outdoor shows, an area for the local market with covered stands and parking, a park with seats and trees. A raised walkway allows you to appreciate the view. Under the walkway there are toilets, a bar and indoor meeting spaces. The project is structured by levels; each level is accessible at the same altitude from the road allowing direct access to all, without ramps or walkways.
The project involves the conservation of the existing green and the creation of a green space with seats accessible to all and usable by all age groups. The presence of the local market, merged into a precise space, keeps Trecastagni clean and provides services to the community. The materials used are local, lava stone and cocciopesto, mixed with the most innovative and contemporary as the corten.
Safety and security are ensured by wide paths, in non-slip materials but not excessively rough.
In all interventions were planned:
- smooth access floors, entrances without steps and/or stairs,
- roughness of areas requiring minimum effort for their practicability,
- light paths in dark or poorly lit environments,
- places accessible to all age groups,
- Safe places for travel, parking and use.

5. Conclusions

The research, proposes scenarios of intervention that stimulate the sociality and satisfy the demands of the users, starting from the relationships of the public space. It is a process that respects the rights of urban space [13]: the right of access and freedom of action. The first concerns both physical access (it is possible to enter from all sides without obstacles) both visual access (you can easily see the public space for potential users and see the various parts that are recognizable by function and by materials) both symbolic access (there are no elements that can discourage potential users). It is respected in all the proposed interventions for the center of Trecastagni.
The second, the concept of freedom of action, provides for the use of public space according to your preferences, respecting the need to share that space with other subjects who, in turn, will respect the needs of other people. The space designed is a social space, for everyone, regardless of age, culture, religion or ethnicity.
In other words, the project stimulates sociality without forgetting the desires of the community, producing social well-being.
Finally, the project proposes to use public space to distract from the daily routine. There is a real possibility of creating economy and allowing the opening of interesting commercial activities for frequent visitors and tourists. It would be a positive solution for both the municipal administration and the private sector; at last, both could see their old abandoned warehouses and small houses occupied. It is recommended not to exceed in catering and gastronomic activities.
A place so peaceful and so rich in history, returned to its territory, becomes a place of all and for all.

Acknowledgements

Project of enhancement on public space for Trecastagni and relative images are taken from the de-gree thesis of Giuseppe E. Santonocito entitled: *The future of memory: an ecomuseum for Trecastagni*. Supervisor: Prof. F. Cantone, Catania University, SDS of Architecture, Syracuse, Sicily. Academic year 2019/20.

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Octagonal architectures between religious and power symbols

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Abstract
In the past, the most classic geometries, for defines the layout of the architectural space was the circle, rectangular and square.
However, there are octagonal layout architectures, which due to the very strong intrinsic meanings that this form possesses was used for particular architectural structures that had a strong symbolic value, of secular and religious power, often opposed to each other precisely through the particular shape of their octagonal layout.
The octagonal geometric shape is full of esoteric meanings. Used to define the architectural space of numerous baptisteries, towers, castles and funeral monuments that are inextricably linked to number 8. For various peoples, the octagon has been a sacred geometric figure throughout history, so much so that it has been used for various architectures with an octagonal layout. Frederick II of Swabia, Leonardo da Vinci and many others drew inspiration from this particular shape, used extensively in Islamic architecture.
The goal of this paper is to understand the meaning hidden behind this geometric figure when it is used for the definition of the architectural space, to catalog in chronological order the numerous architectures with this particular layout and to understand their placement in the historical, political and religious period, focusing on the Dome of the Rock, in Jerusalem, which best represents the meaning of octagonal architecture for the three major monotheistic religions.

Keywords: Octagon, Octagonal Architectures, Dome of the Rock, Architectural layout.

1. Introduction
Among the geometric figures used in architecture, the one most loaded with meaning and symbolism is certainly the octagon. This figure, also known as the Ottonary, is the symbolic entity linked to the number eight. The eight horizontally is the symbol of infinity which for the esoteric expresses the idea of an existence subject to a cycle of rebirths and reincarnations, the two circles in fact represent life and death [1]. The octagon is obtained by rotating two squares between them by 45°, taking the name of Double Quaternary (Fig.1). Many peoples have drawn inspiration from this layout, associating it with a hidden meaning.
The two superimposed and rotated squares form an eight-pointed star that throughout history has been associated with various female deities such as *Ishtar*, the Great Mother of the Babylonians (Fig. 1), *Astarthe* for the Phoenicians and finally became the emblem of the Virgin Mary for Christians.
The choice to associate this figure with a female divinity derives from the observation of the behavior of the planet Venus. The ancient Sumerians observed that the planet is in inferior conjunction with the Earth every 1.6 years or so. This laps is known as the synodic period of Venus. During each lower conjunction, the position of Venus is not the same; for Venus and Earth to return to exactly the same positions it takes 5 lower conjunctions, that is a period of eight years. During this time, marking the position of Venus on the zodiacal circle, we obtain the vertices of a regular starry pentagon, symbol of the Sacred Feminine (Fig. 1).

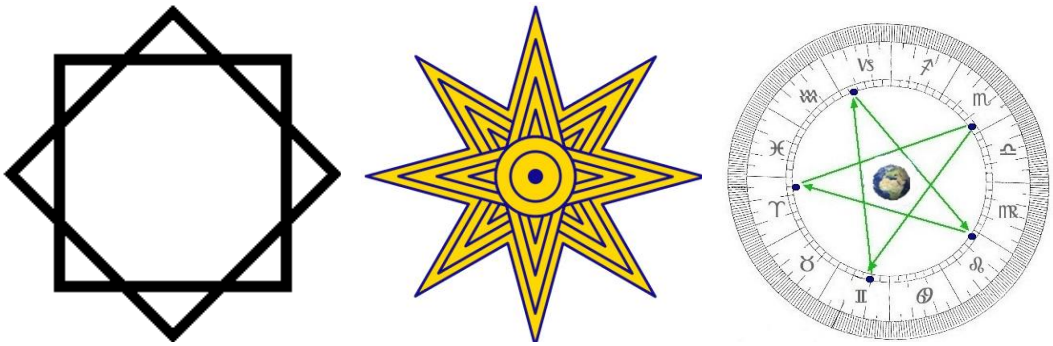


Fig. 1: Double Quaternary symbol (left). Star of Ishtar, symbol of the Great Mother of the Babylonians (center). Astronomical circle with the Pentagon of the five conjunctions of Venus (right).

An obvious example of the link between pentagon and octagon in architecture is Castel del Monte which has the shapes and proportions based on the numbers 5 and 8, where we find the number eight in the shape of the layout and the number 5 in the golden proportions of the portal (Fig. 2).

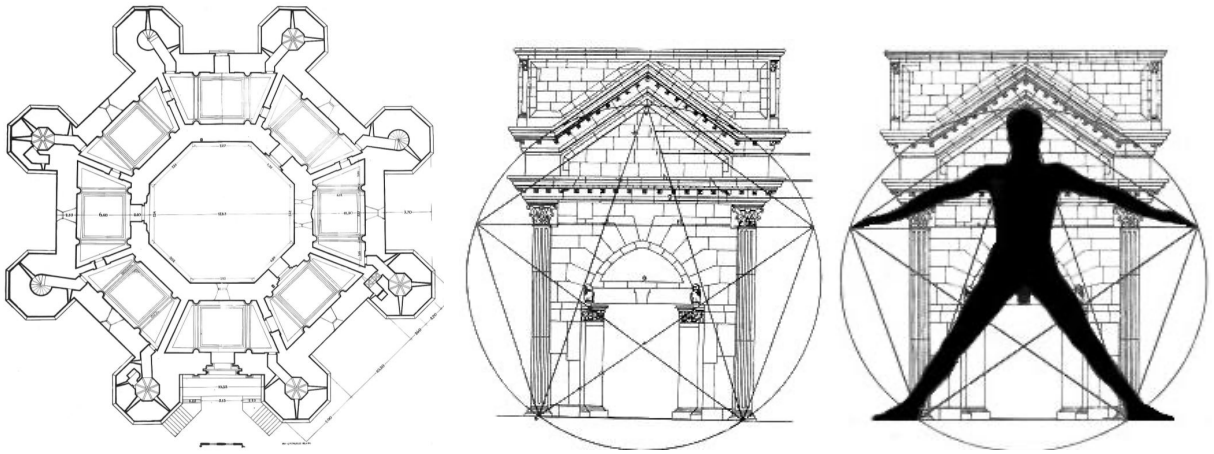


Fig. 2: Ground floor plan of Castel del Monte (source: Ing. G. Mongiello). Portal of Castel del Monte with superimposition of the starry pentagon with the proportions of the golden section.

Other architectural structures that have used the octagonal layout are those built by the Knights Templar for their temples, associating a strongly symbolic message to it. This geometric shape, in fact, stands as a mediating figure between the square, which represents the Earth, or the human dimension (the Microcosm) and the Circle, the perfect symbol of Heaven, that is the Divine (the Macrocosm). The eight sides symbolize the eight doors that allow the passage, from one state to another, from renewal to resurrection until reaching the perfection represented by the circumference [2].
Due to this characteristic, which binds man to God, the ground to the otherworldly, the octagonal shape has inspired the creation of the architectural space of those structures that must have had a strong symbolic value, which very often saw ecclesiastical power opposed. This layout inspired the "enlightened builders" of the old time to build their homes and strengthen the symbolism of their power against the antagonist.
For this reason, today, we find Islamic Temples, Baptisteries, Towers, Squares and other numerous structures in which the octagonal shape is present, which still represents a source of inspiration today.

2. The background of octagonal architecture in the world

To better understand the evolution of octagonal architecture, the most representative ones scattered around the globe have been surveyed in chronological order and of which there is information from historical sources appropriately documented and relevant to the research topic. This temporal cataloging has led to the understanding of the evolution of these particular architectural spaces built with an octagonal layout.

2.1 Tower of Enna - Italy (11th century B.C.)

This structure is one of the oldest buildings built with an octagonal layout, it is located in the exact center of Sicily. The position of the Tower of Enna (Fig. 3) represents the navel of the Mediterranean and the

world known in ancient times. The building, about 27.5 meters high and sides of seven meters. Built on three levels, the last of which does not have a cover.
Some researchers believe it is a building by Frederick II of Swabia, others argue that it is of much older origin, attributing it to the Sicilians of the 11th century B.C. Probably, the tower served as an astronomical-geodetic observatory [3].

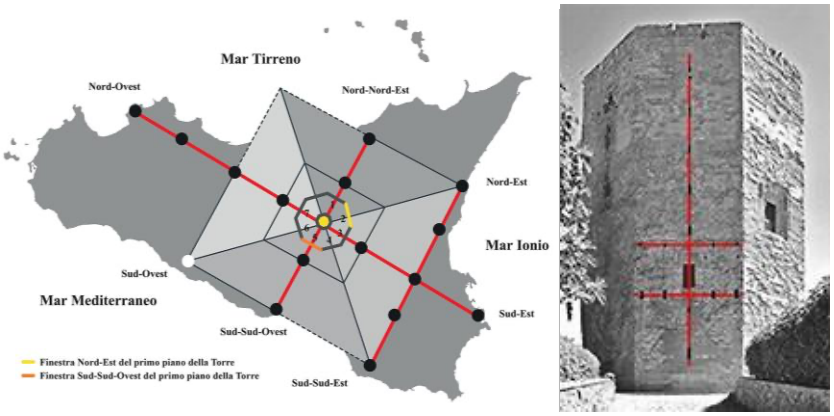


Fig. 2: (left) The map of Sicily with the position of the tower, which is located in the exact point where the *decumanus* meets the first sacred hinge, at the behest of the Gods and defined the gromatic center of the Island of Trinacria, the Navel of Sicily and how believed by the ancients, the center of the Mediterranean and the world. (on the right) The South / West elevation of the octagonal tower of Enna, the Sicilians reproduced the fundamental scheme of the "*Delimitatio Templus Caeleste*" of Sicily, still clearly visible today, formed by the decumanus (eight vertical slits) and by the two hinges (in total eight horizontal slits parallel to each other) [3]. The change of its name, from the original Gabri to the current one, suggests that the structure was prior to the Arab invasion [5].

2.2 Jabalieh Dome - Iran (II century. B.C.)

In the southern part of the country, on the slopes of Mount Gholleh Dokhtar (Fig. 4) in Kerman stands the Jabalieh Dome. It is of octagonal design and comprises three floors crowned by a rather flat dome, totally empty inside. The dome, a place of historical importance in Iran, has been constructed of stone and brick, though the building is of stone and gypsum, and its architectural affects have been inspired from the Sassanide period [4].

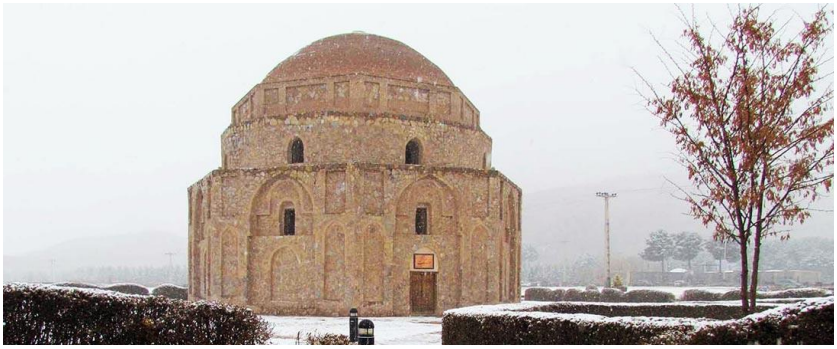


Fig. 4: Jabalieh Dome Kerma, Iran.

2.3 Tower of the Winds - Greece (100 B.C.)

On the Roman Agora of Athens under the reign of Julius Caesar, the Syrian architect Andronicus Kirristes designed the Tower of the Winds (Fig. 5). The building has a width of about eight meters and a height of 12 meters. On the upper part the eight divinities stand out, the Aeredi to whom the tower is dedicated. Sculpted in flight with open wings while carrying gifts, Boreas, Kaikias, Euro, Apeliote, Austro, Lips, Zefiro and Skiron also represent the eight cardinal points. Originally the Tower of the Winds, also known as Horologion, also had a water clock designed by Kirristes and fed by the Clepsidra stream, which descended from the Agora.

2.4 Qubbat al-Ṣakhra - Israel (691 A.D.)

In the holy city of Jerusalem, on top of the Temple Mount of the Old City, stands the Qubbat al-Ṣakhra (Dome of the Rock), an Islamic sanctuary. The ninth Umayyad caliph Abd al-Malid ibn Marwan entrusted

the temple project to Abul Mikdan Rija ibn Hayah ibn Jarul, known for his erudition and wisdom, and Yazid ibd Sallam of Jerusalem. The building was erected in 689-691 AD, three years after the conquest of the city. An exceptional monument of Muslim architecture, the sanctuary is one of the most revered in Islam. Building with a great political and propaganda role of the 10th century, aimed at overcoming Jews and Christians in urban planning, architecture and art.



Fig.5: Elevation and plan of the Tower, taken from an ancient print. The tower today (right).

2.5 Lingxiao Pagoda - China (860 A.D.)

Lingxiao Pagoda (Fig. 6) is located in Hebei province. The discovery of stone finds allows us to date the construction of the tower to the period of domination of the Tang dynasty.



Fig. 6: Lingxiao Pagoda.

2.6 Baptistery of San Giovanni Battista - Italy (897 A.D.)

In the city of Florence, opposite the cathedral of Santa Maria del Fiore, stands the Baptistery of San Giovanni Battista (Fig. 7). The latter was the investiture place of knights and poets. The origins of the building constitute one of the darkest and most discussed themes in the history of art. Until the sixteenth century it was assumed to be a temple dedicated to the god Mars. Excavations of the late nineteenth century brought to light the remains of Roman domus dating back to the 1st century. A.D. abandoning this hypothesis. The first certain information written on this spot dates back to the year 897 A.D. [6].

2.7 Chapelle del Templiers - France (1134 A.D.)

In the heart of the old city of Laon is the last vestige of the presence of the Knights Templar (Fig. 8), who arrived by order of Bishop Barthélémy de Jur in 1134 AD. A few years after their settlement this chapel was erected. Originally only the central body with an octagonal base was built whose east side opened into a small apse. In the second phase the choir was enlarged, and the portico was built. Later the bell tower was added.

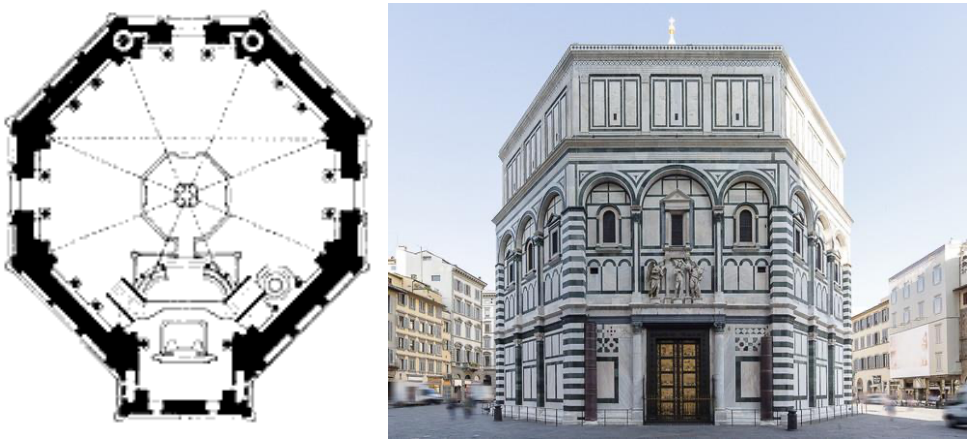


Fig. 7: plan and elevation of the baptistery.

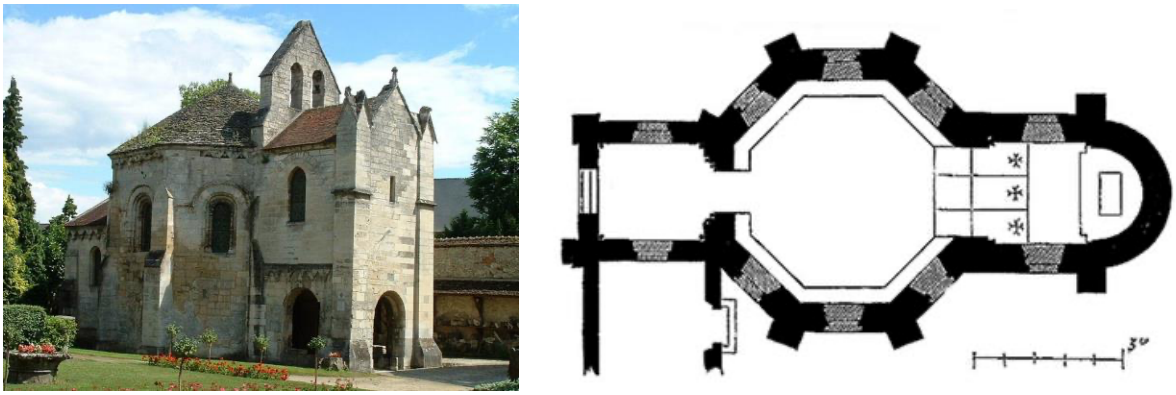


Fig. 8: Chapelle des Templiers, Laon, France. Elevation and plan.

2.8 Castel del Monte - Italy (1240 A.D.)
The fortress of Castel del Monte rises in Puglia, on a plateau of the Murge. Built by Frederick II in 1240 A.D. it combines different stylistic elements and follows an extreme geometric and mathematical rigor. The position has been designed to obtain particular effects of light and shadow in different periods of the year in the internal rooms. The attribution of the designer architect is uncertain. [7]

2.9 Isa Khan tomb - India (1547-1548 A.D.)
In the complex of Humayun's tombs in Delhi stands the octagonal mausoleum dedicated to the noble Isa Khan Niazi (Fig. 9). The building is in the Lodhi architectural style, the last ruling Afghan dynasty in India. The main portal, on the other hand, has a Hindu style. On the western wall the main mihrab was made with Koranic inscriptions indicating the direction of Mecca. The tomb is decorated with gray quartzite and red sandstone. The entire work has been defined as an "asylum paradise", a small corner of paradise. [8]



Fig. 9: Isa Khan tomb.

2.10 St. Martin's Church - United Kingdom (1759 A.D.)
In a small Derbishire village in Stoney Middleton stands the oldest existing octagonal church in England. The Church of San Martino (Fig. 10) was built in 1415 AD. at the behest of Joan Eyre as a thank you for her husband's return from Angicourt. The building as we see it today was built on the ruins of the previous structure, with a more traditional shape, destroyed by a fire in 1759. Only the rectangular-based bell tower still visible today remained intact. The locals did not appreciate the new structure, considering it too modern and in contrast with the existing style, defining it as "bad taste" [9].



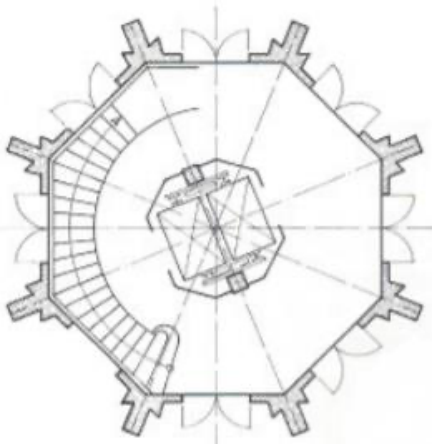
Fig. 10: Church of S. Martino. UK

2.11 St. George's Cathedral - Ethiopia (1896-1911 A.D.)
The Orthodox Tewahedo Cathedral was built within the Arada district in Addis Ababa. The building was built at the behest of the Emperor of Ethiopia Menelik II to celebrate the victory over the Italian army in the Battle of Adua in 1896 which took place on the day dedicated to St. George. The project was entrusted to the engineer Sebastiano Castagna, a prisoner of war, as per agreements made with the Kingdom of Italy. The building is in neoclassical style and is richly adorned internally (Fig. 11). In 1937 it was looted and set on fire by some Italian fascists who ruined the interior of the cathedral.



Fig. 11: St. George's Cathedral, Ethiopia.

2.12 Orientation Tower - France (1924-1925 A.D.)
At the center of the Paul Mistral Park in Grenoble stands the Perret Tower (Fig. 12) which takes its name from the architect August Perret who built it. Created for the Houille Blanche International Exposition as an observation point of the surrounding mountains and to allow the public to orient themselves within the exhibition. The tower is the oldest in Europe made of reinforced concrete and since 1998 it has been recognized as a French Historical Monument. The architect, author of the work and also known as Le Corbusier's master, was a lover of concrete and in 1944 declared: "My concrete is more beautiful than stone, I work it, I chisel it. With breccia of granite or Vosges sandstone as aggregates (...) I make it a



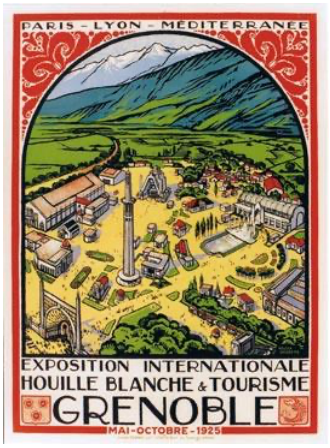




Fig. 12: Plan at the foot of the tower. Poster of the 1925 International Exhibition. The tower today.

material that surpasses the most precious coatings in beauty (...). Concrete is a stone that is born, natural stone is a stone that dies » [10].

2.13 The Octagonal Colony - Mexico (1925 A.D.)

On February 16, 1925, in the presence of the authorities of Mexico City, the "Federal Colony" (Fig. 13) was founded, representing the ideology of a new nation. The desire arose after the Mexican Revolution to establish a new order in all government sectors. To represent this, in the best way, a highly organized layout was chosen, inherited from the previous century with the industrial revolution. The architect who designed the colony was probably inspired by Palmanova located in Italy [11].



Fig. 13: Mexico City. Federal Colony. (GPS: 19°25′10″N, 99°05′20″W)

2.14 Eagle's Nest - Germany (1938 A.D.)

Located in the Bavarian Alps of Berchtesgaden about twenty kilometers from the city of Salzburg, this structure is the result of an idea of the personal secretary of the Führer, Martin Bormann. He, with the help of party members, obtained the necessary authorization and funding for its implementation. The project was the work of the architect Roderich Fick and was completed in just fourteen months by a team of about two thousand employees headed by engineer Fritz Todt. It is thought that Bormann wanted to build the structure in honor of Hitler's fiftieth birthday. The Führer rarely visited the structure using it exclusively for some official events. The entire structure stands defiantly at the top of a steep wall, it is divided on two levels with a large octagonal hall, covered, both internally and externally, with large blocks of granite. In the main room there is a fireplace made of red Carrara marble, a gift from the Italian leader Benito Mussolini. After the defeat of Germany, the allies thought of blowing up the Nest, but thanks to the negotiations initiated by the president of the provincial government and the prime minister of the time, it was possible to save the building which today constitutes one of the most evocative viewpoints of Berchtesgaden (Fig. 14).

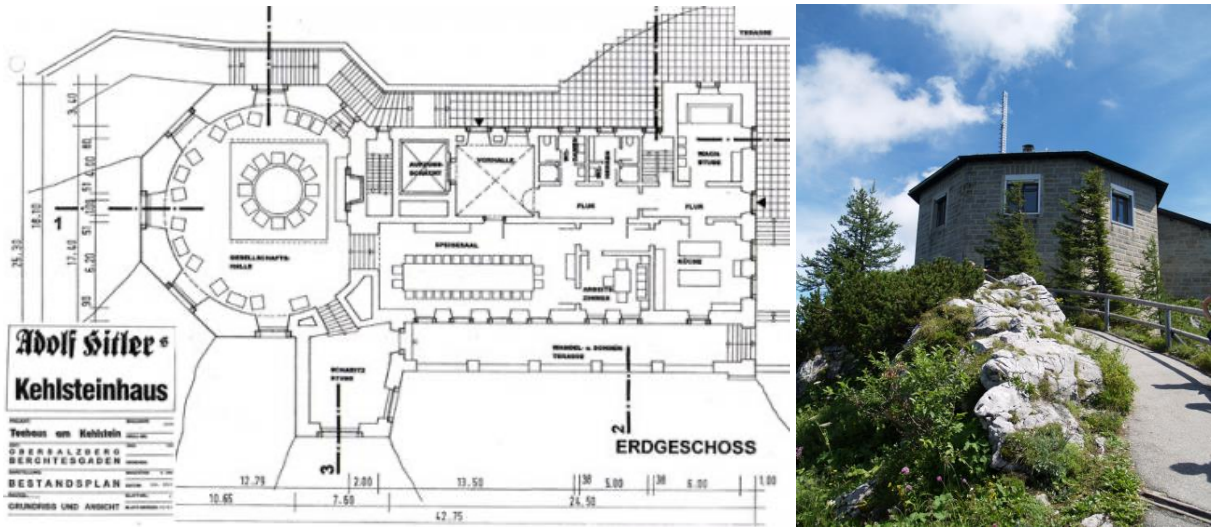


Fig. 14: Eagle's Nest. Plan and octagonal tower.

3. Case of study. Qubbat al-Ṣakhra (The Dome of the Rock) - Israel

The focus of this paper case of the buildings with an octagonal layout has focused on the Dome of the Rock, this being a symbolic building for the Muslim religion and which in its spatial configuration holds all the stylistic features and mystical references.

3.1 Preliminary information collection

The Dome of the Rock is the most recognizable building in Jerusalem. The structure is built four meters above the level of the esplanade, which is accessed across a wooden bridge that, from the Western Wall leads to the esplanade where the dome stands. The structure has a central octagonal plan, with two aisle and covered by a single dome. In this important architectural space for the Muslim religion, we find numerous symbolic elements of this religion. All the walls of the perimeter octagon measure about 20 meters, the dome has a diameter of 20 m. and a height of 25 meters, the total width of the base octagon has a diameter of 60 m. The structure represents the subdivision of time with 52 windows, representing the weeks of the year, 24 arches, such as the hours of the day, 12 columns, such as the months and 4 supporting pillars such as the seasons.

The building has an architectural style of Roman and Byzantine-Syriac tradition. According to Ibn al-Faqīh, in 903, the outer cladding of the dome was made of lead sheets and gilded copper plates, currently it is covered with gold sheets purchased by King Hussein of Jordan in 1959. The building has 4 portals of entrance, each of which, 4.3 m. high, by an architrave and one topped by a raised arch. The architraves are covered on the lower face in embossed copper and bronze sheets. The door frames date back to the Ottoman sultan Suleiman who had them restored in 1552. The four portals are arranged according to the cardinal points, at the time of al-Muqaddasī. The entrance from the north side is called the "Gate of Heaven" (bāb al-janna) and the door is called the Gate of David (Bāb Dāwūd). The main door opens on the south side, is preceded by a marble covered portico and supported by columns.

Outside the building is covered with glazed ceramic tiles with bright designs and colors, where we find inscriptions in Arabic. All the windows are covered with perforated majolica (Fig. 15). Inside the structure is decorated with mosaics, all the tiles are placed at different angles to reflect the light differently in the time of the day. The mosaic represents a rich and flourishing nature, in contrast with the desert climate of the nation, with the aim of evoking the vision of paradise. Outside, the Dome of the Rock is the Dome of the Chain used by the faithful to pray and shelter from the sun, on the north-western side there is Dome of the Ascension which represents the point where Muhammad ascended to heaven in the presence of Allah before write the Quran.

3.2 Reverse engineering

To better analyze the case study, a 3D digital model was created (Fig. 15) which led to the creation of the inside environment and decorative elements on the outside of the building. From the development of the model, it was possible to analyze the volume and how the octagonal element was developed by the designers, the relationship of the structure with the surrounding context in which other important religious buildings are located. In this way it was possible to compose a model that could highlight the shapes and the strong symbolic value of the architecture of the case study.

Analyzing the digital model, it was understood how the mystical and symbolic elements that their fulcrum in the octagon have were applied (Fig. 16). The analysis of the layout highlights the correct alignment and orientation of all the symbolic figures. The squares, the octagons, the circumferences are all perfectly aligned with each other inside component, composing an isotropic shape to represent the mystical codes and symbolisms, important for the Muslim religion.
Observing the layout, first notices is the two concentric octagons that describe the inside aisle. The architectural elements are perfectly aligned and approaching the center of the structure, these transform into the circle that circumscribes the heart of the body containing the Sacred Rock which, despite being subjected to the main floor, defines the centrality of the building.
The two squares rotated to form the inside octagon, define the path of purification and approach to the divine represented by the centrality

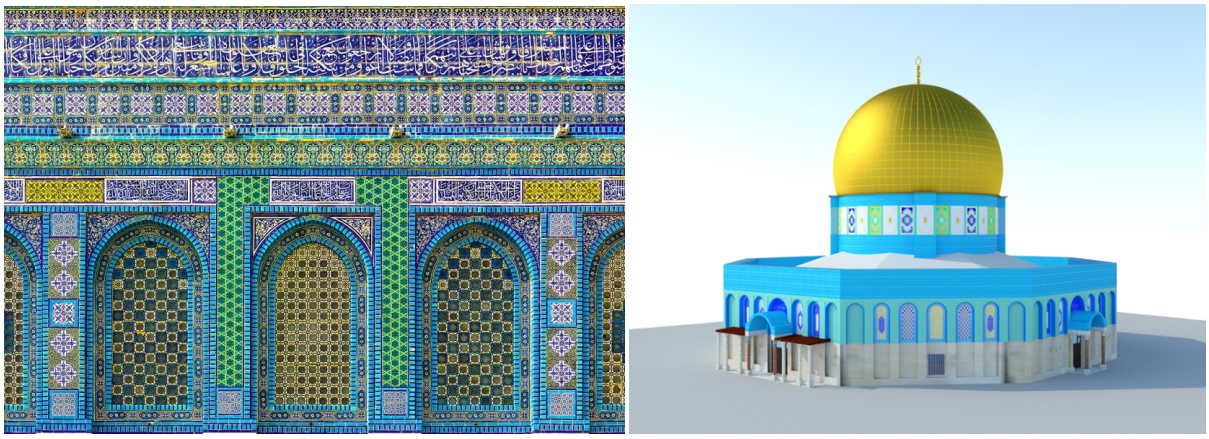


Fig. 15: Tiled windows. Dome of the Rock. 3D model (right).

of the Rock. The sides of the octagon, where there are openings, are suitably oriented towards the directions that face sacred places. The shape of the layout is made to define in detail the symbolic elements, creating a casket to contain an important relic for the Muslim religion.
All the geometric elements described so far have as their center the Sacred Rock which constitutes its dual function of religious center and center for all the geometric elements that represent the meanings described above.

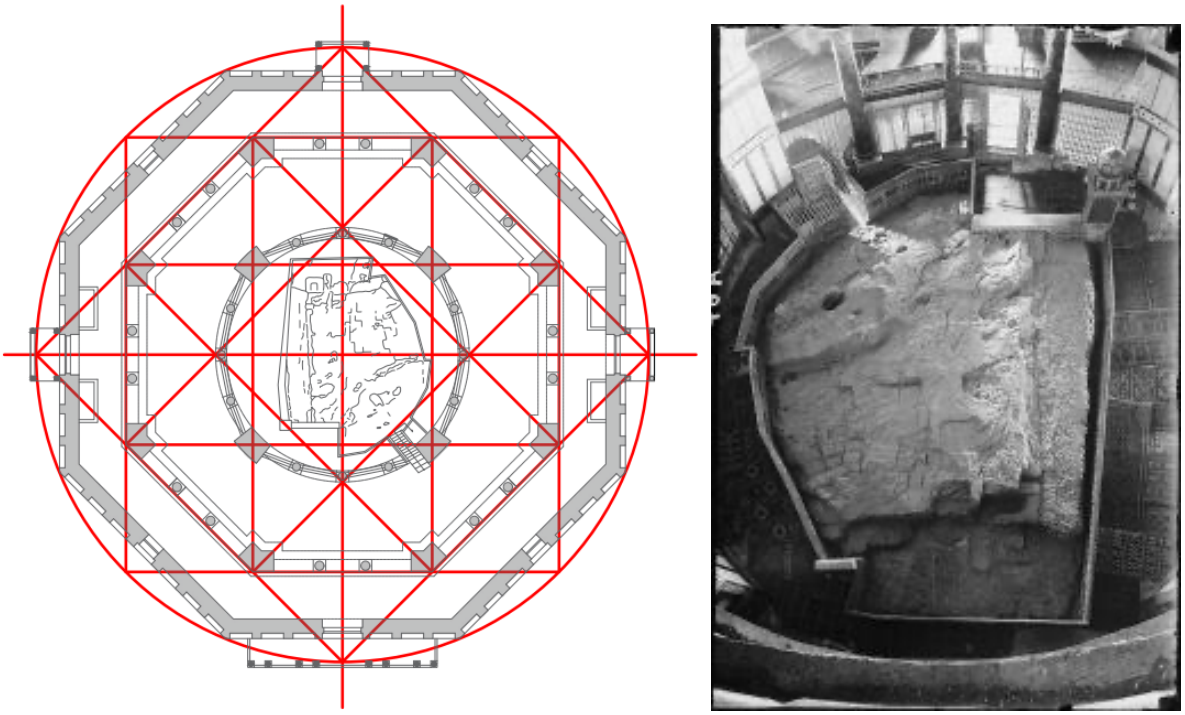


Fig.16: Layout and geometric construction of the symbolic elements. The Sacred Roc (right).

4. Conclusions

The study carried out in this paper has made it possible to develop a critical awareness of octagonal-layout architectures, capable of analyzing and understanding the purpose and symbolic values of each of the artifacts. Every emperor, king, caliph or enlightened man who has understood the meaning of this form, influenced by the strong symbolism that it carries within itself, has created a structure with an octagonal plant with the aim of sanctioning the victory of his power over a nation, on a people or opposing power. The goal of an octagonal-based structure can therefore be traced back to the symbolic meaning of the number eight, it would be the "squaring of the circle" between the unification of the evocative complexity of the octagonal shape and Islamic spirituality [18].

Indeed, the layout of the architectural space of these structures is strongly linked to numerology, the metric in poetry of proportional measures in architecture. The resulting numbers and geometric figures create that world of "Symbols" with which the archetypes of the One Being identified by the Sufists are manifested [18]. Frederick II of Swabia, Caliph Abd al-Malik and many others, have made their power and their victory eternal in history, they have chosen the octagonal shape because only they have been able to reach a superior knowledge and a supremacy such as to be able to elevate them to a higher stage than the common man of their time.

All these great men who have seen in the octagonal form what others have not understood, have in common the open-mindedness to accept the knowledge of other cultures, often very different from theirs. This factor is the basis of knowledge and cultural exchange that, even today, distinguishes the great contemporary architects who give materiality to their ideas, drawing on the most diverse cultures and knowledge that in the current global world are traces of the past and that pushes us to look always beyond one's horizon.

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Agri-food Museums. A Knowledge Resource for Environmental and Social Wellness

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Agri-food Museums. A Knowledge Resource for Environmental and Social Wellness

Agri-food museums are becoming a new opportunity for communities in order to acquaint experience for the care of the entire environment in which they live. Territories, food, sustainability, wellness of people and new economic opportunities find in them an overall heritage balance.
In these experiences the design of exhibition routes is comprehended with the intention of interacting with visitors, at the same time on the one hand through innovative sensorial multimedia experiences and, on the other hand, through the real physical contact with antique agriculture machineries. The learning experiences are so not only intended to be as a cultural historical understanding, but also for the constitute food best practicing recommendations on which foods people choose to eat and how to prepare them for their wellness.
In that way the memory in the food supply chain becomes an incentive against wastage, rethinking how we cultivate, produce and consume. We have to be sensitized on this focus because 1/3 of produced food is not eaten.
A series of synergic case studies are presented, which involve people in an awareness process of the of connections among our health, our culture and our planet equilibrium.

Keywords: Agricultural; Economy of Territory; Cultural Heritage; Protection; Agri-food Museums

1. Agri-food Museums: the new economy of Territory and the real Cultural Heritage[1]

Food is not only a basic need but is also vital to our health, wellbeing and cultural identity. From agri-environmental research to diseases which cross the species barrier between animals and people, our applied work relates to real issues and extends through the food chain to connect with health, the environment, economic prosperity, heritage and culture.
We apply our expertise to address global issues including climate change, resource degradation, hunger, poverty, diet and health. We work across disciplines to enhance well-being, prevent disease, improve diagnoses, develop new therapies and advance clinical practice.
Transforming the landscape into a tourist product is an increasingly topical challenge, where the concept of museum space is intertwined with that of sustainable care and culture of the territory and the environment.

[1] By Fosca Tortorelli

Processing companies can also become objects of tourist interest and of value from a landscape point of view. They are magical places where with the wisdom and experience of generations it has been possible to provide many people with excellent products

The combination of agricultural and food museums combined with sustainability has now become fundamental as a cultural contribution to the establishment of sustainable societies. In the debate for the new definition of museum promoted by ICOM, the Italian Committee made its proposal at the end of a participatory process among the members, which reads: "A museum is a permanent, accessible, non-profit institution, which operates in a system of relations to serve society and its sustainable development. It researches, acquires, conserves, communicates and exhibits the heritage of humanity and its cultural landscapes. It promotes learning and responsibility, critical thinking, participation and wellbeing in the community".

Museums and cultural organizations can contribute to the construction of a cultural ecology and must take the issue of sustainability ever more seriously, as a challenge that urges their role as "activators" of awareness and knowledge about the challenges in place, and potential changemakers with respect to individual behaviours and collective choices, also reflecting on their own management and functioning models.

Agricultural Museums have the opportunity to rethink themselves by orienting themselves towards the future, to exercise relevance within the territories and communities and are at a turning point for the role they intend to play within society, as regards the general meaning of their mission and main functions

Thanks to their widespread presence on the territory, museums constitute a cultural infrastructure, they are related to the urban and territorial context as a sort of antenna that has the possibility of listening to and disseminating good practices.

Sustainability is therefore treated with a broad meaning and involves the different domains of culture, the environment, the economy and society, intertwining numerous issues and producing different possibilities for interaction and integration between the variables involved. A paradigm shift and an interdisciplinary vision are needed between the issues at stake.

It is highlighted that to date, although the most interesting experiences are based on interpretations and principles now shared at an international level, a declination is necessary based on the context of application, the reference legislation, the specificities of the museums and the territory.

Among the most current objectives, or perhaps we could affirm between the most recent challenges of modern agriculture, is the territoriality itself, with its specificities and characteristics, which must be protected and preserved, as well as developed in a sustainable manner.

But what exactly is meant by territorial agriculture?

Briefly it is a series of agri-ecological measures and practices strongly linked (and therefore compatible) to the typology of the territory in which they are implemented, capable of providing, moreover, an important support for the maintenance of biodiversity and environmental balance, and therefore concerning also local fauna and flora. An activity that looks carefully at the consumption of the soil and the resources related to it due to the work of man, avoiding that the anthropization reaches a point of no return.

Local biodiversity, linked to territorial agriculture, therefore brings into play a variety of species to be protected and enhanced thanks to the action of the farmers themselves, addressed by the launch of national and international plans.

A sort of "natural tradition" to defend and strengthen, which is inextricably linked to the Italian agri-food heritage, one of the richest in the world, incredibly varied in terms of products and flavors, with truly unique and often inimitable organoleptic characteristics.

Protect territorial agriculture and its production, not only helps biodiversity, but directly and consciously involves producer and consumer.

In Italy, there are more and more virtuous projects, which in the field closely related to agriculture, in particular viticulture and olive growing, have made environmental sustainability and good design practices based on energy saving and self-support, their creed. The Sicilian realities, of **“Radicepura park”**(Fig.1) that**,** that has made green and nature a form of art is an extremely interesting case. This Foundation was born in 2017 from the enlightened vision of the Faro family in wanting to create in Sicily a place dedicated to the enhancement and richness of biodiversity. A unique botanical park of research-oriented Mediterranean plants, which embodies the authenticity of nature and the most innovative technology.

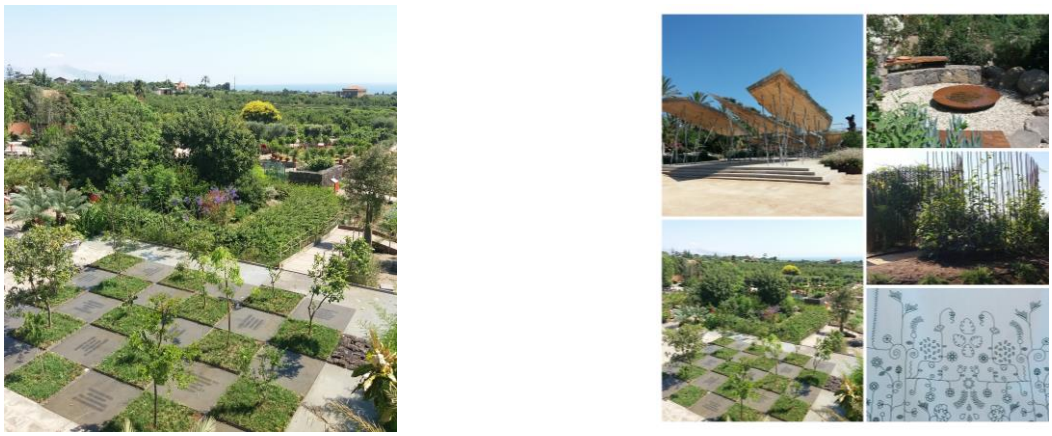


Fig. 1: The Sicilian realities, of “Radicepura park

Mario Faro, founder and managing director of the “Radicepura park” is the promoter of the “Radicepura Garden Festival”, an international garden design event, probably the most important in all of southern Italy. Sicily is like a large garden, so the intent is to revive and pay attention, as happened in the past, to the culture of the garden. For this reasons Radicepura decides to put on a Festival that tells, just inside its park, the landscape and nature in all its aspects. Particular attention is paid to the Mediterranean landscape using The conservation and enrichment of the various botanical varieties under various profiles (cultural, tourism, environmental, scientific and educational) is their primary purpose; a sort of temporary open-air museum that also try to give an answer to very topical questions such as the functions of the garden in the near future or how to repair environmental faults.
Gardens are therefore able to repair and protect from harmful elements, becoming curative elements, as well as a source of refreshment and tranquillity. Another purpose is the study of the environmental adaptability of the species in order to identify the most suitable and innovative cultivation techniques.
“Radicepura” wants to promote and spread the art of landscaping, increase the sense of respect and safeguard against nature and, more generally, the places we live. The Radicepura Garden Festival is the first international event in the Mediterranean dedicated to garden design and landscape architecture where the garden becomes the new habitat to be rediscovered and experienced at 360° degrees.
Another interesting example is the “The Museum of Contadinerie” (Fig.2) that take place in Piemonte, it was an idea of Arturo Bersano, winemaker, scholar, poet: ”The idea of collecting the tools that the farmers used for the work in the vineyard, in the cellar, in the field and in general for the life of a farm, came around 1950. For some time I had been persuading, through personal experience, that how much the peasants had created to work the land, to live, to hope, was disappearing”.

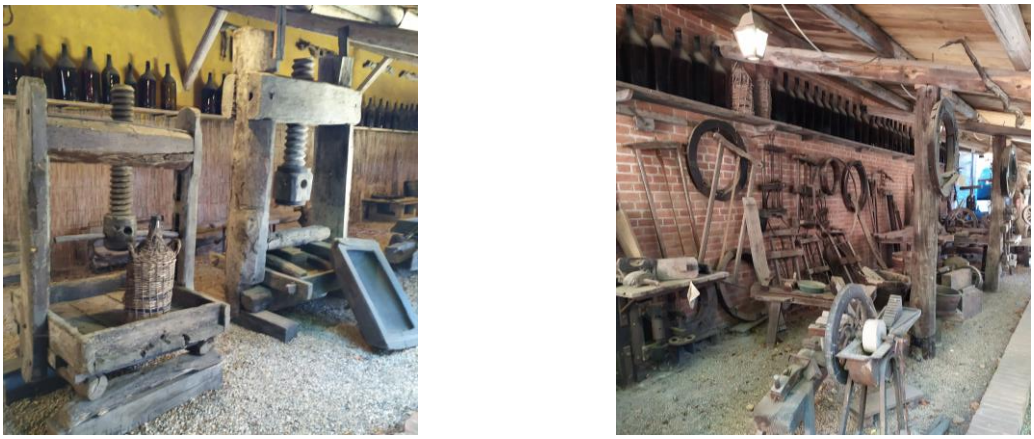


Fig. 2: The Museum of Contadinerie

The museum is open air because the life of the farmers and their daily work took place there. Between the masters, the scythes and the farm carts the elegance of the presses emerges. Like their few other artifacts, their majestic simplicity recreates the conjunction of the art of wine from the ancient Romans to the present day. Beautiful specimens of the ‘700 with descending lives, those called “Genoese” and

other smaller for family use. The wonderful peasant art is also appreciated in the approximate finish of the pieces, in the cutting boards, mortars, pots, barrels and “barlet” barrels for the wine that the farmer paid homage to brokers and carters.
In the containers there is the history of the drinking civilization. Piemontese peasant culture lives with glasses and goblets of coarse glass, a guarantee of durability over time, but above all of extraordinary pints and quarters of Brenta blown in the dark glass of Poirino.
Everywhere you recognize the most inaccessible soul of this land and you can taste the history of the eras that have followed in the adventure of everyday life.
Another interesting museum is that dedicated to pasta. The headquarters of “Pasta Cuomo” is based in the heart of Gragnano, in the famous via Roma; it is an historical company that has its roots in 1820. Starting from 1832 the brothers Antonio, Crescenzo and Nicola, in order to increase the production and sales of macaroni, rented several water mills owned by the Marquises Quiroga. Some years later one of their nephews, Nicolino, used the ancient family palace, located in the central via Roma, to develop a vertical pasta factory in accordance with the Gragnano tradition. Thus was born the modino mill and pasta factory of Nicolino Cuomo, among the most avant-garde in the pasta industry. The vertical arrangement of the pasta factory safeguarded the ancient and experienced craftsmanship processes and the typical division between the staff dedicated to kneading, bronze drawing, drying and packaging, that guaranteed an excellent quality product.
And we couldn’t allow that all the historical legacy could be forgotten. So we decided to come back to Gragnano from Rome and London to recover that tradition and that history, that made Gragnano the city of pasta in the past, that otherwise would have been lost forever. The idea of the museum (Fig.3) stems from the desire to show the world the results of historical research on our family - as Amelia Cuomo, owner of the pasta factory tells us: "Ours was a life choice that actually led us to return home after so many far from Gragnano. The research lasted 3 long years during which it was possible to highlight what it was possible to discover. Through the collaboration of the emeritus professor of economic history of Federico II Silvio del Majo and his assistant Francesca Caiazzo who have given new life to our historical tradition that from 1820 to today has taken place in the same spaces as always”.





Fig. 3: The Museum of Pasta Cuomo

Not a real museum, in the canonical sense of the term, but a tangible example of tourist and cultural recovery and enhancement is the Foundation of Reggia di Carditello.
The Real Sito di Carditello (Fig.4) n is located in the municipality of San Tammaro, a few km from the city of the Royal Palace of Caserta. Wanted in 1787 by Ferdinand IV of Bourbon as a hunting lodge, today it is preparing to host three vineyards, as well as offering itself to visitors for its architectural and landscape beauties. After decades of neglect, Carditello is also preparing to resume its ancient agricultural vocation.
A journey that began in 2013, when the Ministry of Cultural Heritage and Activities and Tourism bought the site and in 2016 the Real Sito di Carditello Foundation was set up by MiBACT, the Campania Region and the Municipality of San Tammaro of the restoration and safety works. A co-branding operation made possible because the Ministry of Agriculture has granted 4,000 square meters of land to be planted with vineyards.
Vigne Chigi, winery of the Chillemi family located in Capua, is a new technical sponsor of the Real Sito di Carditello Foundation. A very ambitious agreement in the name of the enhancement of the territory, the rediscovery and recovery of ancient vines such as Pallagrello, which will allow Reale Delizia to be present on national and international markets with a production under the Carditello brand and to support the rebirth of the Reggia di Carditello. As explained from Giuseppe Chillemi, owner of Vigne



that look to the future with optimism. We have decided to al vines in the area, planting a new one-hectare white w black and white Pallagrello vineyard in the Foundation's or nature have always guided all our choices". As said : "In March 2021 in Carditello we planted a vineyard of grello, vines particularly appreciated by the Borbone, e Chigi. A brilliant operation made possible by the recent a share of over 4,000 square meters of land to be planted ent with Cantine Magliulo for the production of Asprinio, relaunching the new development plan of the Foundation and at the same time confirming the vocation of Fattoria Reale ".



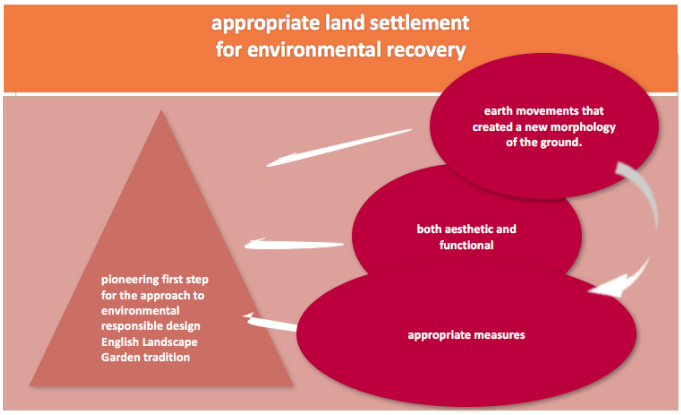
Fig. 4: The Real Sito di Carditello

Carditello will also become a farm again, a historical memory of what happened, recovered both through the archive traces of the documents and through the paintings and frescoes. The vineyard is present in one of the frescoes in the central building. In addition, for two years, the breeding of horses has been restored, 50 specimens of the Persano breed (named after the Royal Site of Persano, a Borbone residence in the municipality of Serre, SA), of which 12 were born locally. This breed is a cross between the Spanish horse and the Neapolitan one and then between the Neapolitan and the Turkish one wanted by Charles III of Borbone. A breed that dates back to over 250 years ago and that we brought to Carditello thanks to an agreement with Prince Alduino of Ventimiglia who is the owner of the horses. Overall, in Italy there are just over a hundred horses of this breed.
A very important didactic-reminiscent initiative of the past era and a inducement for the area.
In this way, memory in the food supply chain becomes an incentive against waste, by rethinking how it is grown, produced and consumed.
The different case studies presented involves people in a process of awareness of the connections between our health, our culture and the balance of our planet.

2. Cultural heritage and territory preservation with community[2]

The learning experiences above presented are not only intended to be as a cultural historical understanding, but also for the constitutd food best practicing recommendations on which foods people should choose what to eat and how to cook it for their wellness. Community cultural landscapes may benefit from the widespread of this kind of knowledge, which is necessary for an adequate recovery practice with the reference to the past under a human centered point of view. It includes also the understanding of the traditional way of living into a territory and the correlation with human conditions of life in the history of a place. A complex system of data is consequently included for the control of ecological, environmental, perceptive characteristics.
We could also add that, speaking in terms of food, wellness and traditions of human life into a place, it has got in itself the symbolic sense of a natural recovery of territories for the future, but also with a better livability for community in every time. In fact, in a certain sense, thinking in terms of a possible

[2] By Francesca Muzzillo



area, connection with the individualities of a heritage for has the meaning of working the benefit of people who into continue to spend their days the context, with their products, cultural expressions, working capabilities.

an Moreover, in the direction of artistic recovery for landscape, we can even think of remote examples, specifically the eighteenth century aesthetic picturesque theories of William Gilpin, Uvedale Price and Richard Payne Knight. In their vision, nature was the main reference for the design process, which had to be realized through earth movements that created a new morphology of the ground giving the idea of a place untouched by men and made by the nature itself with a sense of respect to the inherent intentions of places. And this approach appears as still a valid guide to communities' intervention into landscape in order to pursue an artistic image in which everyone could be involved and so having his own creative place. It would be useful again to try and design today with this way of tackling environmental landscape degradation like the typical English Landscape Garden mode of shaping the ground, which was not only a question of informal aesthetic choice, it was a more complex natural approach which denied a strong human continuous control of the vegetation assets, leaving instead space to autonomous biological processes.

Speaking of agricultural territories, in collecting and re-elaborating the heredity of the past, it is thought that the new rurality is completely entrusted to conscientious participating. So, through an association of ideas, it appears also reflected in some experiences carried out in Southern Italy countryside around Matera in the 50's, as could be seen in the «Comunità» magazine. At the time sociologists, architects and writers wished to build a new rural reality, in which culture, progress and equality were bound to the past. They understood that a creative work into agricultural territory is a mean that strives to comprehend personal and community identity. In it art, design, architecture and agricultural capabilities are linked together, into a wide range of perspectives as cultural roots of a territory with its multiple meanings.

Along this track the given examples are new experimentations in which people have to make decisions for the place in which they live, through the adoption of an artistic expression and at the considerate for oral presentation and publication.

Fig. 5: Diagrams of adequate designing processes for environmental problems into agricultural territories

Naturally only with an interdisciplinary way of affording the problem it is possible to find new opportunities, as the only possible way in order to obtain the expected outputs is often an interdisciplinary one. Many territorial questions may be solely afforded with a design which has risen above any kind of confinements.

A fundamental step in an adequate design process consists in taking advantage of technologies, which are necessary in order to create resilient surroundings. The identification of latent hints of an

evocative system related to the past let us draw a creative matrix of alternative solutions of technological design problem solving opportunities.
When we think about productive territories, particularly, our mind has instinctively the impression of something which is bound to the idea of “community”. It is probably this one the main idea that has over time had an influence on the way in which people have conformed South Italy territories, with the intuitive concept of collecting people together.
An emblematic case of creating effects of interplay between people into territories is possible to be found into internal areas on hill and mountains. It is not only a question of territorial morphology anyway. The environment is more than an addition of aesthetically beautiful places, it is the habitat in which people live and work and so it acts as a complex system, connected by human, artificial and natural entities. For making territories more livable and having a significant impact on a broader context, it is necessary to improve the sense of identity and belonging, making at the same time people aware of environmental benefits and let them experimenting personally a perception of wellbeing into a wider imaginative sensitive self-consciousness.
We specifically wonder how design could frame an appropriate strategy in order to promote a new rural awareness, both taking advantage of technologies, which are necessary for creating new economic opportunities, and contemporary promoting people sense of identification with their environment.
The terms of design thinking for recovery agriculture territory are so related in a progressive series of steps, starting first of all from the perceptive reception of the landscape impact on people, the exchanging of opinions on the success of proposal, the identification of habitants’ needs, the translation of explained needs into a system of requirements.
As design specialists, we not only have to collaborate in order to have an intuitive sense of possible recover, as it has been drawn, but also we have to return into a prefigured arrangement in order to check how many of our design intention have succeeded to be successful. A reliance on human ability to ever succeed in defending his patrimonial value with resilience and capability of forecasting natural performances; only in this way it is possible to make a difference between response after time has changed the physical aspects of places, and, at the opposite, to be prepared to prefigure adequate assets in advance.

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The Ecoheritage Project: how Ecomuseums can Reinforce the Relationship among Culture and Nature

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Abstract
This article presents the first results of the Ecoheritage project, which aims to raise awareness on ecomuseums as a tool of participative heritage management. After a briefly explanation about the situation of Italian ecomuseums, with a focus on their network tools and objectives, the results of Ecoheritage survey are illustrated. Ecomuseums are a tool of sustainable development and Ecoheritage consortium aims to create a common framework and best practices in Italy, Spain, Portugal, and Poland. Ecomuseums' training needs will be analyzed in the conclusions of the article and will also be the next steps of Ecoheritage project, which will involve European marginal areas in an education program.

Keywords: ecomuseum, sustainability, community, heritage management.

1. Introduction
The aim of this paper is showing how Ecomuseums can play a key role in the sustainability transition, that is a very debated topic in various fields. We would like to reach such aims presenting Ecoheritage project: i.e., an Erasmus project recently financed.
As it is known, Ecomuseum stimulates a virtuous relationship between community and territory, where people are involved in safeguarding their heritage. The Ecomuseum term fulfilled the need for alternative use of traditional museums' space, focusing on the social dimension and the ecology.
The new museum model goes beyond the confines of the building and empowers communities; an ecomuseum is a community-led heritage or museum project that support sustainable development (Davis: 2007). Ecomuseums have also the potential to get closer to truth about places and better capture local identity and foster the achievement of local pride (Davis:1999). According to Tuan, what begins as undifferentiated space become place as is getting to know better and endow it with value (Tuan, 1977). Therefore, ecomuseums try to represent places as honestly as they can, using the material and intangible resources that they have, capturing the tone of places. (Davis:1999).
Ecoheritage aims to empower rural communities to enhance their heritage, giving them an instrument (i.e., ecomuseum) for economic and social development. Furthermore, Ecoheritage will promote ecomuseums as a collaborative management model, establishing a set of criteria for its recognition. The project will boost the creation of ecomuseums as an endogenous resource for the competitiveness of agricultural landscapes, providing skills to adult learners through training materials of participatory heritage management. The Ecoheritage consortium, formed by international experts, will create a strong communication network for good practices exchange for new ecomuseums implementation; this will

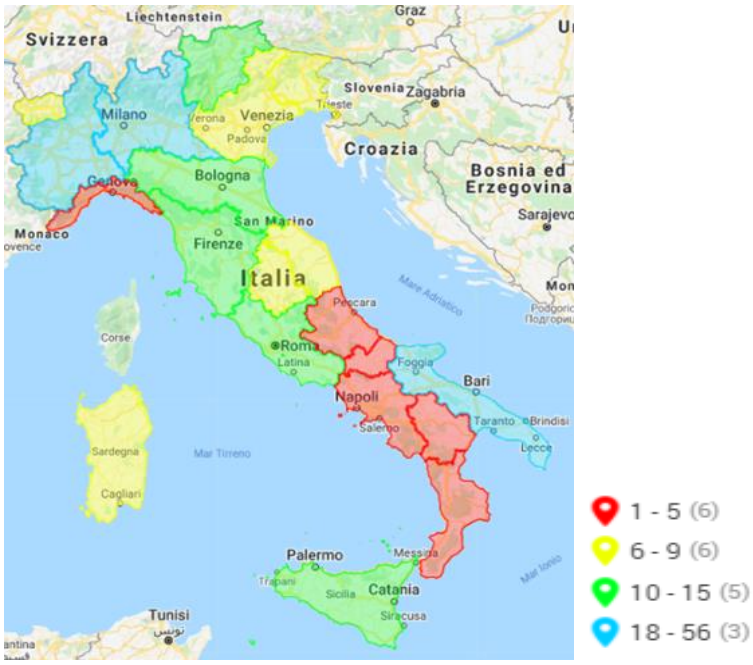
guarantee transferability of the results in Italy and Europe and activate heritage protection in fragile areas.

2. Ecomuseums in Italy

Ecomuseums are deeply rooted in Italy. According to the last census of the Politecnico University of Milan, there are 244 institutions that define themselves ecomuseums; 141 of them are officially recognized by the competent regional administration with the common trait of a strong community involvement, towards and effective preservation of local heritage.
Ecomuseums are distributed in all the Italian regions, as show in map 1:

- 151 ecomuseums in northern Italy (61,9%).
- 47 of them in central Italy /19,3%).
- 46 in Southern Italy (18.8%).

Over the years, ecomuseums have been increasingly recognized by local administration. Ecomuseums were framed within specific regulations, which advancement led to improve their identification. Southern regions are relying more and more on this heritage preservation tool.



Map 1. Number of ecomuseums in each Italian Region in 2021.

One of the first Italian scholars to give a definition of ecomuseums is Maggi (2002), who defined them as a “pact by which a community takes care of a territory”. Drawing on this definition, the representatives of italian ecomuseums gathered in 2007 in Catania, where they eventually agreed on the following definition of ecomuseums: “Ecomuseum is a participatory practice for the territorial development and cultural heritage preservation and valorization”. Cultural heritage is intended as either tangible and intangible. The developer is usually a local collective organization, usually a network of local stakeholders and inhabitants. The main goal is to preserve local cultural heritage and environmental endowment, rather than pauperize it, according to the principle of sustainable development. This concept is of paramount importance in Italian strand of Ecomuseology, and therefore, in Italy, ecomuseums are considered a primary tool for sustainable local development. The valorization of either tangible and intangible territorial assets, combined with strong governance neworks, the beneficial sinergies developed with the touristic sector and the other economic sectors, not to mention the focus on cultural and environmental preservation makes Ecomuseums a key tool for the sustainable development of regions and communities.
In the world there is no consensus as in Italy regarding the taking into consideration of the landscape in the theory and practice of ecomuseums (De Varine: 2017). Within the italian ecomuseolgy context, cultural landscapes play a very important role. This Italian peculiarity is due to the fact that since 1947, the Italian Constitution articulates safeguarding of national landscapes and the historical and artistic heritage as the state’s principal duties (Art. 9).
It is possible to state that landscape lies at the heart of ecomuseums’ preoccupations. Landscapes are here defined according to the European Convention of landscape (Article 1, Florence: 2000): landscape is a cultural construction. Therein, it is stated that ‘"landscape" means an area, as perceived by people,

whose character is the result of the action and interaction of natural and/or human factors.' The concepts of 'landscape' and 'cultural landscape' have been widespread in Italy since the early 20th century. Moreover, the Siena Charter is also based on the Italian context and practices and thus plays, to date, an instrumental role in the safeguarding of landscape on a national scale. As well highlighted by Pidello (Riva: 2017) in the new perspective indicated by the European Convention of landscape, it is no longer sufficient to deal with environmental and cultural emergencies, but there is the need to consider them along with the context, the "framework" of which they are part . It is necessary to leave the certified landscape behind and enter into a field yet to be explored, where "expert knowledge " is contaminated with the " common "knowledge" and seeks for new syntheses capable of speaking to everyone.

The interesting part of this definition of landscape is that it is detached from the concept of beauty and aesthetic values and it is also tied to some events. In the late 20th century, the Italian landscape was tragically affected by its exploitation. In such a context, it was recognized that the local community is a very relevant actor for protecting, transforming and improving the territory and that working on how people perceive their territory was fundamental for avoiding other disasters. Maggi talks about the community like a "sentinel of the territory". Because ecomuseums aim to work with the local community for improving the landscape in all its aspects, they are good instruments for public mobilization and education. The relevance of cultural landscape is given by the role of local communities: they are the only ones who can help understand the way the territory is perceived, i.e. the cultural landscape, and, likely, the best ones to intervene in order to promote it and preserve it.

Cultural institutions such ecomuseums were defined through Italian Constitution: "A practice of active citizenship that, in accordance with the principle of subsidiarity, (art. 118 of Italian Constitution) is aimed at the care of landscape and the heritage (art. 9) to contribute to the material and spiritual progress of society, (art. 4) and the full development of the human person (art. 3.2)". (Dal Santo, 2019)

Involving the museums in the management and care of the cultural landscape means to develop their natural vocation, by extending their responsibility from their collections to the cultural heritage and surroundings: their local towns, villages, and communities (ICOM: 2014).

In 2014, Italian ecomuseums founded a national network to promote their work, to define tools, methods, and specific objectives of ecomuseums. The community is composed of working groups that are developing planned projects. To achieve these goals, ecomuseums are relying on European Union funds or on forms of self-funding capable of involving several ecomuseums around issues of common interest. Ecomuseums are working together to achieve the following goals: organizing activities and projects that gather Italian and foreign ecomuseums around common themes, to increase the national and international exchange and cooperation; networking and communicating around ongoing projects; monitoring the results; promoting a national draft law on ecomuseums.

Consequently, they are working to foster many objectives, such as dynamic dialogue with stakeholders committed to cultural heritage. Municipalities, provinces, regions, and NGOs are important partners for ensuring the solidity and value of participatory processes and local development goals. Indeed, where the relationship between ecomuseum, municipalities and inhabitants are close, swift, and effective action on the ground and local networks is possible. Today, due to the complex problems of local communities, there is the need to seek new alliances between related stakeholders to share principles and objectives. The specific nature of ecomuseums is, in fact, to create communities, release energies, and carry out enhanced actions to solve complex problems, according to the principle of subsidiarity (Dal Santo, 2017).

In 2015, Italian ecomuseums approved: "the Strategic Manifesto of Italian ecomuseums" that aims to contribute to the creation, development, and evolution of ecomuseum experiences, and that can produce virtuous models of sustainable local development. The Manifesto is a work in progress, and it contains both theoretical principles and actions of the annual ecomuseums' Agenda. It also lists tools used by Italian ecomuseums, such as parish maps or cooperation agreements. The manifesto promotes ecomuseum formulas that can make modest cultural revolutions possible on a local scale, by investing in cultural, environmental and landscape heritage and in methods to communicate related knowledge to the wider public and inform them of its use. As local center intended to support a 'local' culture and processes of heritage development, Ecomuseums want to promote heritage laboratories and/or observatories, working on supporting processes of territorialization, developing heritage awareness. To achieve such goals, ecomuseums are working on training and research, landscape planning and educational activities. (Dal Santo, Baldi, Del Duca Rossi: 2017).

The Italian ecomuseums contributed to fund the DROPS international platform that aims to connect national Ecomuseum and Community Museum networks and other heritage and landscape NGOs, in a virtual and interactive space. The purpose is the production of a multilingual documentary and a bibliographic pool of resources on ecomuseology and its best practices.

3. The EcoHeritage project: a brief presentation

EcoHeritage is an international project, supported by Erasmus+ funds, and the main consortium members are from four States: Spain, Portugal, Italy, and Poland. This will guarantee a consolidation of the international network of case studies and best practices at a European level.

While highlighting the occasionally substantial differences in how each country defines the concepts of landscape and cultural heritage, the openness to international comparison makes it possible to identify some invariants that constitute the original contribution of ecomuseums to the project of sustainable development. (Riva:2019).

EcoHeritage will be a constantly evolving tool of study and research that aims to raise awareness about the role of ecomuseum in sustainable development. The transmission of heritage from generation to generation is a key condition of sustainability. To be sustainable, heritage should be constantly kept alive and cared for its transformation to accompany the evolution of society and environment. It is also important to achieve a cooperative management of heritage, empowering the community (De Varine:2019).

The Ecoheritage consortium members have a consolidated experience in ecomuseums and community-based heritage management. The international composition of consortium members is an opportunity to support and promote ecomuseums in Europe. EcoHeritage aims to contribute to the consolidation of ecomuseums as a model of sustainable and collaborative heritage management for the development of economic growth and social cohesion among rural communities in the consortium countries.

Ecomuseum has always been a fluid term since 1971, date in which the term was created by Hugues de Varine and Henri Riviere. Today, an ecomuseum can be defined as a pact for the community in safeguarding their territory. (Maggi: 2001).

Ecomuseum concept is a holistic interpretation of cultural heritage: it is a dynamic way in which communities interpret, preserve, and manage their heritage for sustainable development. According to Davis, an ecomuseum is a community-driven museum or heritage project that aids sustainable development. (Terzic, Bjeljac, Jovicic, Penjisevic: 2014).

The specific objectives of EcoHeritage are:

-raise awareness about ecomuseums as a collaborative heritage management model, establishing a set of criteria for its recognition and a common methodology to improve its contribution to social, economic, environmental and heritage sustainability of rural areas.

- provide skills to adult learners in rural areas through the creation of innovative training materials on active citizenship promotion and participatory heritage management.

- to generate a continuous communication network between ecomuseums at national and European level thus fostering knowledge and good practices exchange that will contribute to the sustainability of consolidated and new coming ecomuseums.

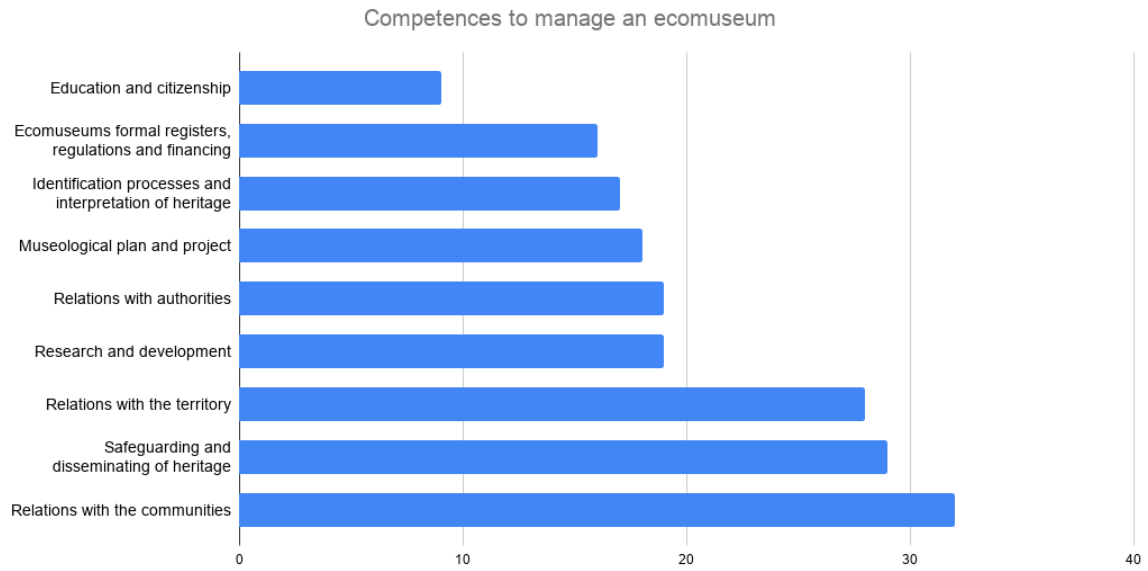
- to foster the creation of ecomuseums as an endogenous resource for competitiveness and social, economic, and environmental sustainability of rural areas.

3.1 First results from the Ecoheritage survey

To identifying the ecomuseum situation in the Countries involved in EcoHeritage project, a survey was defined. The original questionnaire was in English, and was translated in Polish, Italian, Spanish, and Portuguese, before being disseminated by Ecoheritage partners. In the early March 2021, the Italian questionnaire was shared through different channels to reach a wide number of ecomuseums and to have a complete framework and data of them. The channels used were: DROPS web platform with its newsletter, the Facebook page and group of the Italian ecomuseums network, e-mail to the steering committee of the Italian ecomuseums network and to the regional network of ecomuseums; direct contacts via e-mail or WhatsApp of some ecomuseums. 42 Italians ecomuseums answered the questionnaire, and due to the high number of collected surveys (17% of the Italian ecomuseums) no interviews were made. However, Italian ecomuseums were further involved in different meetings, for example, a discussion with Hugues de Varine about his latest book: “l’ecomuséé singulier et pluriel”, which has been recently translated in Italian.

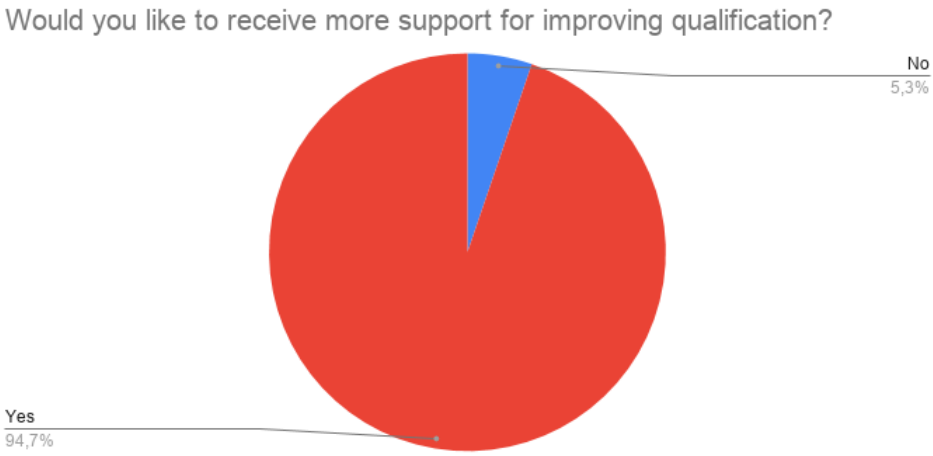
The survey was structured in different sections: identification, structure and management, human relations and partnerships, museum approach to innovation, and museum performance. The main objective was to improve the knowledge about the situation of a selected group of museological institutions, mainly in the fields of definition, characteristics, and experiences of ecomuseums, social museums and other participatory examples of cultural and natural heritage management. Common values, civic engagement, and participation in shared cultural and natural heritage management through Ecomuseums. The organization of the questionnaire and methodology were based on the vast existing bibliography on Ecomuseums, Community Museums and Sociomuseology.

After the analysis of questionnaire's answers, a National report of Italian ecomuseums was written. This will be the basis for the redaction of the Transnational Report of ecomuseums. The report will also be the starting point for developing training and education for ecomuseums. The collected data were useful for outlining ecomuseum main characteristics. Concerning ecomuseum which answered the questionaire, the sample is made up of men in a slight majority over women, half with degrees or higher qualifications, none with training in museology, many are volunteers or members of the community. A large majority of ecomuseums are part of recognized and regularly open. Mostly of a private nature, the ecomuseums interviewed respond to the main objective of interpreting and managing the cultural heritage, mostly in situ, specifically identified with the help of the community, and organized into themes and through cultural itineraries. Mostly equipped with programming carried out with the participation of the local community. Three quarters of the ecomuseums support direct community action. Ecomuseum are mostly managed by coordinators with various qualifications, mostly not related to museology; answers underlined that the main skills for managing an ecomuseum are: relations with local actors and the protection of heritage, as shown in graphic 1.



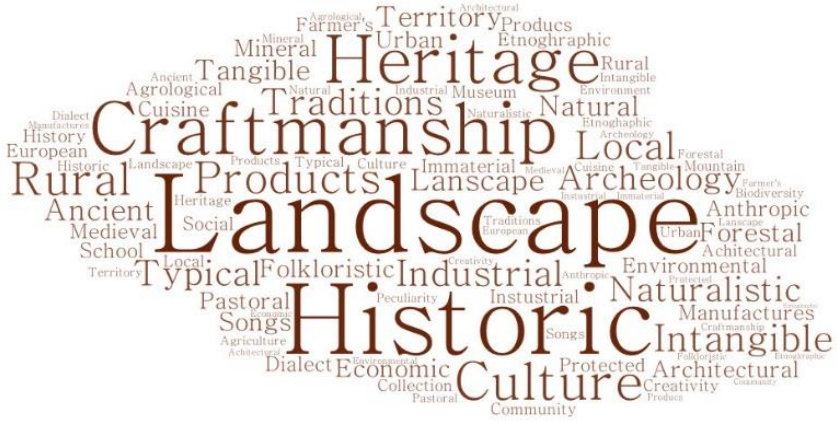
Graphic 1. The graphic shows the competences for managing an ecomuseums.

Also ecomuseum's technicians aren't trained in museology. Ecomuseums offer traning for their local community, using different methodologies and media. A third of the ecomuseums interviewed do not offer training, but almost all would like to receive more training through different channels, as shown in graphic 2. Anwers also underlined the main topics of desired trainings, which are communication, participation and planning.



Graphic 2. The graphic shows the percentage of ecomuseum which would receive more support for improving their members' qualifications.

Concernig funding, not all are financed by their own funds, half of the ecomuseums are in fact loaned by an external public or private institution; they also often use a variety of other sources of funding. In light of all this, one sixth of the interviewees declared that the activity is fluctuating.
The monitoring of the ecomuseum is mostly carried out by external institutions such as the Region, and within the ecomuseum management. Just over a third use self-assessment tools or monitor with the population results and impact. Some do not monitor at all. They use various technologies for their activities.
Concerning the most relevant heritage for ecomuseums, data collected underlined some keywords and trends, as shown in word cloud 1. Those topics are landscape, craftsmanship, the heritage in a holistic way (cultural, historical, archeological, and local tradition heritage). All ecomuseums affirmed that such local heritage has been properly identified by the ecomuseums with the support of the community.



Word cloud 1. This word cloud represents the keywords in ecomuseum answers about their most important cultural heritage.

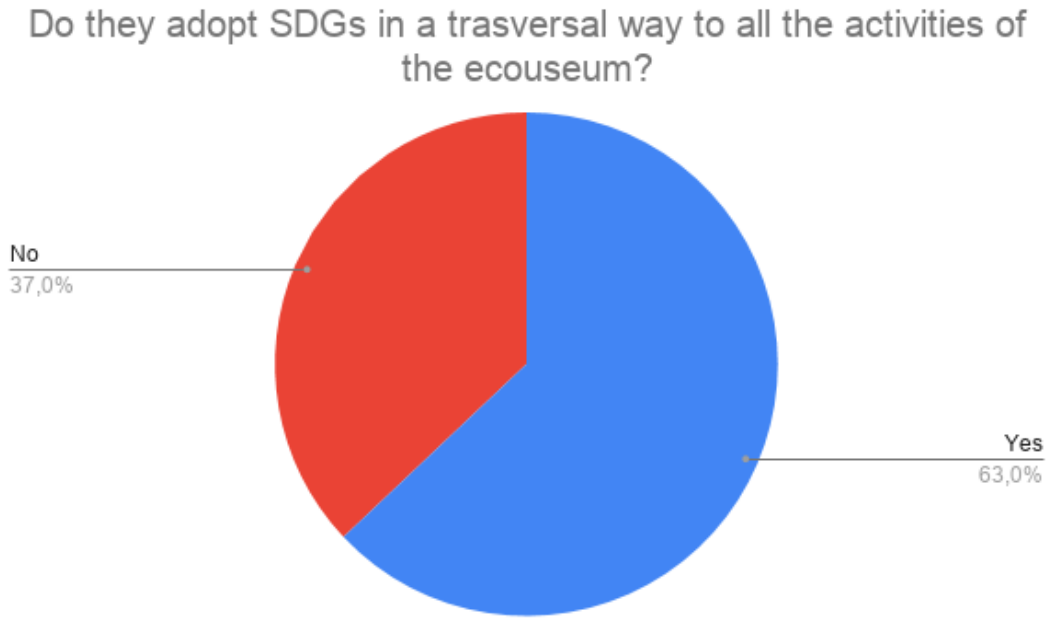
Heritage relevance for ecomuseums is also underlined in data concerning activities. Indeed, ecomuseums specify different domains that have a relevant impact for their activities, as shown in word cloud 2. Heritage is the most important topic, followed by natural resources relevance, education, and people potentiality.



Word cloud 2. The word cloud represents keywords in ecomuseums' answers about the domain in which ecomuseum have a more relevant impact.

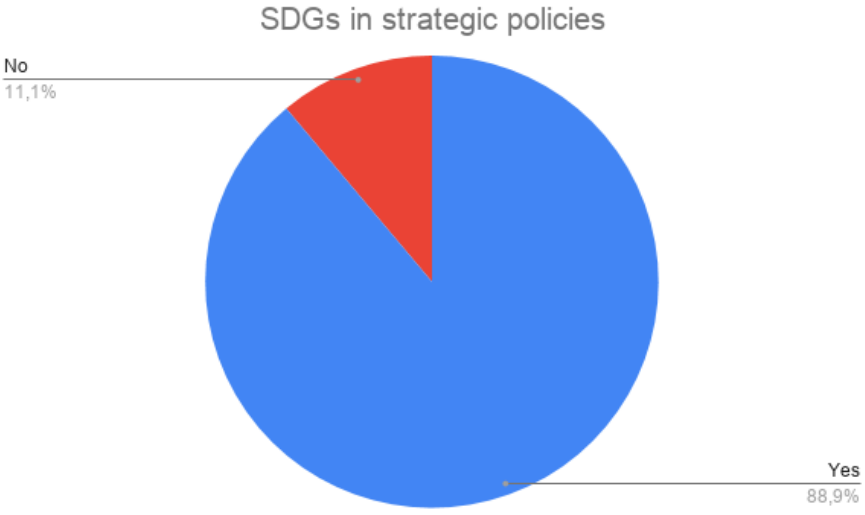
Concerning training needs, the results obtained show that one third of the interviewed ecomuseums do not offer it, but almost all ecomuseums would like to receive more training with different media, particularly in the fields of communication, participation, and planning. Furthermore, just over a third use self-assessment tools or monitor with the population. Some do not monitor results and specially impacts. This suggests the need of specific training on the subject.
In the last 5 years many ecomuseums have introduced or innovated their services but largely have not promoted training for their development often entrusted to volunteers and community members. It would be advisable to evaluate how to develop specific training on the subject. The ecomuseums are strongly committed to the issue of education for all age groups, but with a prevalence of young people and with cooperative learning methods and mainly through guided tours and excursions; only half of the

ecomuseums make use of specific figures for education, which is largely carried out by their collaborators or by members of the community. So, on the one hand there is the need to train educators, in particular volunteers, on the other hand there is the need to train ecomuseum operators on the techniques for the continuous and cooperative training of adults to empower them in managing the living heritage in a sustainable way with the purposes of local development.
Two thirds of ecomuseums adopt the SDGs as cross-cutting objectives in their activities, as shown in graphic 3. Almost everyone is interested in integrating the SDGs into their policies: for this a specific training would be appropriate.



Graphic 3. The graphic shows SDGs goals included in a transversal way in the ecomuseums activities.

As shown in graphic 4, ecomuseums already adopt SDGs in strategic policies. Encouraging training in SDGs will empower ecomuseums strategic policies in this way and will also be along the lines of European objectives in sustainability.



Graphic 4. The graphic shows SDGs goals included in respondents' strategic policies.

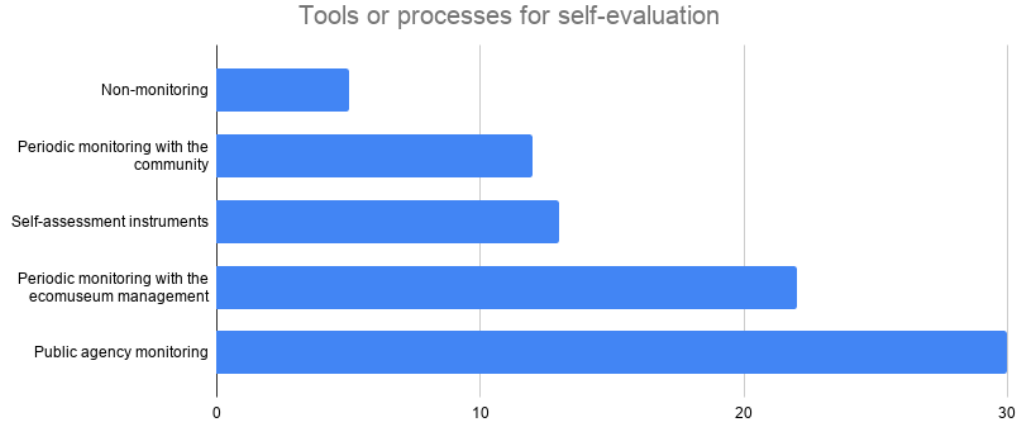
We propose to modulate this training on the "climate action" objective. Because of its transversally to all objectives, it was specifically introduced in resolution no. 15 on community museums, which was approved by ICOM at the 2019 Kyoto General conference. Climate action has also strategic importance for ecomuseums.
To resume, the main topics of training needs come to light were:

- the need to improve the competences in local development and in community involvement.
- the relevance of SDGs in defining new practices.
- the need to receive more training and support for improving professional qualifications.
- the need to recognize and communicate heritage.
- the need to improve museal education for heritage enhancement.

Ecomuseums have in themselves the ability to disseminate the culture of sustainability because they are established as institutions strongly rooted at the local level, able to produce initiatives and interventions tailored to the territory, enhancing above all social relations as their action is focused on “networking and cooperation”. (Riva:2019)
It will be fundamental to involve ecomuseum in choosing their training methods, and to consider the differences between each ecomuseum. Indeed, some ecomuseums are well developed and have a concrete objective and strategy, while other have not a clear vision of actions and development yet. Regulate the type and the methods of training and education depending on ecomuseum features can represent the right tool for their best performance.

Conclusions

EcoHeritage first result for Italy was the ecomuseum national report, which offers a panoramic view of ecomuseum, and their training needs for improving their performance.
There are different situations in ecomuseums, in terms of structure and vision: some of them have a clear view and mission, while others do not have a structured strategy or vision. This is the reason why we decided to divide ecomuseums into two main 2 groups: unstructured ecomuseums, and structured ones, to plan and answer to their training needs in the best way.
In particular, unstructured ecomuseums need training and education in effective and innovative communication, participative heritage management and cooperation skills for new collaborations with other institutions. In this way they will obtain visibility and they will develop a strong strategy for the future. Structured ecomuseums need a training that can reinforce sustainability actions, which are already conducted, but are not based exclusively on SDGs objectives.
Structured and unstructured ecomuseums will both need to be evaluated with internal or external tools for measuring their impact as a social institution.
Graphic 5, created collecting data from the survey, shows the tools for self-evaluation already used by ecomuseums. Two kinds of monitoring are present: the most used is the external one (monitoring by public agencies). Monitoring by ecomuseum management is the second most important tool. A more participative monitoring is needed, indeed, community-evaluation could be improved.



Graphic 5. The graphic shows different kind of tools used by ecomuseums for self-evaluation.

Evaluating means measure actions and has three main purposes: evaluation for recognise counterpart (identity), evaluation for having more authority and reliability as a group (collective organization), evaluation for making more effective its own behaviour (effective actions). Auto-diagnosis aims to help people in understanding ecomuseums’ main pillars: participation, accountability, and involvement of local community; the definition of an action-strategy and governance; safeguarding and enhancement of territorial resources for stimulating sustainable development. (Borrelli, Corsane, Davis, Maggi: 2008).

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Heritage between identity, memory and evolution

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Abstract
Digital techniques are leading to a drastic reduction in the "distances" between different places and cultures; the contemporary architectural trend is pushing towards a "globalisation" of architecture and building techniques that seems to be eradicating the historical link it has always had with the culture of places.
In this situation there is a risk of losing the identity of places, which, in order to respond to the new demands dictated by progress and digitalisation, undergo a radical transformation, denying their relationship with their history and context.
Only that part of the heritage which the international community - throughout history - has recognised as such, will survive this process whose aim seems to be to unify architectural trends in the name of ever more imminent progress. The monuments that have made great cities famous will continue to be appreciated as such, but all the small works that have always characterised each culture will be forgotten and erased to make way for an international cultural unification.
It is not only the modest architectural artefacts - though rich in historical, cultural and social significance - that are at risk, but the context itself: the place that has always prompted man to modify it in order to appropriate it.
This reflection leads us to analyse the emblematic case of a city that has undergone inevitable nineteenth- and twentieth-century transformations and that today, in the name of a much-dreamed-of " recovery " risks seeing many traces of its past erased, which, although minor, are fundamental for the preservation of the place's identity.

Keywords: Identity, Place, Anthropisation, Memory

1. City and digital techniques
The recent global situation imposed by the pandemic has further highlighted the potential of today's digital tools. The habit of 'connecting' in real time with every part of the world, overcoming the limitations of distance, has spread with unexpected speed. People had the impression that every place was extremely close and - even though for more than a year people were particularly distant and even more distant - they believed they could be simultaneously in every place, from every part of the world, at any time. Thanks to technology, distances were 'virtually' eliminated.
In these times, cities have appeared empty, almost inanimate, and life instead of taking place in urban spaces, in the open air, has been relegated to domestic spaces, to enclosed places. The potential of digital media appeared of fundamental importance and, suddenly, direct contact with reality was lost. Every relationship has been borrowed from the computer medium and the web: meetings have taken place electronically, places and cities have been travelled 'at a distance'; there has been a tendency - or an imposition - to take exclusively 'virtual tours', losing all contact with the real context. Everything has been borrowed from the digital medium.
While all this has enabled a further surge in the dissemination and interchange of ideas and cultures, projecting us definitively into the digital age, it has also generated the erroneous assimilation of every place to a virtual place without identity.

1.2 Globalised architecture

In a context such as the present, in which the real place merges with the virtual place, the increasingly massive use of digital technologies in field of design has contributed to standardising the way architecture is conceived, spreading typological and linguistic models which are no longer influenced by the place, but generated mainly by the potential of software.
Current modelling software is having a decisive influence on contemporary architecture trends and is defining an architectural language which appears to be the exclusive child of the potential of digital tools. In these years we speak of "parametric design" associating this term mainly with the use of advanced digital technologies in complex projects.
In reality, the concept of 'parametric' would imply the set of relationships that exist between the various 'parameters' during the design process, but its applications in architecture are still poorly defined.Parametric architecture, in fact, is mainly understood as architecture developed through the use of software that allows the creation of very complex forms.
In the 1990s, thanks to the contribution of Gross, who recognised the potential of 'parameters' in the elaboration of complex forms applicable to building design, a parametric approach to design was introduced.
Following the completion of Gaudi's Sagrada Familia using computer models based on the use of digitally controlled surfaces, Josep Gómez Serrano provided an explicit definition of the implications of parametric procedures in project design. The potential of parametric design was soon realised and extended to structures and definitively integrated the design act with the digital component [1].
It is also thanks to the application of computing processes to the design of buildings that Frank O. Gehry's deconstructivist architectures become an important example of the (parametric) architecture that the major architects of the last decade are working on. Their projects are generated by a system based on 'parameters' and 'relationships' [2].
The influence of the technical (digital) tool on the act of designing has, on the one hand, made it possible to develop new linguistic and typological models that have opened up new avenues for design, but on the other hand it has generated a disconnection between architecture and place and has not taken into account the link between the new artefacts and the culture of the places for which they were conceived.

1.3 Identity of places

The widespread application of digital technologies to design has led to the development of new architectural languages that place the performance of the software used for design and modelling at the centre of all experimentation. All of this leads to the emergence of increasingly stunning and surprising architectural languages that seem to celebrate themselves by overshadowing the relationships they could (and should) have with the place for which they are conceived.
Architects have always contributed to the dissemination of universal models for architecture: Vitruvius transcribed the principles of architectural practice in his Ten Books, proposing linguistic models in Roman culture that came directly from classical culture. The same 16th and 17th century treatise writers rediscovered these models a millennium later and applied them in their works, giving rise to extraordinary examples of Renaissance architecture that would become the source of inspiration for 19th century neoclassical works.
In more recent times, Le Corbusier, theorised the principles of rationalist architecture in a radically new and unequivocal way. *Pilotis* (pillars), *Toit terrasse* (terrace or roof garden), *Plan libre* (free plan), *Façade libre* (free façade) and *Fenetre en longueur* (ribbon window) lay the foundations for a new way of doing architecture that derives directly from the structural innovation that totally transformed the way we build: the use of reinforced concrete. That technological invention - and the subsequent architectural theories - paved the way for an international type of architecture which, over time, has increasingly characterised the places themselves.
Although even rationalist theories defined universal principles for the realisation of works, designers have always tried to interpret their projects with respect for the place, its culture and traditions. Extraordinary works built in the first half of the twentieth century - in full respect of the rationalist language - have found an unavoidable link with the place for which they were conceived.
(fig 1 marinella, iren, gas)
This is an attitude that the digital era seems to have partly forgotten. We are witnessing a very standardised way of doing architecture, based on functional models generated almost exclusively by economic and construction processes, and in any case inspired by a language which, without being based on any theoretical principles, seems to influence contemporary architecture at an international level.
Today, when the distances between places seem to be shrinking due to the spread of the digital network, this attitude is even more evident and it is almost impossible to trace a building back to the place that should have generated it.



Fig. 1: The Marinella (Genova Nervi, 1930s) and the Gas Company building (Genova Gavette, 1950s) are inspired by the characteristics of the site on which they are located.

2. Architecture and place

Every place has characteristics that make it unique, recognisable and differently usable. Vitruvius taught us that the correct choice of location is fundamental to the construction of a city, and the Roman architect thus established an inseparable link between the environment and architecture. [3].

Christian Norberg-Schulz affirms that the architect's task has always been to create places for the development of human life in relation to a given natural environment [4], which makes this link between place and building even more indissoluble.

Architecture is the result of a historical process that has lasted for thousands of years and has generated the coexistence of very old buildings with contemporary artefacts, even through inevitable transformations of the environment itself. Each individual may have a different idea of 'architecture', balancing art, science and technology. However, this is not just an idea, as architecture is a real fact, which belongs to our daily life and which we find in the cities, in the countryside, in the environment in which we live.

Architecture, then, is something concrete that has been produced over a very long period of time - and as such may have existed for thousands of years as well as for a very short time - and yet finds correspondence in an infinity of different ideas that vary from individual to individual. In recent times it seems that these ideas are constantly changing faster than in the past.

It is interesting to compare the idea of architecture formulated by Vitruvius two millennia ago with contemporary architect Frank O. Gehry's conception of it. If for Vitruvius architecture is based on respect for three fundamental requirements: *utilitas*, *firmitas* and *venustas*, for Gehry architecture coincides with art understood as a discipline free of constraints and conditioning [5].

Gehry, unlike most 'traditional' architects, detaches himself from concrete issues. Since the strength and disarming fascination of the work of art are also inherent in its uselessness (since pure and divine beauty is free of all constraints, all conditioning and all time), the artist could live in a purely aesthetic condition. The architect, on the other hand, is also required to have an ethical vision that cannot disregard either cultural and social conditioning or relations with the place itself.

Although Gehry can be considered an artist capable of producing forms - or rather buildings - independently of any real concerns (structural, functional, distributive and historical) and as such can be admired, it is unthinkable that a similar consideration would be given to any designer, under any circumstances. The risk would be to permanently lose the link with the place.

Many archistars impose their idea of architecture on the site. Richard Meier's white buildings also appear to be self-celebrating buildings that impose themselves on the places where they stand. If one looks at these buildings, they appear extremely balanced and denote an incredible identity, the hallmark of a great architect like Meier. But if these buildings were to be decontextualised, almost nothing would change in our reading of them, since they are not born of the place and its identity, but impose themselves on it (commendably).

Meier's buildings in Italy, Europe and America show the same characteristics, and none of them truly belongs to the place for which it was conceived.

Gehry and Meier are architects who come from a culture - that of the United States - which certainly does not have a strong bond with the place and its history, so it is possible that their design attitudes are also affected by this characteristic.

Meier's statement that "white buildings make you more aware of the colours of nature" is all very well, but it can lead to a "standardisation" of architecture itself and a loss of the identity of places. This also happens in Calatrava's works, which impose themselves on the site as strong, autonomous signs. Even the Spanish architect's white bridges become unmistakable signs which, in an attempt to further connote a place, tend to standardise very different places.



Fig. 2: Richard Meier: New Harmony's Atheneum, Indiana; beach house, California; MCBA, Barcellona. Santiago Calatrava: bridges in Pontevedra, Cosenza and Siviglia.

2.2 Recognised and forgotten heritage

The city is made up of streets, squares, residential and specialised buildings; Marco Romano has defined the city as a sequence of 'houses' and 'collective themes' [6]. From a spatial point of view, the city is a sequence of solids and voids. In it emerges a "recognised" heritage to which history and society have attributed a perpetual value: these are the great buildings (palaces, villas, castles, etc.) built in glorious historical eras that have been consecrated as the connotative heritage of the place itself. In addition to these, there are those urban complexes that have characterised the history of the place (historic centres, villages, etc.). Often the authorities protect and safeguard these precious artefacts in an attempt to protect the history of the places.

In spite of this, unfortunately, protection is often limited to individual complexes and does not concern the entire system - made up of both architectural emergencies and more modest artefacts - nor does it concern the entire more or less man-made landscape context. This leads to recognising only a portion of it as heritage to be protected, with the danger that over time the legibility of the landscape and urban complex will be lost, and the identity of the place and what is still there will be lost.

2.3 The place that no longer exists

Focusing on just a few elements (emerging for historical, cultural, economic, etc. reasons) of the city and not paying as much attention to the whole built complex means "dismantling" the history of the places themselves and giving them a different identity. In the process of continuous evolution that concerns cities, it is inevitable that they undergo continuous transformations and adaptations in order to meet the renewed needs of their inhabitants. The most radical transformations most often coincide with particularly important historical moments, often marked by epochal revolutions that have led to an upheaval in the structure of the city itself.

This is the background to the great 19th century urban transformations that affected every large city. In those years, technological innovations imposed the definition of a new model of city capable of accommodating an increasing number of inhabitants. In the space of a few years, the whirling development of communication routes (with the invention of the automobile in the first place) required an adjustment of the entire road network, which inevitably led to the search for a new urban layout in every city. The Second World War, with its destruction, forced a reconstruction that should have taken place in a few years and with relatively contained costs, after the previous two decades in which architecture had, more often than not, been conceived to celebrate governmental power.

The new millennium opened with the explosion of the digital era. While at the end of the 1980s less than 1% of the world's technologically stored information was in a digital format, only a few years later - in 2007 - this percentage had already risen to 94% [7]. The year 2002 is said to be the "beginning of the Digital Age". It is perhaps the most important revolution in the history of mankind; a revolution that is still going on and that has not yet shown all its potentialities but also its limits.

In recent years, life has changed radically. And cities are adapting to the new changes. While waiting for transport to change radically again in order to decongest urban and interurban traffic, new roads are being designed in an attempt to "free" built-up areas from cars, which for decades have literally been invaded by them. Efforts are being made to rediscover green spaces, which have all but disappeared in cities, and to design new forms for contemporary cities.

This universal attitude generates different interventions in different places: tree-lined promenades are built where until recently there were traffic arteries; more efficient residential complexes are built; commercial activities are gathered in reserved spaces that are no longer integrated with residences; areas are created that are exclusively dedicated to industry and/or large commercial chains; attempts are made to highlight the architectural emergencies - or parts of them - that still remain.
While this attitude is more than correct and desirable, there is a risk that new projects will not be linked to the identity of the place, but will still be generated by private interests and a dystopian vision of the city. This danger stems from the fact that over the course of history - and especially in the last century - places have undergone such incredible and irreversible upheavals that they have now been left without identity. For these places, even before embarking on a further process of transformation, it would be necessary to define what could still be recovered of the lost identity.

3. The case of Genoa

For the purposes of this discussion, Genoa is an excellent example on which to reflect in order to start subsequent considerations. The history of the city is marked by a number of fundamental stages that have given it a structure that remained almost intact for several centuries, until the dawn of the great transformations of the 19th and 20th centuries.
Not particularly important in Roman times, Genoa, from the first millennium onwards, mainly due to its strategic position in the Mediterranean basin, underwent an extraordinary development that made it first the most important commercial city in the Mediterranean and later one of the most important cultural capitals in Europe. [8]. At the beginning of the twentieth century, the city discovered its industrial vocation and, as a result, took over large areas, removing them from the land and the sea.
It is above all these invasive transformations that have marked a decisive turning point in the current layout of the city: these transformations have definitively changed the environment and the relationship that the Genoese have always had with it.
Suffice it to say that in the first half of the 20th century the natural orographic boundary that had always enclosed the city to the west (the hill of San Benigno) was cancelled, and the coastal strip was moved away for several hundred metres in many parts of the city (in Cornigliano, it advanced towards the sea for almost a kilometre, recovering about 600,000 square metres of surface area [9].

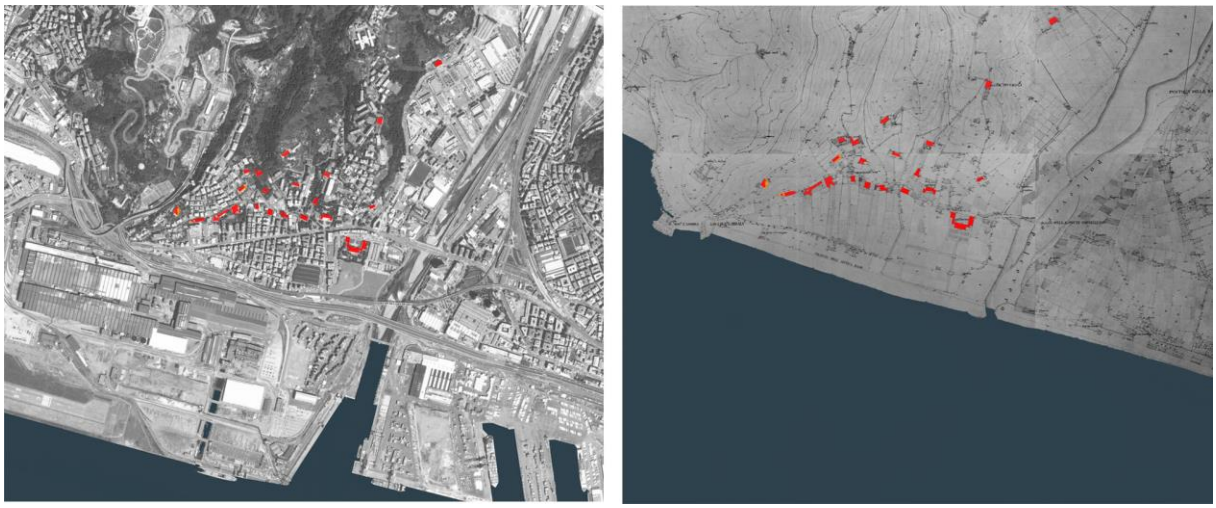

Fig. 3: Genova Cornigliano: graphic elaboration for the comparison between the current urban layout and the situation in the mid-nineteenth century (in red the villas still existing)

Following the destruction of the war, in the same period, some Genoese neighbourhoods (Piccapietra and Via Madre di Dio) that had survived the urban transformations of the beginning of the 20th century and that had strongly contributed to build the identity of the city itself were definitively demolished. The demolition of part of the ancient urban fabric that had characterised Genoa for centuries offered the Genoese new spaces to rethink the city of the future. Many opportunities, in those years after the Second World War and up to the end of the century, were not seized in the best possible way and an opportunity to redefine the city's identity with coherence and farsightedness was missed.
Where until the 1970s the identity of a neighbourhood strongly connected to the historic centre and linked to the sea until the end of the 19th century had been maintained, a business district settled in, which in terms of architectural quality and social aspects immediately appeared as a suburban area largely disconnected from the rest of the city. The Piccapietra district had already experienced a similar situation a couple of decades earlier, and its post-war interventions had not succeeded in restoring to this part of Genoa the identity that had always characterised it.

The result today is quite evident: entire portions of the city that day by day seem to become more and more inanimate; deserted spaces that have never found a real identity and complain about the presence of a social life; or even improbable green spaces that do not have the characteristics to be 'lived in' by the Genoese.



Fig. 4: Genova. Following demolition in the 1970s, the Via Madre di Dio district was transformed into an office district. One of the few recognisable elements is the eighteenth-century bridge that now dominates the Giardini, known by the Genoese as the 'Plastic Gardens'

3.2 A city of buildings

The radical transformations that have characterised the last one hundred and fifty years have attempted in some way not to permanently destroy the rich heritage of important historic buildings. While it is surprising to learn that after World War II - when there was already a certain amount of sensitivity towards basic building in historical centres - nothing was done to safeguard entire portions of the historical fabric (such as Piccapietra and Via Madre di Dio), it is comforting to know that an attempt was made to protect the most important buildings. Many of these, however, had already undergone considerable mutilation in previous years, which had deprived them of their natural relationship with their context.

The nineteenth and twentieth century expansion of the city, which led in 1926 to the formation of 'Grande Genova', required interventions that overturned the entire territory and irreparably changed the old urban layout.The peripheral areas - annexed under a single administration - were affected above all by large-scale infrastructural works.

Exemplary cases concern the districts of Sanpierdarena and Cornigliano, located to the west of the city, beyond the San Benigno hill and separated by the Polcevera torrent. Until the 19th century, they were considered ideal holiday resorts, located in the immediate vicinity of the city. Their orographic structure remained easily legible until the beginning of the 20th century and was for several centuries characterised by a sequence of small valleys and hills on which important noble palaces had been built since the 15th century

Villas and palaces were often the holiday homes of the most important Genoese families, who built extraordinary examples of 16th and 17th century architecture in these places. Each villa had a large green space, partly dedicated to cultivation and partly used as a garden. This is an extraordinary heritage of villas and palaces that in most cases has survived to the present day, but has now lost its original identity.

Urban transformations have in fact spared the buildings, but have sacrificed the entire context in which they were immersed and which had contributed to defining the identity of these places. Most of the

aristocratic buildings still exist today, but it is no longer possible to read the relationship they have (or rather, had) with the place.
It is astonishing to compare the current state of this densely and haphazardly built-up part of the city with the way it looked up to one hundred and fifty years ago, when a few grandiose buildings enhanced the characteristics of the place. The development of new roads and the concomitant building development have completely erased the original conformation of the territory of these two important portions of Genoa.

3.3 The city not considered

The desire to safeguard the villas and palaces stems from a criterion that attributes different values to the heritage in relation to aesthetic, historical and cultural aspects and cannot ignore arbitrary evaluations. From this point of view, a component of the city has had to be neglected which, although secondary and perhaps less important than the most important buildings, has nonetheless contributed to shaping the image and identity of the city throughout history: the relationship with the place and the secondary buildings.
The places have been transformed and have lost their original connotation; it is no longer possible to read the structure of the territory that until the mid-nineteenth century had always suggested any urban development. The "secondary" fabric, made up of spontaneous constructions and buildings not considered particularly important, was quickly erased to make way for new urban layouts. This betrayed the logic with which the city had developed over the centuries to adapt to the characteristics of the site. It is necessary to have a strong sensitivity before intervening irreversibly in the territory and its history. The example of Cornigliano - but also of Sanpierdarena, Via Madre di Dio, Piccapietra and many other parts of the city - is emblematic. The loss of identity of the place inevitably generates the loss of identity of every trace that continues to remain on the place itself. Ensuring the existence of an extraordinary seventeenth-century villa without protecting the place on which it stands means decreeing its demise. This is the case for the dozens of historic villas that are now 'suffocated' by twentieth-century constructions and disconnected from the ancient urban layout that conceived them. This is the case for many buildings considered to be of great value, which are preserved by depriving them of the place on which and for which they were conceived.
During the construction of an important Genoese road axis, between the end of the 19th and the beginning of the 20th century, the demolition of part of the historical walls was imposed. The so-called "Fronti basse" belonging to the new walls (built in the first decades of the 17th century) and some sections of the 16th century walls were demolished. This also entailed the demolition of some access gates, including the Porta di Santo Stefano (Porta degli Archi) and Porta Pila.

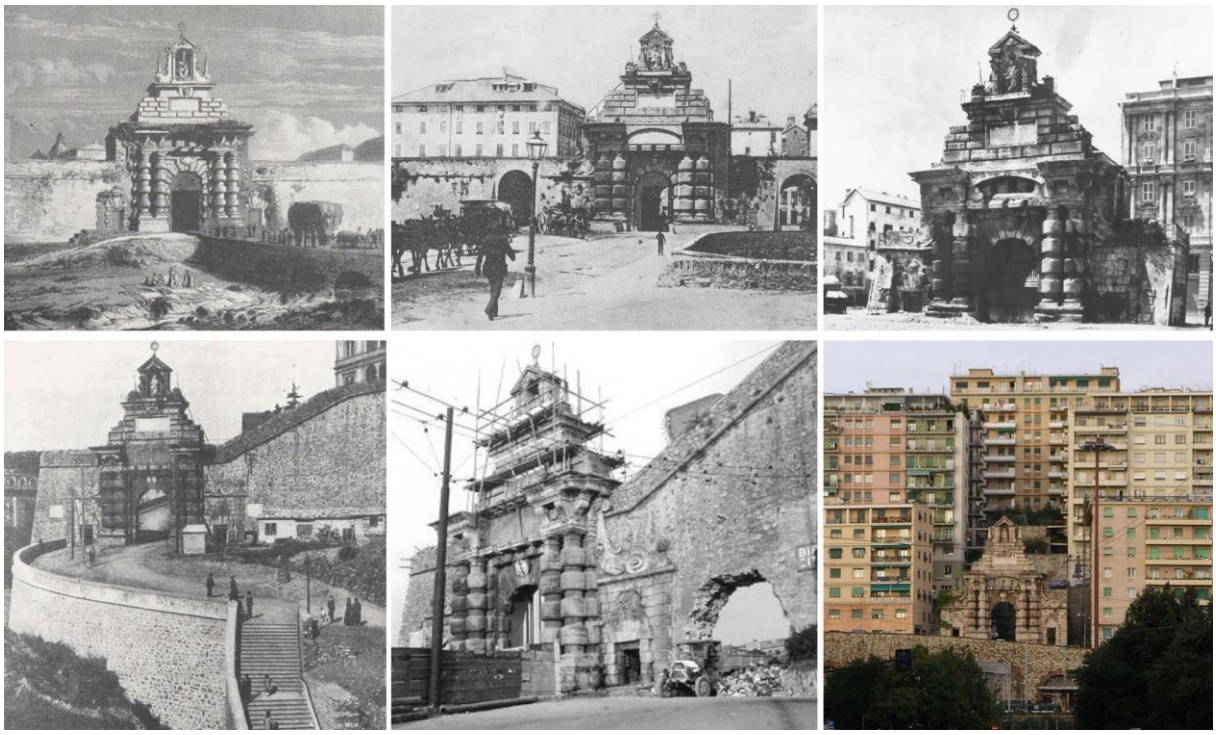

Fig. 5: Genova, Porta Pila. The gateway to the city was originally located on the Bisagno plain, in the 17th-century walls; it was dismantled at the end of the 19th century to be reassembled further upstream. After the war it was dismantled a second time and moved a few dozen metres.

The two city gates were not actually demolished, but dismantled, and rebuilt a few hundred metres apart. Porta Pila was even dismantled a second time (in the 1940s) in order to free up a road that in the meantime had taken on a strategic role for communications and transport. Today, the gate in question is in an elevated position with respect to the plain for which it was conceived and is placed in a rotated position with respect to the actual course of the city walls.
It is obvious that the complete transformation of the context renders almost useless the efforts made to keep the artefact intact (or rather, rebuilt!).

3.4 The lost identity

The loss of the identity of places deprives the planner of a fundamental input for the design of the city. It is becoming increasingly difficult to intervene with architectural and urban planning works on places that are no longer recognisable and have lost their identity. The traces that can still be read are often evidence of isolated interventions, originally conceived as "major interventions" or "works of art". On the other hand, the testimonies that, even in their simplicity, have always characterised every place are being lost.
It is not only the stately buildings that document the history of a place, but also the secondary architecture, the spontaneous architecture that first initiated the process of anthropisation of the place. Each artefact becomes an important piece of the history of the place: it can be a testimony to building technologies, typological systems, the environment and the territory. It is also thanks to the preservation and protection of these (apparently less important) elements that the identity of the place can be kept alive and recognisable.

4. The need for a new sensibility

The last one hundred and fifty years have seen events that have radically - and irreversibly - transformed human life and the environment: since the beginning of the last century, distances seem to have almost disappeared; the process of anthropisation has increased unexpectedly in recent decades and, with the aim of improving the quality of life, we are still struggling to recover the quality of the environment. For centuries, architecture has developed using natural materials and has managed to relate to the territory with discretion and respect, leaving indelible signs that have helped to define the identity of the places themselves.
The attention currently focused on an exclusive part of the heritage should be directed not on individual buildings of primary importance, but on the place itself, with the aim of preserving all those aspects that contribute to defining its identity. Every design choice should be based on a more careful observation of the characteristics of the place and its history, avoiding contributing to the process of "globalisation" of architecture that is producing self-referential artefacts everywhere that are completely detached from the context and its cultural, social and architectural traditions.
The lack of this sensibility contributes to erasing the identity of places: architectural interventions no longer seem to arise from the place, but tend to impose themselves on it, irreparably distorting its geomorphological characteristics which for centuries have marked the path for the development of every anthropic intervention.



Fig. 6: Genova Cornigliano. Project for the recovery of via Cornigliano (www.comune.genova.it)

The countless opportunities of recent years - in which cities are undergoing radical transformations dictated by socio-economic reorganisation - have in most cases not been fully exploited. Where just a few decades ago there were industrial plants, large empty spaces have become available that need to be completely rethought in order to revitalise entire city districts.
In Cornigliano, the construction of a new artery further out to sea for fast traffic towards the west has considerably eased traffic on the main road which has been crossing the neighbourhood for more than a century, where until the nineteenth century there were market gardens. The road has thus undergone a restyling, which is still in progress, in an attempt to improve the aesthetic characteristics of the road without, however, drawing inspiration from the original identity of the place.



Fig. 7: Genova Molassana. Residential development in the former industrial area of Boero colours

In the middle Valbisagno, in the Molassana district, the void left by the closure of the Boero colour factory has been filled with a new, very dense residential settlement, together with the inevitable supermarket. The buildings now being completed adopt formal, chromatic and linguistic choices that distinguish many residential settlements built in recent years on the outskirts of Milan and which have nothing to do with the Genoese fabric. Not far away, only a few years ago, a nucleus of historic buildings which had also influenced the place's toponymy (l'Olmo) was demolished to allow the construction of the new municipal headquarters. It is an intervention that has nothing to do with the size of the neighbourhood itself and appears to be a pseudo-industrial building erected next to what remains of the old national theatre built at the dawn of the 1930s at the height of art deco [10].



Fig. 8: Genova Molassana. New municipal offices in the Olmo area, next to the historic Deco-style National Cinema, now abandoned

Many glimpses of this part of the city offer views that confirm the absolute lack of sensitivity in the management of the interventions that have been carried out over the last century. Even the latest redevelopment operations show a haphazard collage of inhomogeneous and contrasting interventions. Among these, the pseudo-cable-stayed bridge stands out, seeming to mimic Calatrava's candid engineering works without in any way confronting a residential context.
Until we succeed in acquiring a marked and renewed sensibility towards the connotative characteristics of the place, every intervention will always risk being self-referential, disconnected from the context and its history and, more often than not, will contribute to cancelling the identity of the place itself.



Fig. 9: Genova Molassana. The new cable-stayed bridge looks like an element that is completely out of context

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Living in comfortable, identity and evolving spaces

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Abstract
Current sensitivity is geared towards psychophysical well-being and the pandemic crisis we are experiencing is amplifying the search for answers to health, on one hand, and to connection on the other. We are increasingly projected to the virtual dimension, often forgetting concrete reality. In fact, a planning or a design risk, also favored by technological advances, is that it responds more to the rules of the market and to the emerging virtual needs of the community rather than to the resolution of real and priority problems, modifying the evolution of the city, which shapes up to be a system. The management of the territory can no longer be exercised, in actual fact, on individual areas, but rather implies an overall, holistic vision in consideration of the "principle of absolute uniqueness" of the landscape in all its components, including cultural heritage. In this sense, the design response has to resemble a process which, by emulating the regenerative and resilient mechanisms of nature, tends to integrate and optimize both the cultural heritage and the specific resources of local contexts, in order not to lose the interaction between man, built and environment, with the additional risk that urban spaces are not perceived as their own and, therefore, not used. Bioclimatic design strategies and passive solar systems can play a decisive role, also because they maximize energy efficiency and concretize the search for health solutions.

Keywords: environment, interactions, comfort, identity, bioclimatic

1. Introduction

Urban design, dealing with the places of human action, can have a decisive political function, just as it can open the doors to the future, in a present that teaches us more and more that "the price of not doing" is much higher than what we are willing to pay for concrete and ecological actions in the area. The unstoppable climate change and the increase in health problems are a clear manifestation of this. Certainly, compared to a few decades ago, current sensitivity appears increasingly oriented towards psychophysical well-being and the pandemic crisis we are going through is amplifying the search for answers to health, on the one hand, and to connection on the other. Well-being is never just physical: there is a close relationship between body and mind (a well-established concept in oriental medicine) that calls into question relational dynamics within our ego but also and above all between us and the outside world, to the point of involving the work, the social and environmental context in which we live and with which we confront and from which we involuntarily absorb the characteristics, unfortunately more and more often harmful. The awareness of the material care of the body is certainly more widespread. But do we reflect enough on how the immaterial contributes to create our balance, well-being and therefore our appearance? The overall well-being of the person is a response to the perception of harmony and to an integration into a system to which meaning is attributed. The human being, inevitably interacting with the surrounding environment, needs at least not to receive too negative stimuli, not to perceive annoyance or discomfort, as often happens, for example, for acoustic bombardment, for radon, for harmful substances that release substances into the air we breathe even years later, due to pollution in general. On the contrary, the beauty of a landscape capable of restoring a soul can truly be a resource.

2. Design for health

The city, in Plato's "Republic", a political metaphor and architectural object, was described as a pasture, "a place that conditions and nourishes the growth and development of those who live there - and which as such must be - organized and built in this way to be nutritious and healthy“ (quote Emery, 2007b, 5-6), because the city nourishes the citizens without their realizing it, forging consciences, souls and bodies for "aesthetic addiction” (Emery, 2007a). Architects and builders and those who intervene on the territory by organizing it physically have the task of preventing the “bad weeds” from poisoning the citizens and depressing them instead of making them thrive. On the other hand, that the environment influences us both physiologically and psychologically was already evident at the dawn of medical medicine with Hippocrates, who started his therapy by reflecting on topographical and topoclimatic aspects. Today, without taking advantage of a healthy, clean, aesthetically pleasing environment, any other right, to dignity, freedom, food, health, as stated in the 2030 Agenda, cannot be said to have been achieve. The health of people is inextricably linked to that of the world in which they live. The National Bioethics Committee treats the issue of health in an essential way from collective activities; these have repercussions on everyone's health, which therefore cannot be treated without considering the various contextual implications and interconnections. Governments should promote social responsibility and awareness of environmental policies and pollution, including in internal environments where the individual is directly involved. If by health we mean the condition to fully express one's activity (NBC, bioethical guidelines for health equity, 11), the treatment will consequently be a restoration of these abilities. In this sense, political operations could be aimed at promoting healthy abilities, environmentally and socially responsible lifestyle. In short, we are not patients, but above all “agents”, whose actions deeply affect reality and can cause flaws, gaps. Just think of the spread of the Coronavirus pandemic that has taught us how it is not possible to save yourself alone and how our planet is basically small because it is intensely connected. How long has it taken for the tiny virus to reach all continents? The causes of the most common infectious diseases transmitted in confined environments are in fact attributable to viruses, due to their high contagiousness and environmental resistance. (Coronaviruses, responsible for respiratory infections, can cause an atypical form of pneumonia that causes patients to develop severe respiratory dysfunction in a few days, if attacked by that particular group of viruses identified as Severe Acute Respiratory Syndrome / SARS). Recent research from the University of Catania links the increase in Coronavirus to pollution: factors such as the increase in fine particles or air pollution can affect the epidemic, increasing the risk of contracting Covid19 and developing it in severe forms. The data in particular from some regions have shown this. On the other hand, among the measures triggered to contain the spread of the virus, the generalized closure has regressed the greenhouse effect, reducing air pollution. For a short time nature seemed to regain possession of its spaces. It was the only one to breathe in a context of physical suffering for many and of generalized human and social isolation, which forced us to profound limitations in our existence, and caused significant levels of psychological distress, especially for children, adolescents and young people. The pandemic therefore highlighted the close relationship between mind and body but also between the individual and the environment. It brought to light the essential concrete needs and human frailties in a world

that travels very fast due to technological progress which unfortunately, no matter how powerful and omnipresent it may be, cannot make up for every human issue. The closure of places of education, culture and relationships has fueled the desire for real and not virtual encounters, for the re-appropriation of external spaces and the context - dense with the historical and emotional experience of each one. Yet, it seemed that networking could annihilate distances and fill any social void! Certainly society has progressed a lot for forms of digital communication, which have streamlined and speeded up various steps. Just think of the extension of smart working for which many large companies are benefiting, not only for the undeniable advantages on business costs, but also in consideration of productivity, the increased time spent by workers and their concentration. However, and fortunately, not everything can be solved "remotely", in every field. If we are increasingly projected to the virtual dimension, we certainly cannot neglect concrete reality. For example, children, patients, the material that is forged, urban projects, almost therapeutic realities for the quality of collective life, cannot be treated remotely. For the design, the risk could arise, certainly favored by technological advances, but also information technology if one thinks of BIM), of a response to the emerging virtual needs of the community and to market rules, rather than the resolution of real and priority problems based on a sensible, scrupulous, contextual research. In the case of an urban open space for public use, if there is no sensitive listening to the needs of the inhabitants of the place, sometimes expressed involuntarily through actions and gestures rather than through words, the design runs the risk of pleasing itself or of to give a purely decorative answer to what are the recurring dynamics.

3. Living in urban spaces

The dynamic complexity inherent in reality is only a starting point for the debate on a city that is respectful of its inhabitants. Today is the inhabitant really the end user or the recipient of the government action on the territory? Yet, the appreciation of urban spaces through voluntary use (and not induced by other factors) is the clear answer to good governance of the territory. People choose, not as architects or urban planners, the places in which to recognize themselves, in which to dwell for a fraction of time. As Whyte argues: “The human backside is a dimension architects seem to have forgotten”. An urban space is not recognized by the users it is intended for if an understanding of real life, the needs or demands of the people it is addressed to, miss. Instead, a development process is triggered if the favorable conditions offered by space generate other questions, stimulating people to experience new scenarios. This is the case in which the project becomes a process rather than a product, research rather than a defined and crystallized sign. The more the project manages to interact with the context, absorbing its physical and environmental characteristics and reflecting its socio-cultural components, the more evident the sense of recognisability that is at the basis of the use of a space will become. More the project manages to interact with the context, absorbing its physical and environmental characteristics and reflecting its socio-cultural components, the more evident will be the sense of recognisability that is at the basis of the use of a space will become. Not surprisingly, the Latin term “Habitare”, frequentative of habére, means possessing a thing through a certain continuity of use, and therefore refers to the possession of a space as a place to live. The meaning that derives from this is the recognition of a place as one's own, a sort of identification, a sense of sometimes ancestral and intrinsic values, which are the starting point of our knowledge of the world. "To build you need to know how to live" argued the philosopher Martin Heidegger, but perhaps, even more, to know that you are part of a system where everything is interdependent and in any case related. This was clear in the absence of so many superstructures. Typically Western oculocentrism probably has a certain weight in moving us away from reality, especially if, in the architectural and urban context, spaces are designed as if they acquire value in their being universally understandable “images". The designer is required to hurry, so already tested solutions are adopted, repeatable in different places, ignoring the signals coming from the territory and its people. At the same time, there is a spread of approved technological solutions, valid regardless of contexts, which tend to supplant the uniqueness of the place and the interrelated relationship between the built environment and the physical-climatic context, which has always existed. With the progress of technical advances, undoubtedly important, also the interaction between man, building and the environment is reduced to a minimum. However, if we think of the "landscape" of everyday life, of that part of the territory (European Landscape Convention) as it is perceived by the populations, we find a complex set of physical and anthropological characteristics, where the interactions between natural and human factors are often intertwined to the point of becoming a unicum, which can be better expressed in a design process. In this sense, the management of the territory would imply an overall vision based on a holistic approach, in consideration of the “principle of absolute uniqueness” of the landscape in all its components, including cultural heritage. Today we are no longer dealing with formal models, but with an idea of urbanity (Piano, 2014), which considers the territory as "a dynamic fabric in constant evolution. For its proper management and enhancement it is therefore always necessary to look to the future horizon and plan in advance the strategies to be pursued “ (Bozzetti,

2013, 175). On the other hand, every goal, in order not to remain just a desire, should include an action plan.

4. Design answers

The design process, which would replace the project understood in a defined and closed sense, could attempt to follow the evolution of its landscape, first by adopting its own dynamics and optimizing its resources in an overall perspective of harmony or balance that is never definitive and never just aesthetic. On the other hand, the landscape is a system that can always be broken down into further identifiable elements and subsystems, as taught by the complex and mathematical organization found in Nature. In fact, just as natural cycles are regenerative and resilient, so design could emulate their mechanisms, starting from an understanding of the place and its uniqueness, and considering buildings and outdoor spaces as complex organisms capable of interacting with each other and with the environment. When a building or a space is made autonomous with respect to the context, or sometimes detached from it almost as if it had been lowered from above, it could over time turn out to be weak, albeit performing and beautiful, and unsuitable to respond to identity values, up to not to be recognized. When that often involuntary process of identification with the environment fails, the places seem to belong only to themselves. This is more perceived in urban suburbs, in spaces of public use, uninhabited, crossed, empty theaters or without all those unnecessary and therefore voluntary activities, which instead sanction the social success of an urban project. The identification process does not belong to the field of social networks and virtual satisfaction but to concrete reality, and must be verified in the field. The strategies supporting this design find the basic methodology already at the time of Vitruvius in De Architectura Libri Decem. The general approach, which in the past influenced urban settlements and determined the living conditions, was characterized by a holistic approach that we can now implicitly define bioclimatic. It is bioclimatic an architecture that pursues quality in the harmonious relationship between its components rather than in the sum of the aspects of quality, which is very efficient, which starts from the orientation, composition and selection of ecological materials and which makes use of minimum plant support or external compensation technologies; likewise, a design that moves from the contextual analysis and optimization of its intrinsic local resources is bioclimatic, and which aims to systematize all the variables involved for natural and healthy choices, with the minimum use of artificial solutions. On the other hand, the term bio derives from “bios” (life), living being. A bioclimatic intervention strategy is not closed, but in evolution. Bioclimatology studies the interactions of life with the climate and establishes the ways in which humans build their habitat according to the typical characteristics of each climate, the materials available locally and not impacting the ecosystem and human health. In the past, in the Mediterranean area, the climate was one of the decisive factors both for the location of settlements in ancient cities and for the conformation of the artifacts. The relationship with the place has been internalized to such an extent that it also determines the architectural conformation; the buildings such as the open spaces of the cities have been taking shape through a slow process of adaptation that has selected the most suitable types for the contexts. The inseparable relationship with the context, without which life in that place would often not have been possible, had as its premise the understanding of external physical agents, and in particular climatic ones. The new landscapes created by man were naturally in harmony with the existing contexts: the construction techniques worked with the very material of the places, the consolidation of the slopes created for the construction of a road took place using trees with particularly dense roots such as cypresses, the houses were built with materials found in the vicinity of the construction site, therefore all with the same stone or with the same wood, inevitably obtaining a homogeneous whole. The result was a "new" landscape that was coherently identifying. Today, with climate change and deforestation, there is an increase in landslides which, for example, could be limited not so much with sophisticated techniques but with the methodology used by nature to deal with natural phenomena: the leafy canopy of a tree would generate a less violent repercussion of rain, and likewise the dense roots would serve to contain the soil. The trees would act as a barrier and effective filter. In the urban environment, an important filter could be green nets and the arcade. It is no coincidence that the urban spaces equipped with the latter are privileged, not only for its architectural connotation: if properly displayed, the arcades represent an example of high environmental and microclimatic quality that favors the perception and the transition between two different realities. As the research teaches Rediscovering the Urban Realm and Open Spaces - coordinated by CRES, Buildings Department, Designing open spaces in the urban environment: a bioclimatic approach, Center for Renewable Energy Sources (CRES), 2004, for example, perception thermal is basic and conditions the instinctive choice of the place to stop. Therefore, the habitability of open spaces is directly related to the level of thermal comfort, determined by scientific parameters, that people experience in outdoor environments. An extremely favorable condition in terms of perception of well-being, according to the 40° N research conducted on a sample of case studies between Salerno and the Amalfi Coast, concerns the access to solar radiation, that is the amount of sun and heat that the spaces receive and which may or may not hold back not only due to air flows or

wind trails but rather due to morphological and material conditions on which the design is concretely involved. The lower overheating of the surfaces and the greater availability of an external space to receive solar radiation are decisive for the environmental quality of the external spaces in our contexts. From an operational point of view, the work of an architect or an urban planner can modify the topoclimatic or microclimatic conditions to affect the overall energy balance above all through the choice of materials which, through some of their physical properties, inevitably interact with the morphology in which they are inserted, affecting the microclimate and the energy balance. A simulation carried out for the city of Sacramento shows that by increasing the physical property of albedo from 0.2 to 0.78, energy consumption is reduced by 80%. The urban materials of the parterre, facades and roofs can reduce thermal gains in relation to the characteristics of the location and morphology, or the use of water and greenery, in general with passive bioclimatic design strategies. The morphology of places affects energy in a broad sense because it can change people's behavior. We find, by extension, in urban centers, certain housing morphologies, such as the courtyard typology. The actual choice of particularly welcoming spaces for protection characteristics and, at the same time, openness to the external context has a psychological origin and can be identified in a sort of niche effect. On the other hand, the niche, from an archetypal point of view, refers to the cave, a safe and enveloping habitat that establishes a direct relationship with nature and the earth. These prerogatives are also found in the enclave. It is no coincidence, in fact, that in the absence of welcoming spatial configurations, a point of support is sought, or simply a physical limit. A space shaped in such a way as to collect and define micro-areas that have their own characteristics within a unitary design, can, for example, encourage social dynamics. And even the personality of the inhabitants appears in direct relationship with the physical place. Each specific reality therefore corresponds to environmental parameters and potential resources to be considered in the design phase. But could a design work reproduce the variety of solutions that exist in nature, optimizing contextual resources? The reverberations would be multiple from the fruition and social point of view and advantageous for the economic and political aspects, with effects on the perceived environmental quality in general. On the other hand, the quality of the urban context and above all of the public use space used is a concrete measure of government action in the area.

Fig. 1: Plaza de Santo Domingo, Madrid (Spain), work of Marin˜as Arquitectos Asociados: example of inhabited sub area that simulates a niche. Photo of Fernando Alda



Fig. 2: Piazza Santo Stefano, Bologna (Italy), its particular conformation evokes the identity of a place. Photo of Alfredo Carbone



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THE CASE OF THE ORATORY OF SAN ROCCO IN SORAGNA (PARMA): FROM ABANDONMENT TO HEALTH FACILITY. AN INTEGRATED RESTORATION PROCESS

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Abstract
It's well known that the identification of the most appropriate use for historical heritage, is a fundamental instrument of conservation, which in maintenance, even before in "restoration intervention", find the first guarantee of success.
In this paper, the participated restoration process which involved the abandoned convent of San Rocco in Soragna (Parma) is presented, with the aim of showing the application of "integrated conservation process" principles to an interesting episode of cultural heritage.
Starting from historical and structural analysis of this really compromised and damaged structure, the project of reuse is presented, which, starting from a deep interaction between social and functional aspects, gathering local and social needs, has led to the creation of a territorial health structure, a small-size health facility, thus becoming a response to the municipality's needs, making the most of the historical vocation of the building.
Moreover, the adopted approach counterposes with the current tendency of multiplying interventions by proposing a diversification of uses instead: higher flexibility of spaces, and functions operating at different times of day will lead to a more effective and extended functioning of the complex, resulting in an overall better use (and, thus) preservation of the building in the long-term.

Keywords: Integrated restoration; reuse; consolidation; oratory; health facility

1. Introduction
Within our cities we notice that some buildings or spaces have lost their function over time, often for changes in technological, cultural and economic developments, which had led to their progressive abandonment [1]. This process does not exclude even historically relevant buildings, which also played a crucial identity role in the community, being the witnesses of the culture of the time. Today these buildings are empty containers, waiting for a new function which could recall their original importance.
The recovery of these buildings has to start from the context in which they are located, but also from their spatial "vocation".
The strategy that best integrates the aesthetic-testimonial instance and the use of the building is represented by reuse, which is able to enhance the space and adapt it to the needs required by the new intended use.
The need for a new use can lead to the transformation interventions, which must always pursue the principles of minimum intervention and compatibility with the materials and of the use of the building itself.

The principles which guide any restoration process arise from a critical analysis aimed to formulate a value judgment on each architectural element of the building and on its whole organization.

An example of this process is the restoration of the former convent of San Rocco in Soragna (Parma, Italy), located on the back of the more famous Rocca Meli Lupi, which has always maintained a role of service for the citizens, reinventing itself over time with multiple functions (Convent, Women's orphanage, elementary schools).
The community has always been the main user of the place during the centuries. The implementation of an "adaptive reuse" project, has tried, in this case, to combine historical analysis, cultural investigations and functional needs for the community, by a delicate balance between conservation of the main architectural aspects and the insertion of a new use aimed at giving back to this complex its original pivotal role. The issue, indeed, is to revitalize these abandoned spaces, while maintaining their nature and collective memory. [2]



Fig. 1: Aerial photo of the complex.

2. The case study: Convent of San Rocco in Soragna (Parma)

The former convent of San Rocco, founded in 1640 by the marquise Diofebo Meli Lupi, is located in Soragna, near Parma. Intended to accommodate a congregation of Carmelites, the convent only hosted the friars until 1769, when Guillaume-Léon du Tillot suppressed the religious order. Since then, the building has undergone a long series of transformations in shape and use, which have concluded in 2010 with its final abandonment.
The structure is composed by three main buildings, dating back to different historical periods. The most ancient and authentic one is the porticoed one, connecting the entrance of the complex to the main body (Block A in the Fig. 2). Despite today the upper level presents plain rectangular windows, before 1780 – year when the convent was rearranged to host a female orphanage – it was configured as a loggia.
The main wing of the building (Block B in the Fig. 2), orthogonal to the previous one, was also included in the original plan. However, due to the several changes in use over the times, it has been heavily modified to better suit the renovated functions. In this regard, the positioning of the stairs appears particularly relevant: while the stair beside the bell tower – although rebuilt in 1933 – still stands in its original location, the second element of vertical connection (dated back to the first half of the 19th century, according to historical documentation) is currently located in the center of the building, differently from its original location on the north-eastern corner.
Finally, the third Block (Block C in the Fig. 2), also organized on two levels, constitutes a 20th century addiction.
The study of the complex was articulated considering the three buildings before described, as well as the buildings facing the church (Block D in the Fig. 2), those leaning against the west side of the church

(Block E in the Fig. 2) and those on the back (Block F in the Fig. 2). In particular, these latter buildings are characterized by a very interesting proto-industrial design to which, over time, a portion in reinforced concrete has been added.

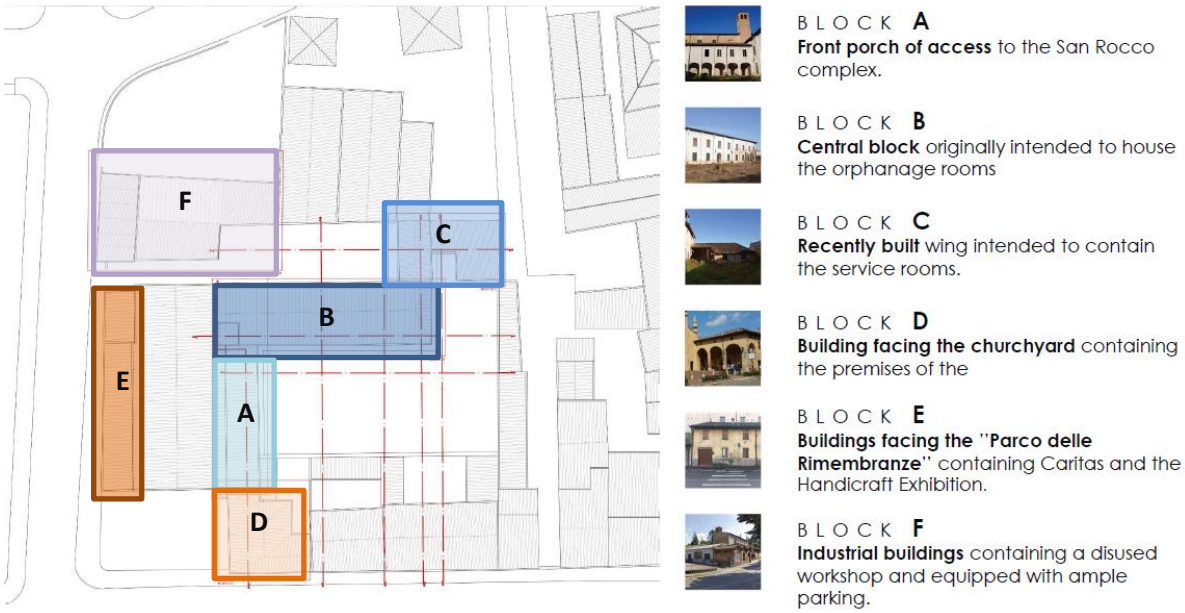

Fig. 2: On the left the roof floor plan of the complex, where the portions of buildings subject to intervention are indicated. On the Right the there is a photo and a brief description of the block.

2.1. Geometric and constructive survey: the state of damage

Over the last fifty years, several works have been carried out with the aim of strengthening the building, thus allowing its reuse. Conversely, most of these interventions have actually contributed to the current state of damage of the building, as they have diffusely compromised its original features together with its stability.

Moreover, the lack of use and maintenance have further worsened the situation, leading to the current state of generalized deterioration and structural disorder.

In particular, from the geometrical and damage analysis, the masonry emerged as the main critical issue: the poor quality of the original materials and arrangements has been indeed worsened by an harmful intervention of integration - with the insertion (from the ground level up to -150 cm) of perforated brick on the external walls and on part of the main spine wall – in the mid of 1970. (Fig. 3 on left)

As for the block A, the vaulted corridor presents a foundation failure mechanism, underlined by the loss of curvature in correspondence with the central pillar. In addition, the original arched wall at the second level has been deeply modified during centuries, which now sees a bad distribution of the point loads of the beams of, (which frequently unload in the middle of the architraves of the added openings).

Moreover, the vaults (in block A and B) - despite the presence of retaining elements
(original tie rods are inserted in each span, even without bolted end-plate) - present a widespread crack pattern, which is particularly heavy in the north-eastern corner of the block B.

In the north-eastern corner the poor construction quality of the vault, which presents an incorrect texture precisely in correspondence with the shutters (Fig. 3 central) was certainly aggravated by subsequent interventions, such as the enlargement of the windows, and by some changes to the general conformation of the plan building.

Moreover, the vaults (in block A and B) – despite the presence of retaining elements (original tie rods are inserted in each span, even without bolted end-plate) – nowadays present a widespread crack pattern, which is particularly heavy in the north-eastern corner of the block B.

In particular, the barrel vault presents important deformations and the collapse of the final part of the vault and the damage of the external wall, which has led to the insertion of a temporary prop (Fig. 3 on right). It clearly shows the activation of a thrust mechanism in correspondence to the graft of the transverse body in which there is an evident bending mechanism, combined to a mechanism of corner failure. An interesting interpretation of the described mechanism has been given basing on some historical drawings of the building (Fig. 4). In particular, the documents testify to the former existence of an additional wing of the complex leaning against the façade that is currently bending, as well as of a stream of water in proximity of the subsiding corner. The demolition of such historic portion combined

with the horizontal thrust of the barrel vault, the occasional seismic activities and the subsiding earth could very well justify the seriousness of the identified mechanisms.



Fig. 3: On the left the masonry of poor build quality. The center photo show the bad construction quality of the vault. On the Right the the north-eastern corner with the collapse of the vault which has led to the insertion of a temporary prop.

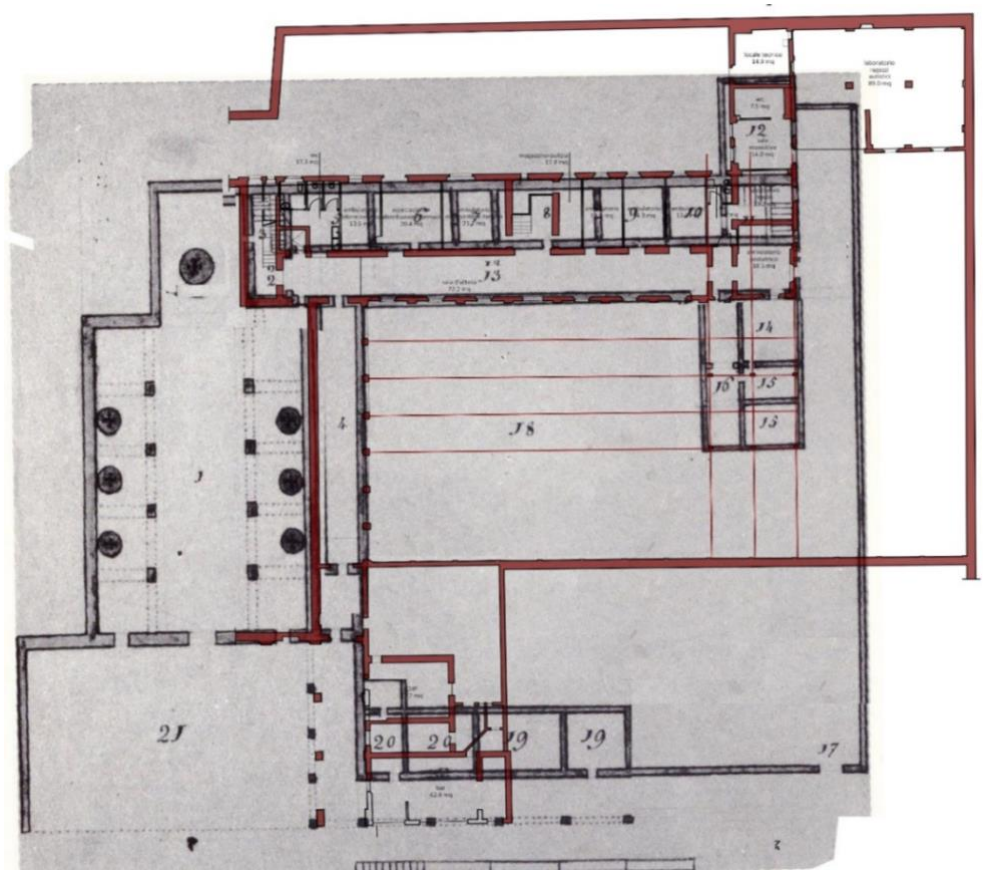

Fig. 4: The main transformations can be seen from the overlapping of the reliefs. In particular, the complete demolition of the wing that separated the court can be observed. This wing held back the thrust of the vault, currently heavily damaged and propped up both on the extrados and in correspondence with the ancient wing.

The horizontals and spine walls in this portion are in fact not well clamped to the surrounding walls, which are in fact subject to possible overturning. To complicate the static situation of the vault was the construction in 1958 of a reinforced concrete slab above the vault itself and above the lateral wooden floors.

To complete the description, the roof of body B, which was originally asymmetrical and pushing, saw the insertion of trusses following the demolition of the spine wall that continued up from the corridor below. The truss chains are currently weighed down by rafters and tiles of the false ceiling which cause an evident bending mechanism, punctually aggravated by the rotting of some beam heads (due to lack

of maintenance of the roof). In addition, the pushing hip rafter of the east elevation have generated deep cracks in the corner walls visible in the fronts, aggravating the tilting mechanism evident in the corner.
Less interesting, from the point of view of instability and conservation, is block C: while the original part (north wing of the original complex) deserves an in-depth study and conservation, presenting similar problems to the rest of the building (lack of masonry quality and heavy transformations of the floors), the more recent leaning building does not present relevant architectural and historical characteristics, thus allowing its demolition.

2.2. Problems and opportunities for reuse: SWOT analysis

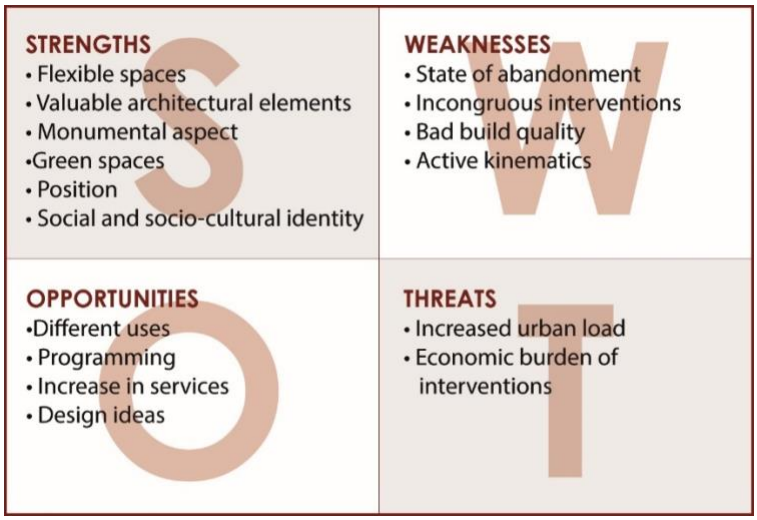

Fig. 5: Swot analysis carried out for the portion of the former convent of San Rocco.

At the end of the survey and analysis process, it is possible to summarize some main aspects, in a sort of "SWOT Analysis", which can serve as a guide for the restoration process of the complex.
From the architectural point of view, the complex shows some interesting and valuable elements, to be conserved, as the ancient vaults of the two main wings (A and B) which strongly characterize the spaces and their possible future organization, despite representing – meanwhile – the main critical structural (and strengthening) issue. At the same time, the lack of any original finishes (such as floorings and plasters), almost in the totality of the complex, constitutes an opportunity in inserting a new function into this "container" a new use, which is facilitated also by the outdoor spaces, constituted by an interesting ancient (and partially lost) cloister which offers a double perspective for utilization: one more public and the other more intimate.
Finally, the main reason for the reuse of the complex stays in the community of Soragna, which, particularly fond of the place, asks to re-inhabit this abandoned space, not as simple visitors, but as daily "users". Therefore, by a dialogue with the municipal administration and with others involved authorities, the different functions which could be included within the building have been carefully considered, starting from the analysis of the territorial context and of the different functions already present around the complex. In particular, from territorial analysis it appeared clear the need, for this little town, of an adequate health facility: the only health structure nowadays used by the population of Soragna is, indeed, that of the city of Fidenza (11Km away), which actually resulted insufficient to meet the needs of such a large catchment area.
Moreover, the volumes of the complex have the potential to absorb multiple functions including health facilities, thus determining the hoped-for situation of a multiple use of the spaces by ensuring the opening of the structure at different times in the day. It's clear, indeed, that constant use, also in time, ensures the maintenance of the structure, which can demonstrate, in this way, its extra-municipal attractive capacity.

3. From abandonment to a new life: the Health facility

Starting from the previous analyses, the project of the restoration of the complex has been carried out, inspired by "an adaptive reuse" strategy, in continuity with the original functions, which have seen the preponderance – in times – of public use compared to the private one.
The project foreseen the refunctioning of the complex into a Healthcare and Welfare Center consisting in a small Health Center. The main function was then flanked by a center for accompanying the work of people with autistic disabilities and by a multipurpose space which can host different citizen organizations. Moreover, the new headquarters of the Italian Red Cross and Civil Protection of Soragna have been located into the surrounding block (E and F), thus triggering a virtuous process of interest in the now forgotten property.

3.1. Multiple functions for a continuous reuse (and maintenance)

The insertion of all these functions, strongly linked and complementary, has required an urban reorganization, with the rethinking of the road layout able to ensure better viability and urban quality and better connect the complex to neighboring countries (thus increasing their use and attractiveness).
As stated before, the strategies adopted are derived from an historical and social analysis, aimed at enhancing the complex through the re-appropriation, by the community, of the identity spaces.



Fig. 6: Project masterplan showing the changes in urban planning.

At the building scale, the project for the new Health facility [3] [4] [5] is articulated around three functional main components, which have independent paths and can operate autonomously at different times. This fact guarantees a differentiated use in the various hours of the day and it allows a greater usability by the citizens, thus constituting a guarantee of maintenance. Indeed, the organization of the routes has been designed in order to ensure separate entrances for each main block, meanwhile taking advantage of common areas where the different functions can be integrated. As can be seen by the figure (Fig. 7), the former convent hosts the Health-care center, presenting a subdivision of the rooms, once organized for the performance of educational and ordinary administration activities, functional to accommodate clinics and offices still connected by the ancient vaulted corridor. Where the large hall dedicated to the orphans' dormitory was built, there is now a flexible space, suitable for hosting a boardroom for use by the community and the activities present within the complex.

Finally, the service room located on the edge of the court (Block C) has undergone alterations and renovations throughout its life, resulting today without any historical-architectural value, but maintaining its intimate position unaltered. Hence, it becomes clear the interesting possibility of placing, in the most secluded and intimate space of the complex, in a backward and subsequent portion, a work center dedicated to children with autistic disabilities (in blue, Fig.7).
In a collective spirit of social sharing and re-appropriation of the spaces by the community, the other spaces of the complex were therefore considered, trying to identify complementary and compatible uses, which together guaranteed the two fundamental conditions for the success of the project itself: maximum use with minimal transformations.

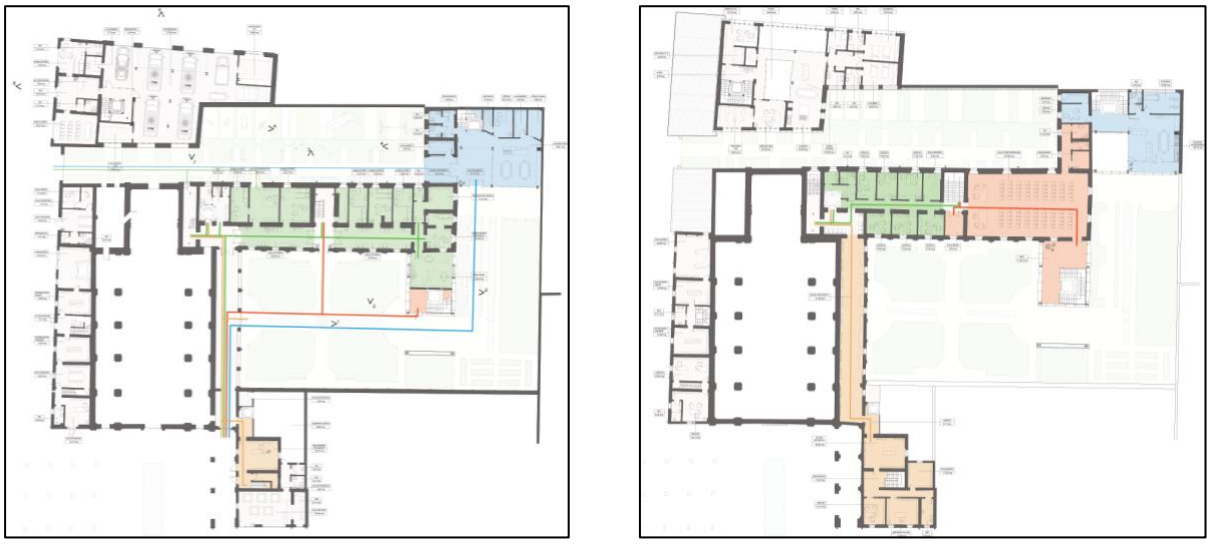

Fig. 7: Distributive plans of the project with indications of the routes and functional subdivision: in green the Health house, in orange the spaces for exhibition, in blue the Center for autistic children, in red the civic room and in white at the back of the structure the new civil protection office and Red Cross.

To complete the new Health center, and to better organize the new functions, the new headquarters of the Civil Protection have been inserted at the northern end of the block (Block F) while the reorganization of the internal spaces and the relocation of the existing functions are carried out on the remaining portions of the property, in order to ensure better efficiency of the entire distribution (Blocks A, D, E).
This combination of intentions and functions is particularly virtuous, not only from a social point of view, but, even more, for the conservation of the building itself. In fact, it was decided to apply a diversification of uses and flexibility of spaces, trying to guarantee a continuous use of the structure throughout the day, which would ultimately lead to greater vitality of the building and its neighborhood.
The proposal combines a collaboration between public and private in the management of uses, which can be seen as a further guarantee of growth of the "interests" involved in the maintenance of the asset and its long-term conservation. It is in this perspective, that the opportunity to identify shared interests and flexible uses takes on greater weight, with the ultimate goal of triggering a virtuous cycle of participation in conservation through the appeal of use. Finally, considering the size of the complex, it is possible to think of the construction organized through successive excerpts that, after making the building safe, provide one independent development to the individual units.

3.2. Multiple functions for a continuous reuse (and maintenance)

Once fixed the main purpose, the project has been then developed in detail, considering the peculiar destinations of the volumes, trying to fit the request of the community and those prescribed by the law (Tab.1).

SECTORS	LAYOUT PROPOSAL	FREQUENCY
Clinical area **TOT. 6 SURGERIES**	3 Group Medicine clinics	5 day/week
	1 Pediatric / specialist clinic	5 day/week (3 pediatrician + 2 psychiatrist)
	1 Nursing clinic	5 day/week
	1 Observation-therapy clinic	5 day/week
Public area **TOT. 3 LOCAL**	2 Waiting rooms	/
	1 Local CUP	5-6 day/week
	1 Drug Distribution / Acceptance	6 day/week
Social welfare area **TOT. 6 OFFICES**	1 Office responsible for the service	5-6 day/week
	1 Senior Social Worker Office	5-6 day/week
	1 Office for Social Workers for minors - adults	5-6 day/week
	1 Administrative office	5-6 day/week
	1 Office responsible for home assistance service	5-6 day/week
	1 Home assistance service office	5-6 day/week

Tab. 1: Summary table of the intended uses included in the new health house in Soragna. On the right the histogram showing the relationship between the areas provided for by the law [5].

Even the regional legislation [4] [5] suggests the inclusion of multiple functions in these Health structures, taking advantage of common spaces.
The distribution of the various functions is described in detail below. As can be seen by the plans (Fig.8), the ancient access is maintained at the ground floor, through the cross-vaulted arcade (block A) from which the various paths (dedicated to each single function) start: the clinics, the multipurpose room, the center for autistic disabilities and the exhibition hall of the institution shows handicraft.

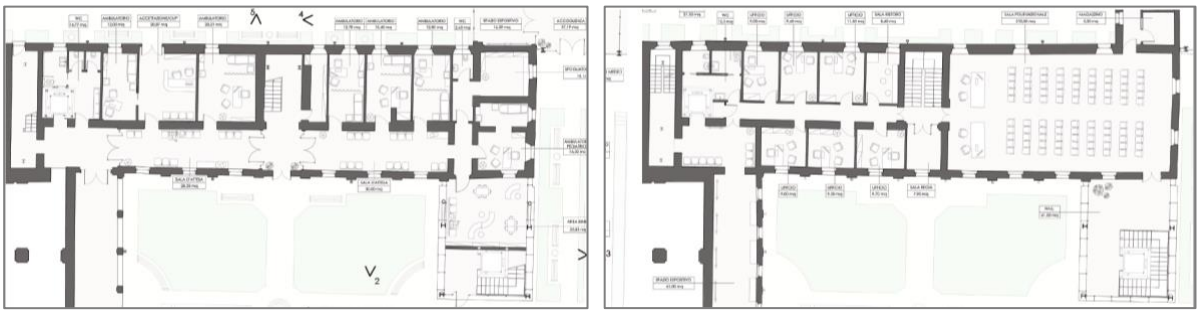

Fig. 8: Distributive plans of the Health house: on the left the ground floor (with the surgeries and the distributive spaces) and on the right the first floor (with the multifunctional room and the offices). The new block (for the new stairs and the elevator) is in the North-eastern corner, on the original demolished block sedime.

Walking along the long portico can be reached the public space of the Health facility (the barrel vaulted corridor) which hosts the waiting room for surgeries. The services and reception are located at the entrance of the corridor, while nursing and observation therapy clinics and the specialistic ones, are respectively located on the west and the east side of the central stairs, conserved in this central position for functional reason, but completely redesigned with new structure and materials (in virtue of the previous historical analysis). At the same floor, the pediatric and psychiatric clinic are located in a more secluded position, equipped with a special waiting room to accommodate children, with the insertion of a new volume at the north eastern corner of the block B, to recall the original court configuration (Fig.9)



Figure 9: On the left: first floor plan of the new stair case, inserted in the new volume at the north-eastren corner of the block B, recovering the ancient sedime of the court configuration. On the right: the perforated steel panels employed by Kerstine Tompson Architects at Wertheim Factory (Melbourne), which suggest the hypothesized materials for the new volume.

Indeed, the historical and structural analysis, has represented the pretext for the restoration process which, attempting to balance the structural, historical and functional needs, as seen the insertion of a new block in place of the original demolished one.
This solution has multiple positive outcomes: from a structural perspective, the replacement of the provisional props – that are currently supporting the south façade – with permanent steel ones incorporated in the new construction, would effectively contrast the ongoing dangerous bending mechanism previously described. Moreover, the added block would facilitate the positioning of a further vertical connection (stair and elevator) between the two levels of the complex, granting an overall better fruition of the complex: through this structure, the new multipurpose room would have an independent entrance, also helping in managing the different flows of users moving within the complex on a daily basis at different times. Finally, as already underlined, this new volume helps in creating a pediatric waiting room directly overlooking the garden, thus allowing to separate the kids from the other patients, with facility granting benefits both in terms of general comfort of the users and epidemic control.
However, the relevance of the new path is also related to the achievement of full compliance with the current regulations in terms of accessibility and fire prevention. On one hand, the positioning of an elevator allows to address the issue of architectural barriers, on the other, the whole stairway configures as an exit route, meeting the safety requirements for public halls.
Finally, the new construction would re-propose the primigenial idea of the never completed cloister, suggesting a better historical reading of the complex. This particular feature will also help in better delimiting the two adjoining areas currently composing the garden, which, according to the proposal, would have two different uses: despite maintaining a direct connection between the two of them, the area comprehended within the entrance porch and the new wing, would be destined to public use, at disposal of the local community, while the portion of garden facing the new employment-training laboratory (block C), would be rather private, for exclusive use of the autistic kids' foundation, as expressly requested for this function (Fig.10).

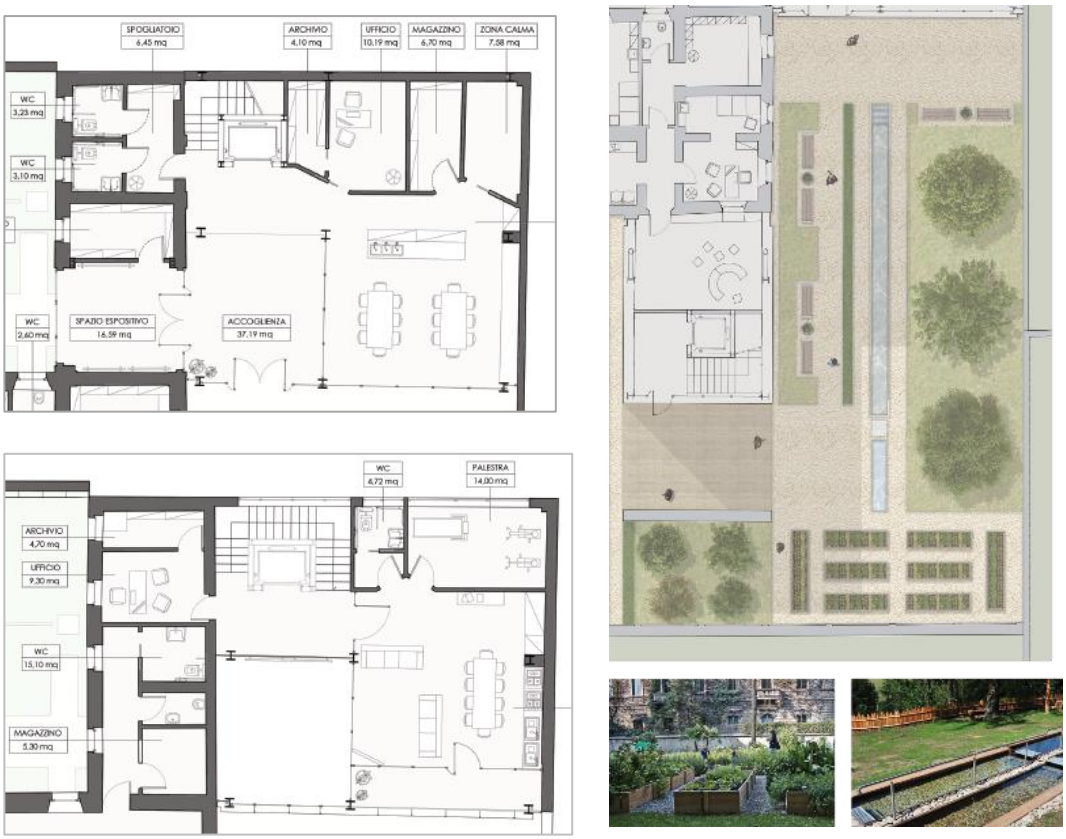

Fig. 10: Distributive plans of the new block C dedicated to the job start-up center for autistic subjects.

This block, considering the historical analysis, has been completely re-designed with the same materials and formal language used for the stairs previously described: articulated in two levels, the entrance hosts an exhibition room (with double volume), while the remaining part is dedicated to the services and laboratory area, positioned close to the historic boundary wall.

4. Conclusion

At the end of this research it became clear that for the town of Soragna the Complex of San Rocco is a "shared" asset and a fundamental memory for the community, which has always remained at the service of citizens.
Deprived for a long time of due attention and subject to interventions which actually damaged the structure, the municipal administration today intends to rehabilitate this abandoned space recovering its original value.
The community was, and still is, the main user of the built heritage; this implies that the conservation of architectural heritage requires an "adaptive reuse" capable of connecting historical-structural and functional needs.
In this sense, the proposed intervention is particularly delicate and requires a careful search for balance between conservation and re-functionalization through a multi and inter-disciplinary approach, capable of intertwining the results of historical analysis with structural and functional ones.
Acquiring awareness and mastery of the topic, through an in-depth initial knowledge phase and a comparison with the other specialized figures involved in the process, the project has tried to to correctly manage the analysis results, determining conscious interventions, aimed at enhancing the intrinsic potential of the building, both resolving structural and historical issues of the complex.
The historic vocation of the building at the service of the city was the basis of the project, this together with modern needs are able to give an impulse to the entire district by constituting an avant-garde pole for local health. At the same time, a careful reading of the context and the needs of the community dictated the guidelines for the re-appropriation of the monument by the citizens. [6] This took place through the determination of a plurality of functions that make it possible to exploit its spaces at different times of the day, thus ensuring the first guarantee of conservation: widespread use (and continuous maintenance).

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WORLD HERITAGE and DESIGN for HEALTH
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Reading a territory through the recovery of ancient routes: the case of Matera.

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Abstract
In recent years, the notion of cultural heritage has come to encompass a growing number of domains including architecture, cities and landscape. It has also introduced the concept of "intangible heritage", meaning the habits, the ways and means of a given culture.
That is why the study of a particular territory has become all the more important. It is a context in which the existence and activities of humans have been stratifying over time, producing a sense of belonging and community.
Many architectural projects involving a territory aim to the preservation of a geographical area and its heritage by recovering its historical paths and landscape.
Such is for instance the case of the Camino del Cid, the cultural itinerary that crosses Spain from the North-West to the South-East following the footsteps of the "Cid Campeador". Or the Via de la Plata, the ancient Roman road connecting Mérida and Astorga, an itinerary of 263 km that crosses the provinces of Salamanca, Zamora and León and includes several architectural and landscape designs.
In the wake of these considerations, this project presents a 37 km long path using the ancient and almost forgotten “tratturi”, which criss-cross the territory around the city of Matera, especially the Parco della Murgia materana. Based on an historical analysis, it includes a few small architectural designs to evoke forgotten landscapes and to provoke feelings that allow a conscious reading and a new interpretation of the history of Matera.

Keywords: cultural heritage; architecture; territory; landscape; itinerary.

1. Tangible and intangible Cultural Heritage
The notion of Cultural Heritage has come to encompass many different domains including cultural sites as such, but also architecture, cities and landscape. It now also includes the concept of "Intangible Heritage", meaning the habits, the ways and means of a given culture.
The latter, excluded from the UNESCO *Convention Concerning the Protection of the World Cultural and Natural Heritage* of 1972, was only introduced in 2003, shortly after the concept of “Landscape” in 2000.
Therefore, today, by the expression “Cultural Heritage” we mean tangible and intangible assets, both expressions of a given culture, bound together by an interdependent relationship.
Throughout time, man’s action on the environment, before it assumed negative connotations, shaped incredibly important landscapes of cultural, natural and economic significance.

Today, the national and international debate, carried on by the organizations whose aim is the protection of nature and culture, highlights the importance in preserving the so-called “cultural landscapes”, meaning all those places resulting from “combined works of nature and man considered to be of great interest and international value” [22].
That is why the study of a particular territory has become all the more important. It is a context in which the existence and activities of humans have been stratifying over time, producing a sense of belonging and community.
The concept of “territory” is also strictly connected to that of “landscape”. If the first one is the container of everything, the box which holds the marks of history, it becomes a landscape once man’s actions have shaped it. Or, as described in the *European Landscape Convention of the Council of Europe* in 2003, “landscape means an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors”.
Men began to carve out territories according to their needs during Neolithic times. It all started with the simple action of *walking*, the first great act of transformation of lands, immediately followed by the necessity of identifying some chosen spots and marking them. The results were the *menhirs*, the first recognizable sign of anthropization and the first architecture in man’s history [2].
“Today, the most difficult thing to do when crossing a territory is to understand the different elements that compose it. As a matter of fact, the landscape, as pointed out by Carandini, is made by *fulcra* and *systems*. The first ones are all those elements identified as “objects” in contemporary culture, such as architectures, monuments, villages and parks: those are all things we see as the result of intelligence, the technique, the artistic culture and the power of past civilizations. The systems are the framework of structures that connect all fulcra and that are often little evident and much neglected” [3].
The most important system is of course that of the road network. Routes and paths’ reason for existence is to put in relation everything in this world. Their very purpose is to connect cities, ports, churches, castles, valleys, cultivated plains etc. Their recovery is therefore the key to the comprehension of a territory, for its conscious use and then for its enhancement.

2. The recovery of ancient routes through architecture

In recent years, more and more architectural projects have been proposed and often carried out to safeguard a geographical area and its heritage through the recovery of its historical routes.
In 1987 The European Council declared the *Camino de Santiago* – the network of religious and cultural roads that ended in Santiago de Compostela – the “first European Cultural Itinerary”. It provided funds to finance a large number of proposals to renovate its tracks making it today one of the most known and followed itineraries of the world.
More recently, in the early 2000’s, a similar project was assembled for the *Via Francigena*, that led from France to Rome, particularly for the section between the Great St Bernard Pass, at the Italian-Swiss border, and the Eternal City.
Another example is the *Way of El Cid*, a cultural and tourist itinerary designed by Spanish architects Darío Álvarez, Josefina González and Miguel Ángel de la Iglesia starting from 1996. It crosses Spain from Castilla, in the Northwest of the country, to the Mediterranean Sea, in the Southeast. It is designed following the literary and historic footsteps of Rodrigo Dìaz de Vivar, the famous Spanish medieval knight, also known as “El Cid Campeador”, who lived in Spain in the XI century. Diaz de Vivar’s adventures, narrated in the *Poem of the Cid*, are the leitmotif of the itinerary, which connect the places, the castles and the landscapes described in the Poem.
Through very punctual interventions of architecture and sculpture, such as info pavilions, viewpoints and rest areas, and signage and landscape measures, the memory of the Poem lives again and rehabilitates the territory. With 1400 km of tracks and 2000 km of roads, the Way of El Cid includes eight World Heritage Sites and is divided in many thematic itineraries of variable length, from 50 to 300 km, which make it more adaptable to the needs of each visitor.
The architects Darío Álvarez e Miguel Ángel de la Iglesia Santamaría also designed, again in Spain, the *Sistema Territorial Patrimonial STP Iter Plata* in 2010.
This architectural plan aims to recover the ancient *Ruta de la Plata*, the 243 km long Roman road that led the current city of Mérida to Astorga. The STP Iter Plata is, first of all, a cognitive tool of the territory crossed by the Ruta; it is also meant to be an “intervention manual”, a sort of pilot scheme for every future project that will be proposed for this area.
At present, part of the ancient paving has been restored and many places have been chosen in which to carry out architectural designs, especially across areas that are close to historic and cultural sites. Also, the mise-en-place of a particular signage allows visitors to really *look* at the landscape, to understand the different elements that compose it and therefore to have a conscious perception of the territory.
In conclusion, these last two projects are an important example of the role that architecture – through precise solutions and all-scales projects – can and must have in enhancing a given territory and its cultural heritage.

3. The case of Matera, Italy

3.1 A cultural landscape

In the light of these considerations lies our project for the area of Matera, in Southern Italy. It is a work undertaken in our 2017 Master thesis on Architectural composition that is still very much central to our research interests. This proposal considers not only Matera as such but also the Parco Archeologico Storico Naturale delle Chiese Rupestri del materano, more commonly known as “Parco della Murgia Materana” (Fig. 1). It is placed to the west of the city and is separated from the urban tissue by the deep fluvial canyon of the river “Gravina di Matera”.

The Gravina runs, like a ravine, on the edge of the limestone plateau of “Murgia Materana” which is a part of the wider Murge area, in the Apulian region. The Murge are formed by Mesozoic shallow-water carbonates and are characterized by the presence of the *gravine*, which are steep-sides slope landforms made by the streambank erosion (Fig. 2).

Throughout the centuries, the canyon has played a significant role for human settling and therefore for the evolution of the territory and of the Parco della Murgia Materana. Along its edges, the water’s erosive action made the soft layers of limestone (scientifically called “calcarenite” but locally known as “tufo”) to emerge which allowed men to settle permanently in the area. As a matter of fact, thanks to its friable nature the calcarenite layers exposed in the ravine have been easily dug and carved by men for over 9000 years: cave houses and rupestrian churches are typical of this territory as well as a complex system of gutters and cisterns dug out from the rock to collect rainwater during periods of drought (Fig. 3).

The ability of the local population to cleverly take advantage of the geomorphology of the area for survival and the close connection between landscape, geology and human actions, allowed the Sassi of Matera to join the World Heritage list in 1993 as “the best surviving and most complete example of continuity in the Mediterranean region of this type of settlement, which developed in close harmony with the ecosystem” [21].

“Matera’s application to be included on the UNESCO World Heritage list has a significance of the utmost importance. It expresses the concept that in cultural heritage architecture and monuments are less important than the urban and environmental structure. It means that what truly matters are human endeavors and geniality to take advantage of and handle, with parsimony and intelligence, the resources of the territory. These are the connections between landscape, architectures and human relations, the true gift entrusted to time by ancient civilisations.

We need new methods of inquiry and research to identify and enhance new values, such as landscape culture and lifestyles, hidden elements diffused throughout the world made of historic memory, craftsmanship and common knowledge.

To do so, we will be needing an all-round deep study ranging from geology to archaeology, to history, to tangible cultures and traditions: we will need to merge ourselves with the territory, to capture its deep essence in a new form of interpretative synthesis” [12].

The territory of Matera is a highly important – and yet almost unknown – container of tangible and intangible cultural heritage and therefore its rehabilitation is of extreme importance.

3.2 Defining a research method

Before coming up with a proposal, a consistent part of this work was to put together a research method that could allow us to have a holistic vision of this territory. We wanted to be able to read the complicated geomorphology – and therefore to understand its geological stratification, its formation and evolution – together with the history of this land. We wanted to be able to understand the events that have been shaping this landscape for thousands of years and to recognize the single elements that form it.

To do so, we needed to deconstruct what we were seeing, to separate every component from the other and then do draw a map for every single one of them.

We were then able to identify six predominant historical periods that, more than others, had an impact on the territory and to reconstruct how this area must have looked in each of them. The result was the identification of what we called six “historical landscapes”.

They are, in order: a) the *Neolithic villages*, the first sedentary settlements in this area, which were placed on the Murgia Materana, at the time covered by oak woods; b) the *Troglodyte settlements*, carved by men in the slopes of the gravina, when humans’ activities led to the deforestation of the plateau; c) the constitution of many *rupestrian monastic complexes*, born from the encounter between the ancient agro-pastoral culture and the spirituality of the Italian-Greek rite monks; d) the *urban expansion*, starting from the 1600s, that led to the definitive appropriation of the area; e) the problem of the *decay of the Sassi*, the traditional local cave-houses, where families of 7 or 8 lived together with pigs and cows in terrible sanitary conditions until the beginning of the XX century; f) the *opening of the big limestone quarries* to build the new neighbourhoods intended for the inhabitants of the Sassi.

Matera, as it appears today, is made by the stratification of all these historical landscapes: their memory, if properly read, can tell us a great deal about this territory’s past.

Moreover, we continued with the deconstruction by giving each historical landscape a further interpretative analysis, inspired by Carlo Tosco's definition of the territory as a "social organisation of space". Tosco proposes the medieval classification of society in *oratores*, *laboratores* and *pugnatores* (those who pray, work and fight) and applies it to a territory's history.
We adapted this theory to Matera's area by identifying a "religious landscape", a "work landscape" and a "housing landscape". This way, we trained ourselves to recognize all the different traces and elements that history has left and were able to come up with an architectural proposal to enhance the territory by the recovery thereof.
We also wanted this analytic study to be a cognitive tool that could guide every future project for this area with the hope of a requalification and evaluation of Matera's territory.
To do so, our most effective analytical tool was walking. We slowly walked the entire area, which allowed us to "merge" ourselves with the territory, to really look at it, to study it and to recognize all those elements that are now witnesses of this land's evolution.
The use of photography was also very important, as it allowed us to go over and over a 50 square km area and to analyse even the most unrecognisable trace.
These two combined tools helped us to locate some actual spots that remained untouched by man's action and still offer an unaltered view of those historical landscapes, so that we could include them in the design proposition.

3.3 The path

Our proposed project is a 37 km long itinerary (Fig. 4), retracing the path of the ancient and almost forgotten "tratturi"[1], which ideally connects the six historical landscapes.
It runs through the Parco della Murgia Materana and part of the city, along both sides of the canyon of the Gravina di Matera, which gives it its main direction. There are three transversal crossings, giving the path a ring shape, and two "access gates" - one placed North and one South - which are located where it becomes easier to ford the stream (Fig. 5). The crossings, on the other hand, coincide with a change in the surrounding landscape: within a few kilometers there are clear differences between the "industrial" area of tufo quarries, the city and the large agricultural areas, highlighting even more the enormous richness of this territory.
Small architectures are designed to articulate the itinerary and to guide visitors. They are divided into three categories of projects: architectures *to reconnect* (bridges and pavement restoration), *to observe* (info panels, benches and panoramic viewpoints) and *to rest* (info points, lay-bys and shelters).
On the route visitors can cross parts of the landscape that have remained faithful to their original appearance and thus get an idea of the transformations that have taken place in the area: the visitor, while walking, can ideally watch the historical phases that have occurred over time and the evolution of this territory to the present day. Also, every viewpoint suggested by the project is designed to show precise aspects of the history of these places. For this reason, at times very close-up and directional views are suggested, while at other times they expand and coincide with the horizon.
The whole path, which is too long to be covered in one day, can be divided into three parts, named after the places they cross: "The plateau", 8.7 km long route accessible on foot, by bicycle or by car; "The agricultural landscape", 7.2 km long route accessible on foot only; and then "The city", 14,3 km long route accessible on foot, by bicycle or by car. Each part includes shorter thematic routes aimed at visiting specific monumental sites: the rocky site of Madonna delle Vergini (4,2 km long); the site of Villaggio Saraceno (1,6 km long); the Sassi (2,5 km long); the tufo quarries (1,4 km long). (Fig. 6).
We have taken the latter as a case study for further investigation. Just outside the northern part of the city, the site hosted the large tufo quarries that provided the raw material used to build both the eighteenth-nineteenth century part of the city and the modern districts born in the 1950s following the depopulation of the Sassi. Here, the path follows mainly the routes that the old "cavamonti"[2] used to walk to work every day.
In this case we cross a "work landscape" where it is possible to read the history through its constituent elements: from the tuff dolmen standing out along the route that indicate the remnants of the manual pickaxe excavation of the 18th and 19th century quarries, up to the regular walls that serially bear the signs of the mechanical cutting system of the quarries in the 1950s.
Architectural projects in this area include the restoration of a ford and of an eighteenth-century bridge directly carved in the stone, which is now inaccessible (Fig. 7). Rest areas with info panels are also provided and a panoramic viewpoint placed above the quarries is designed to allow visitors to get an overall view of them, perceptively different than when you look at them from the inside.

[1] Wide tracks due to the periodic movement of herds led by shepherds during the transhumance.
[2] Literally, the "mountain diggers".

4. Conclusion

The chaos of daily contemporary life and the constant bombardment of images and noise have increased the need to explore the territory and its cultural heritage. Going walking in nature has become more and more common as people started to appreciate a slow and attentive kind of tourism. This last year particularly the urge to escape the city and reconnect with nature has caused many national and international debates on how future cities might look like and how to preserve and enhance the richness of the landscape. And this is the key to understanding our proposal.

A land that has been shaped by men since ancient times such as Matera's could be realized through the recovery of its ancient routes. And it could and should be enjoyed by the one action that truly belongs to it: walking.



Fig. 1: Aerial view of Matera and Parco della Murgia Materana.



Fig. 2: The *gravina* in Matera.



Fig. 3: Rupestrian settlements along the edges of the gravina.

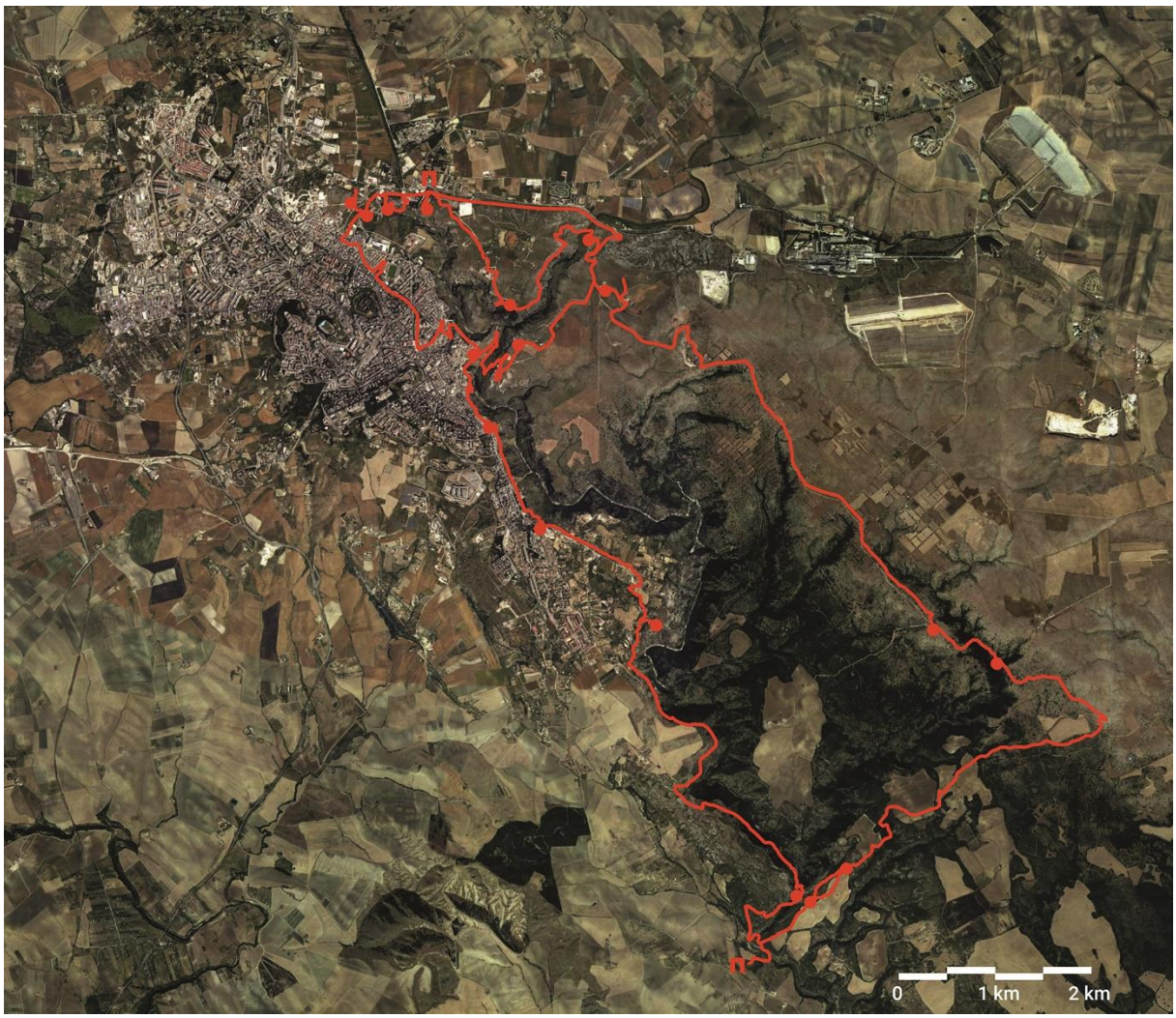

Fig. 4: Aerial view of Matera and Parco della Murgia Materana with the 37 km itinerary. It is possible to recognize the two access gates (in the North and in the South of the path) and all the sites where a small architectural design is proposed (the red circles).

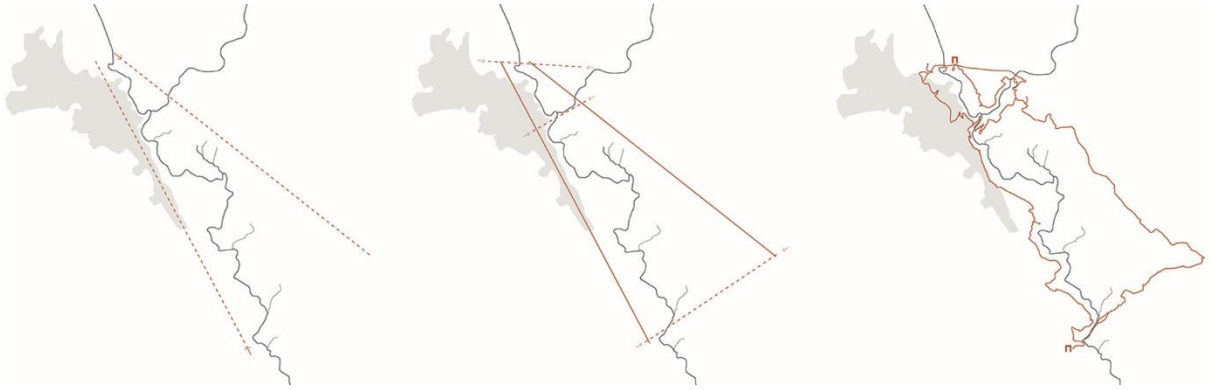

Fig. 5: Explanatory diagrams of the itinerary.



Fig. 6: From left to right: the route “The plateau” with the shorter thematic itinerary “Madonna delle Vergini”; the route “The agricultural landscape” with the shorter thematic itinerary “Villaggio Saraceno”; the route “The city” with the two shorter thematic itineraries “The Sassi” and “The tufo quarries”.



Fig. 7: Photomontage of the proposed intervention on an eighteen-century bridge.

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Learning from Pompeian Baths

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Abstract
As one of the most devastating psychological effects of the pandemic, the loneliness of the individual progresses dramatically. In 2018 the U.K. appointed „the world's first minister for loneliness" (The Times). Post-pandemic health facilities have the potential to counteract this development. The millennia-old European culture of public baths could be a major factor in this development and directly promote the Welfare and Health of the Community.

During the last two conferences we presented a method of visualising hypotheses [1,2] .This presentation illustrates the transversal critical dialogue of archaeology and architecture and in particular the architectonic mediation of culture and heritage, leading to in integration of the skills of building knowledge from history and projecting it towards architectural design without limits as guidelines for investing in the healthcare sector in an exemplary case study:

Two thermal baths of the UNECSO heritage site Pompeji, the Republican and Stabian Baths, dating from different times and unveiling different approaches to the equilibrium of private and public life in the heath sector. The project has been developed in the Excellence Cluster TOPOI, funded by the German Research Foundation DFG, in cooperation with the Institute of Classical Archaeology of the Freie University FU Berlin.

Keywords: Visualisation, Architecture, Archaeology, Knowledge, Hypotheses

1. Introduction – the relevance of the bathing culture
Thermal baths have been a place of coming together for thousands of years. After a phase of athletic swimming pools, today they are increasingly leisure pools. These differ from athletic swimming pools above all in the quality of the stay, which goes beyond pure bathing. In this respect, the ancient facilities become models again, also spatially. So what are the qualities of the ancient thermal baths that are worth considering?

1.2 The evolution of baths in Pompeii
The conservation of the ancient city of Pompeii allows the investigation of the unaltered architectural circumstances of urban life in an active state. This makes it possible to also examine profane facilities such as baths in detail to see how they were spatially structured and how they were then presumably used and, above all, accepted by the population. In the following, two baths in Pompeii will be presented as examples, the Republican Baths and the Stabian Baths, which were researched and visualised within the framework of the excellence cluster TOPOI (The Formation and Transformation of Space and Knowledge in Ancient Civilizations) funded by the German Research Foundation DFG as a cooperation between the Freie Universität Berlin, Institute of Classical Archaeology, Univ.-Prof. Dr. Monika Trümper, and the authors.
The Republican Baths are the second oldest baths in Pompeii. Unlike the Stabian Baths, however, they were not quite as extensively developed, so they were closed again earlier.

But even the small republican baths, which can probably be interpreted as not standing alone primarily due to the adjacent sports facilities, were supplemented with their own peristyle during their substantial expansion. A reconstruction would be particularly difficult here because only very sparse findings are available.



Fig. 1: Republican Baths – overview[1]





Fig. 2: Republican Baths – installation and traces of the finishing[1]

And yet these thermal baths already showed a development in which the baths expanded from purely water baths to a complex with atriums and peristyles, whereby a significantly higher quality of ambience was achieved.
The considerably larger Stabian thermal baths have even their own palaestra, which allows sporting activities to be combined with bathing without leaving the complex. This combination corresponds to the current practice of a facility uniting sports and bathing. In addition, the combination of outdoor and indoor areas means that, at least as far as bathing is concerned, even the weather can be irrelevant.



Fig. 3: Stabian Baths – open air water basin next to palaestra (on the left) [1]

The room programme could easily be extended to include an enclosed gymnasium with or without exercise equipment to meet today's standards. But even without that, the compact antique facility already offers a sophisticated space and access system. For example, access and bathing for men and women were separated, with the thermal supply in the centre, so that the respective baths for women and men are arranged with decreasing temperature away from the central hot water heating.

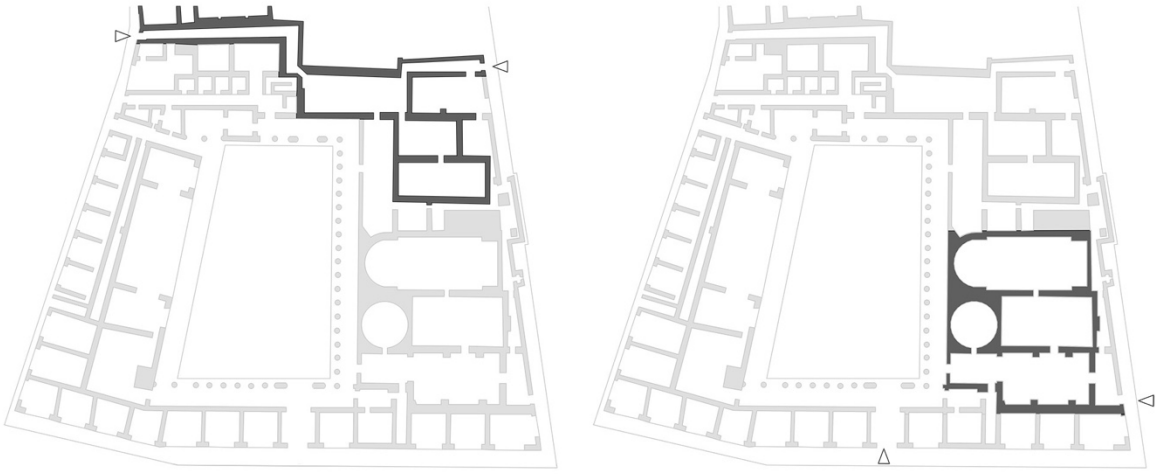

Fig. 4: Stabian Baths – access system women (left) and men (right)
(plans: seminar work Prof. Lengyel and Toulouse)

2. Universal architectural features

There are universal aspects of architecture that have not changed since Roman times, even if they are always subject to mutations and fashions. The pluralism of today, the diversity of forms since postmodernism and, last but not least, the emerging retro chic all provide ideal conditions for a turn to ancient bathing culture in the sense of preventive health care for body and mind.
The first universal feature is the dimensions, especially in public buildings, such as baths, that are not exclusively oriented to the necessary, but also to the quality of stay and perhaps the need for representation after the practical needs have been fulfilled.

Universal is also the eventful sequence of rooms, which not only allow for the practical order of entrance, garden, changing room, bathing area with the optional interconnections to the outdoor area of the outdoor gym and pool, but also allow for more diversified settings, today often referred to as experience. The partially very elaborate ornamentation, on the other hand, clearly reveals the architecture as antique, and accordingly this furnishing feature rather concerns the realm of fashions and the current retro trend. It is without doubt that high-quality furnishings increase the general attractiveness, but the formal style remains independent of this.

2.2 Universal values and possibilities of transfer

It is not the design language itself that is universal, but the values behind it. Certainly, there is no consensus on values and their formal correspondence in contemporary architecture either, but constructive accuracy always represents a high quality architectural production and therefore always expresses an appreciation towards the user. Especially in public buildings, it contributes significantly to the well-being of anonymous guests and visitors.

If one understands the public bath as a gesture of the public or private sector to invite the public, the values mentioned above will certainly lead to a greater acceptance of the establishment.
While architectural values are transferable as a gesture towards the visitor, the question arises as to how this relates to the concrete architectural motifs of ancient thermal bath culture.
A closer look at the decoration details of the Stabian Baths, some fragments of which are very well preserved, shows that there are indeed universal values at this level as well, especially in terms of materiality and fitting. Indeed, in addition to figurative motifs that can clearly be attributed to antiquity, for example in painted rosettes, there are also geometric ornaments that in addition serve practical purposes.

The small pavements not only structure the space, but also fulfil the requirement of prevention against slipping.



Fig. 5: Stabian Baths – floor tiling and wall ornaments[1]

Essentially, the same applies to other features such as small, partly separate bathing areas, drinking fountains and seating areas.



Fig. 6: Stabian Baths – facilities serving the comfort[1]

2.3 The link between archaeology, culture and architecture

The cultural heritage is researched by archaeology and prepared for the understanding and reception of the public. It is the concept of archaeology to try to recognise and resist contemporary projections as far as possible, so as to not encourage interpretations that do not do justice to the antique setting.
Nevertheless, bathing culture is a constant that has developed over thousands of years. It is therefore part of our culture, both the culture of antiquity and that of today.
Architecture is important here in two areas. Firstly, in the spatial mediation of archaeological findings. Here it is architecture that allows with the experience of designing and shaping even undefined spatial approaches to create meaningful visualisations of space even from uncertain hypotheses. Analogous to the openness of an abstract representation that allows a building client to engage in the planning process, it is the same abstraction that allows the archaeologist to be confirmed in the visualisation of his verbal hypothesis. Abstraction here, however, stands for the uncertainty in knowledge, a defining characteristic of all science, not just archaeology.

3. Learning from the past – Archaeology and architecture

There is no question that archaeology is not only used to gain knowledge about the past, but also for our contemporary life. However, this applies not only to modes of life, social structures and technologies, such as those currently being discussed to cope with the consequences of climate change, but also to architecture. For even if the experience of architecture is rather subjective, this subjective perception is still based on a collective cultural memory, the origins of which lie, among other things, in our common antique history. For example, as unfamiliar as the high small rooms with small windows seem to us, at the same time the private urban garden is both attractive and up-to-date, as it is currently being implemented even in high-rise residential buildings.



Fig. 7: Stabian Baths – men's apodyterium[1]

3.2 Science as a never-ending story

In this respect, it is fundamental to bear in mind that scientific findings are and remain open-ended. It is always to be assumed that findings will be overtaken, further developed or contradicted by new investigations. This nature of science corresponds to the open-ended process of architectural design. This, too, is never complete. Therefore, the reference to cultural heritage as a contemporary interpretation and valorisation of the past is always also a contemporary act, which, however, in no way calls its validity into question, but on the contrary actually confirms it as the core of reflexive action.

4. Forms of visual mediation

It is particularly important in the visual communication of abstract geometry to maximise the spatial impact by referring to the rules of classical architectural photography, which is why we speak here of virtual photography.

It is precisely the virtually photographed abstracted geometry, which allows us to bridge the gap between antiquity and the present day, since many unambiguous attributes of ancient architecture, especially painting and ornamentation, are not depicted for reasons of scientific uncertainty and the inner coherence, the consistency, of the visualisations.

But virtual photography only applies in the perspective representation. And a perspective representation has a core feature that legitimises its use, namely that of the centre of projection. The geometric projection centre of the constructed or photographed perspective corresponds to the monocular perception by an imagined observer.

4.2 Central projection

It is essential to realise that the conventional (especially non-stereoscopic) image is not only monocular, but also static. Being static does not only mean that the depicted motifs do not move, but also that the perspective, i.e. the geometric construction, does not change along with the wandering of the eye as it does in natural vision. A static perspective corresponds to the actual spatial (though monocular) perception only when the look is directed to the so-called principle point of the perspective, which is usually the perpendicular of the centre of projection on the image plane, or in words of photography without special lenses, the centre of the image.

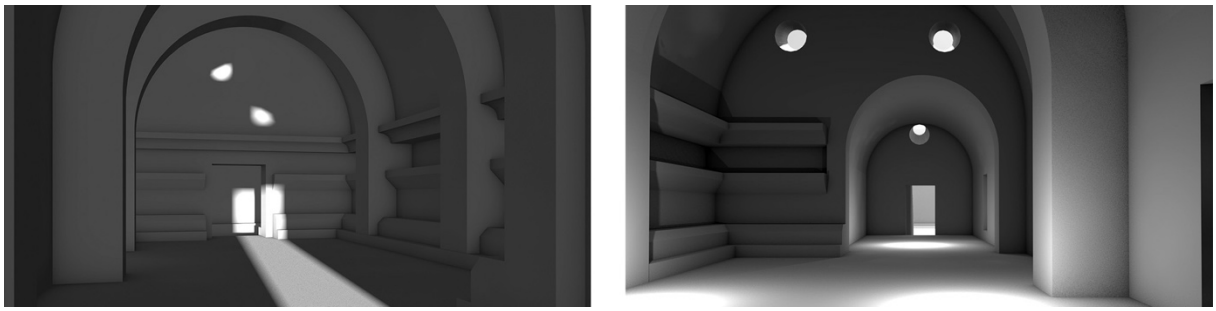

Fig. 8: Stabian Baths – perspective projection (images: seminar work Prof. Lengyel and Toulouse) [6]



Fig. 9: Stabian Baths – perspective projection (image: seminar work Prof. Lengyel and Toulouse) [6]

4.3 Parallel projection

Especially in architecture, not only in historical representations but also in design, parallel projection, i.e. axonometry, has become established, allowing for a more reliable reading of dimensional relationships, proportions, but also spatial orientations of objects in relation to each other.
Parallel projections, unlike perspectives, not only have no shortening and no vanishing in depth, they also have no centre of projection, i.e. no spatial point of view.
In other words, one does not look from a certain point, but rather in a certain direction, and indeed at every detail of the representation from that same direction.
Within axonometries, a distinction is made between straight and oblique axonometries. Straight axonometries are those that correspond to the view from infinity, i.e. asymptotically from a satellite. The most prominent example of straight axonometries is isometry, in which the viewing direction corresponds to a spatial diagonal through a cube, and the three edges of this cube are represented in the same (i.e. iso) length.

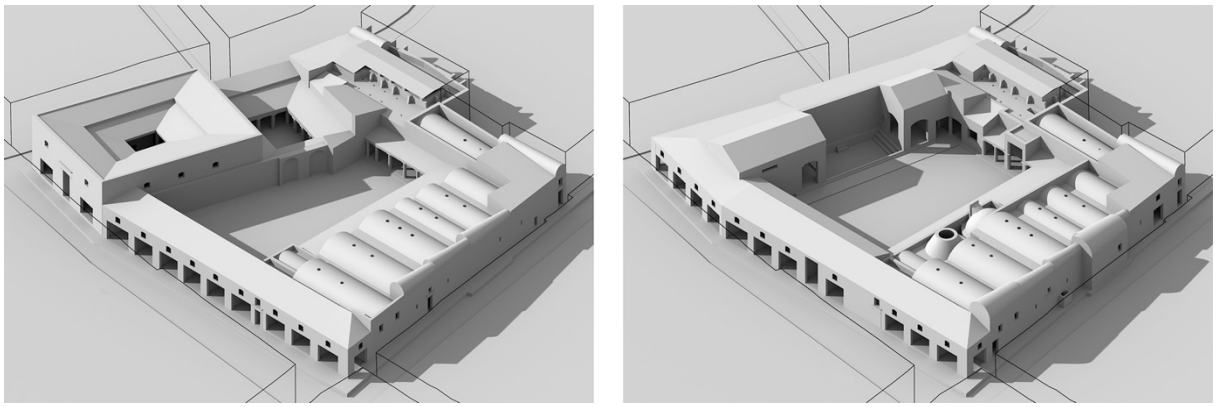

Fig. 10: Stabian Baths – isometric projection phase 1 and phase 4 with double pitch roof [4,5]
(images: BTU Lengyel Toulouse)

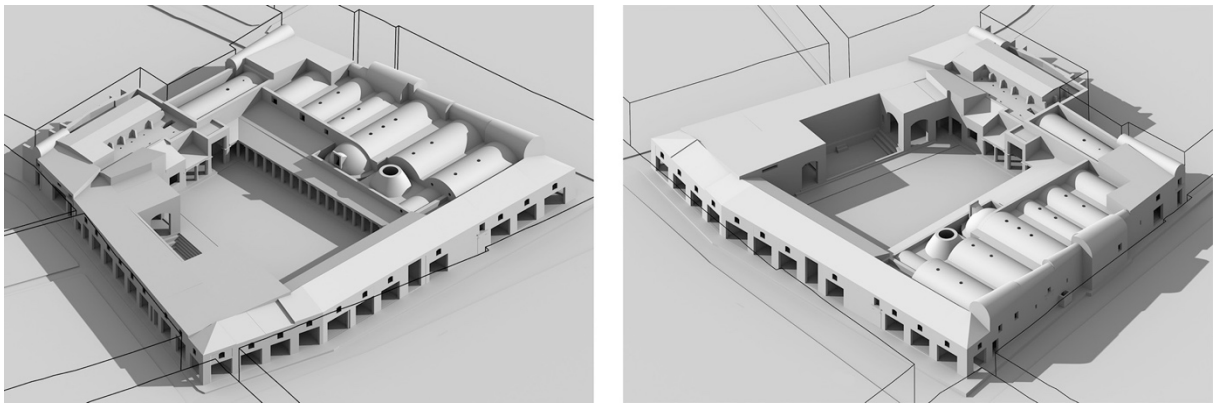

Fig. 11: Stabian Baths – isometric projection phase 4 revised hypothesis with single pitch roof [4]
(images: BTU Lengyel Toulouse)

4.4 Oblique axonometries

Oblique axonometries are those that use surreal orientation of the spatial axes, which in reality would never be possible, even from infinity. Conversely, however, they offer great advantages, such as an undistorted floor plan with at the same time visible wall surfaces. It is not without reason that this was the preferred historical way of representing church interiors, as one can see both the constellation of walls and pillars as an undistorted ground plan and at the same time the wall surfaces, windows and vaults.

The major disadvantage of oblique axonometry is the non-uniform relationship of the scales between the axes. In a ground plan axonometry, for example, the height may appear too little or too pronounced. This is not the case in an isometry.

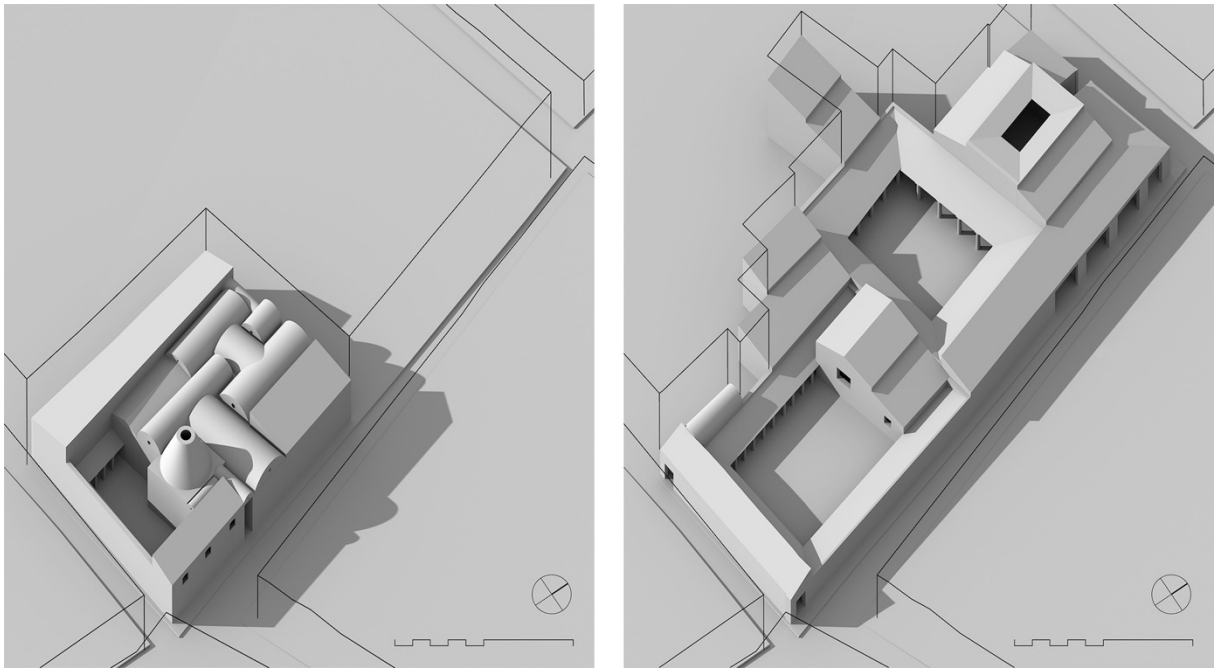

Fig. 12: Republican Baths – oblique axonometric projection [3] (images: BTU Lengyel Toulouse)

5. Conclusion – the potential of investing in the healthcare sector to promote the welfare and health of the community

The study of antiquity also provides a promising impulse for the health sector. Public baths contribute to the well-being and health of society, regardless of their private or public patronage. This insight, which is self-evident in Roman antiquity and can be traced all across time, has great legitimacy for current planning in the health sector as well. Taking architecture into account, especially the spatial qualities that have been inherited, turns cultural heritage into an immeasurable fund for shaping our own future. Designing in architecture is above all reflecting on what already exists; excellent world cultural heritage is particularly suitable as a starting point.

[1] Figures 1, 2, 3, 5, 6, 7 (all photographies) Dominik Lengyel

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Le Vie dei Mercanti XIX INTERNATIONAL FORUM
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De morbo epidemiali nolano: an epidemic of the past and a warning for the future.

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Abstract
In the year 1600, a serious epidemic involved the *ager nolanus* and various areas of Campania, decimating the population.
Two years after, Giovan Battista Cavallari, sent by Viceroy Fernando Domingo Ruiz de Castro to help the sick, published *De morbo epidemiali nolano*, a treatise that sheds light on the nature of the epidemic and the causal link between the calamity and the complex arrangement work of *Regi Lagni*.
The text, of which an Italian translation has recently been published, completes the picture of the information relating to the situation of the territory involved in the drainage, which, for three consecutive years, from 1599 to 1601, was repeatedly submerged due to the "rottura de le ripe" with consequent worsening of the already precarious hydrogeological situation of the area and with numerous defections of master builders and laborers, ascertained by documentary investigation.
If Ambrogio Leone already mentioned the malarial fevers that repeatedly devastated Nola due to the stagnation of swampy waters, Cavallari's essay allows us to note the increased awareness of the danger represented by the hydrogeological situation.
At the same time, it constitutes an important testimony regarding the health situation of the ager before the viceregal drainage and the fundamental link that has always existed between medicine and respect for the territory. The presence of an topographic map, which reproduces that of *De Nola*, confirms the complex cultural interest underlying the treaty.

Keywords: *Ager campanus*, Giovan Battista Cavallari, Regi Lagni.

1. The historical situation of Terra di Lavoro
Epidemics and pandemics, which cyclically disrupt human life, have significant repercussions on the territory and on the monuments that characterize it. Campania constitutes, in this sense, an exemplary case.
In particular, *ager nolanus*, in the heart of Campania felix, as the Romans called this region, keeps the traces of a human adaptation to recurrent epidemics, with the attempt, pursued over the centuries, to resist environmental disasters through the care of the territory and adaptation to it.
The area, also known as "Terra di Lavoro", was clearly delimited by the Clanis river, a large torrential furrow, destined, with its natural configuration, to favor, from antiquity and up to the sixteenth century, the establishment of two different geographical entities and politics, the ager campanus with the city of Capua, and the coast with Neapolis.
The testimonies of Vergilius, Valerius Maximus and Livius agree on the degradation of the Campania centers located between Acerra and Liternum in the Augustan age, while it will be necessary to wait for the Angevin age to see a principle of rehabilitation implemented, aimed at freeing those lands from the scourge of malaria, caused from the floods of the Clanis.
The construction of the Regi Lagni, rectilinear canals that collect rain and spring water, conveying it from the plain north of Naples for over fifty-six kilometers from Nola to Acerra and then to the sea, between the mouth of the Volturno and the lake of Patria.
These canals still extend along one hundred and ten thousand flat hectares of great agricultural qualities, bordered to the north-west by the Domitian coast and the Volturno basin, to the south-east

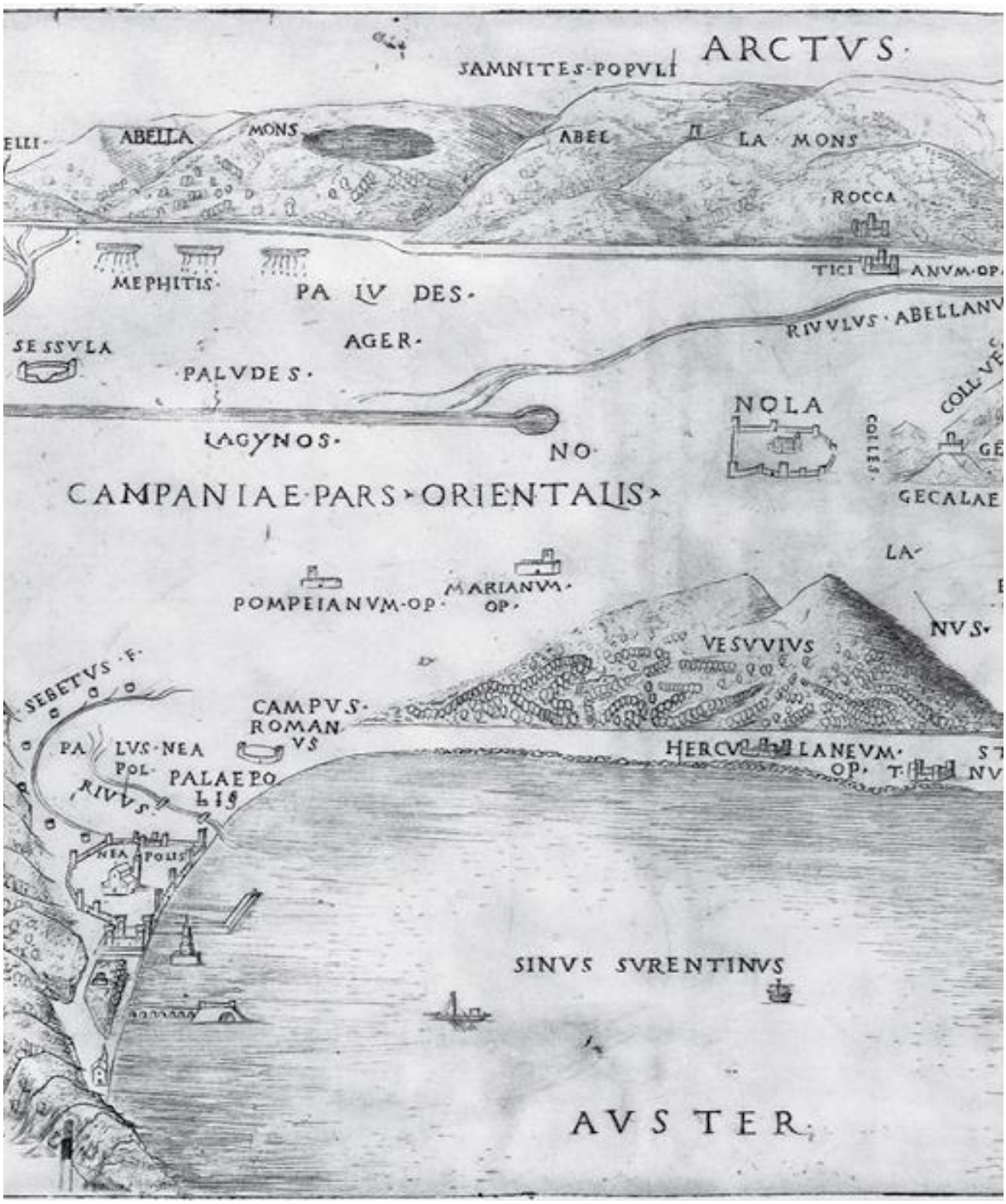

Fig. 1: A. Leone, *De Nola*. 1514. *Ager nolanus* map. (detail)

by the Caserta-Nolana area and to the south-west by the Campi Flegrei. It is a work created by talented architects such as Domenico Fontana, Benvenuto Tortelli, Rinaldo Casale and others, which composes a complex drainage system, performing a fundamental function for the protection of the hydro-geological balance and represents one of the major works of that time.
An important testimony regarding the swamping of the region in the previous phase of this grandiose hydraulic work is constituted by a decree, signed by Robert of Anjou (1311), in which we read that the riverbed had a tortuous path, cluttered with deposits and waste due to the «humana malitia», or to the slags from the processing of flax and hemp, very common in the area due to the particular environmental situation.

1.2 The Aragonese age and the beginning (Arial – 10 pt – Lower case letters - Bold – Left aligned – Number style 1.1, 1.2,)

With the conquest of Alfonso and the beginning of the Aragonese age, the entire Neapolitan territory and its hinterland were affected by an intense building fervor, responding to a specific program of intervention on the territory, in which the realization of a efficient waterway network and an effective defensive system.
It became therefore essential to heal the "complain" as they were called, with a word of Greek origin (λάγυνοι), the territories involved in the constant flading of the river.
The strengthening of the borders, crucial for the Aragonese regency, involved the reorganization and increase of the roads, with the creation of navigable canals and the reclamation of vast swampy areas.
The interest of Alfonso the Magnanimous in the reclamation of the area north-west of Naples is also linked to the problem of water supply in the capital and the enhancement of river ports, important commercial hubs.
As evidence of the sovereign's commitment to the reclamation of Terra di Lavoro, there remains a series of parchments depicting Naples and its hinterland, today divided between the Naples State Archives and the Bibliothèque Nationale in Paris.

The parchments offer a precious picture of the situation, partly in contrast with subsequent literary sources: thus, despite the heavy sanctions threatened by the royal authority from the Middle Ages onwards, in order to restore the lost efficiency to the channels, we know from nineteenth-century sources that by now, during the sixteenth century, Acerra, one of the main centers of the region, was reduced to an almost depopulated village, due to the presence of extensive marshes.

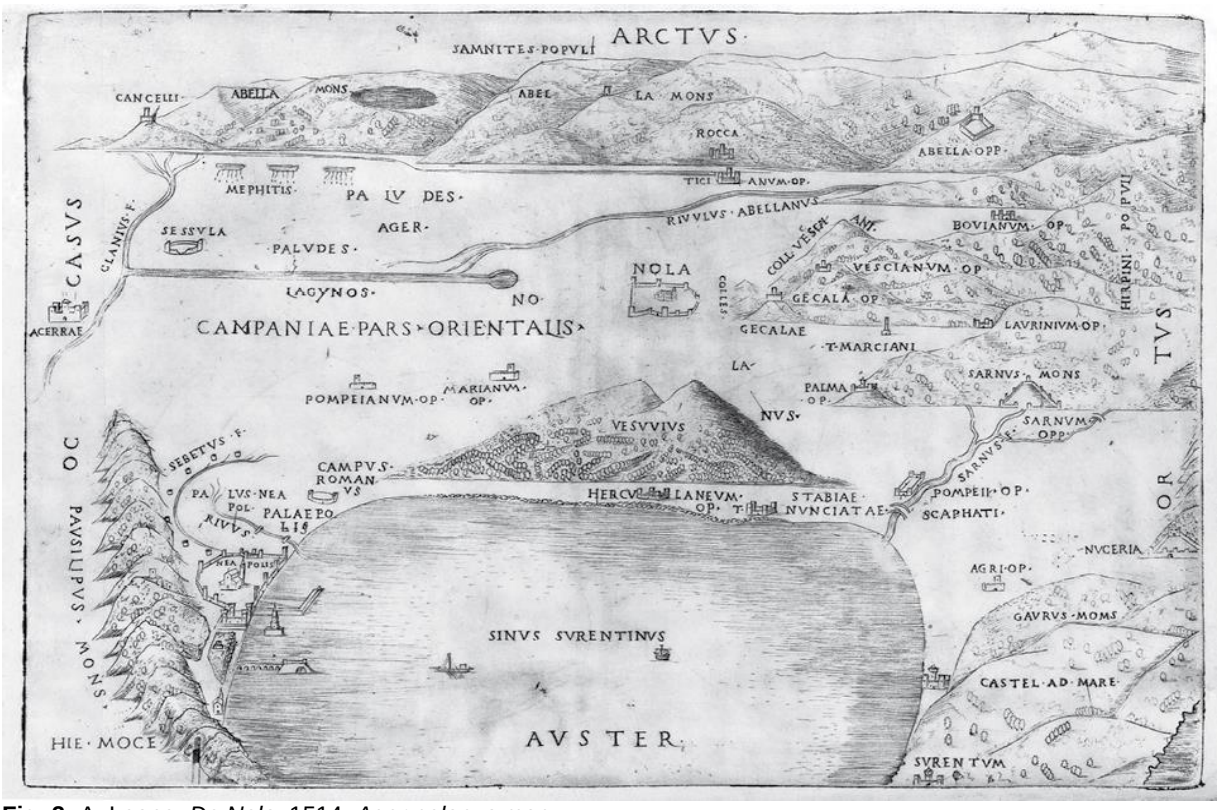

Fig. 2: A. Leone, *De Nola*. 1514. *Ager nolanus* map.

Instead, in the cartographic document, however, no swamps or marshes are reported, but the path of the Clanio river appears regular and its canals cross large wooded areas.

With the conquest of Alfonso and the beginning of the Aragonese age, the entire Neapolitan territory and its hinterland were affected by an intense building fervor, responding to a specific program of intervention on the territory, in which the realization of a efficient hydro-road network and an effective defensive system, based on the reuse of old structures transformed into development and coordination centers of the rural provinces.
The strengthening of the borders, crucial for the Aragonese regency, involved the reorganization and increase of the roads, with the creation of navigable canals and the reclamation of vast swampy areas. As evidence of the commitment made by Magnanimo for the reclamation of Terra di Lavoro there remains a series of parchments with the depiction of Naples and its hinterland, certainly part of a larger group of Aragonese plants, copied in Paris, in the eighteenth century, by Abbot Galiani.
Currently six of these copies are in the State Archives of Naples, seven at the Bibliothèque National in Paris, while another four, also recently published in the Neapolitan Archives, may be the only surviving part of the originals. sent from Paris. Among them, one represents the area east of Caserta, between Nola, Acerra and Maddaloni: in the design of the territory, with great attention to the archaeological and antiquarian data, ancient remains, even in ruins, are reported, often accompanied by the specification " dirute ”or“ almost dirute ”. The smaller centers are represented in a schematic way as a group of houses leaning against a bell tower and with an equally simplified graphic sign the characteristics of the vast ager are rendered: small parallel line segments, oriented vertically, horizontally or obliquely, correspond to the cultivated fields, alluding to the tracing of the furrows, often delimited by trees and rendered in square modular fields. A concentration of plants makes the wooded areas, while the mountains are indicated by thin wavy lines, except for the most important reliefs, identified with a schematic pyramidal shape.
Some depictions of cities turn out to be true documentation of the precise configuration of the urban nuclei at the end of the fifteenth century, in which the most important cities are highlighted with a wealth of details, including both the course of the walls and the fortified structures.
The cartographic representation of Nola reveals the presence of the Roman amphitheater and the existence of a large urban nucleus surrounded by walls, in which the main door opens, the civita or citadel-fortress with five towers, placed in defense of Porta Vicanzio . Although the bastion-like semicircle forepart present in the plan attached to the 1514 edition of De Nola is missing, the testimony of the parchments documents the presence of towers and defensive structures prior to the sixteenth-century reorganization.



Fig. 4: G.B. Cavallari, *De morbo epidemiali nolano*. 1600. *Ager nolanus* map.

The parchments offer a precious picture of the situation, partly in contrast with subsequent literary sources: thus, despite the heavy sanctions threatened by the royal authority from the Middle Ages onwards, in order to restore the lost efficiency to the channels, we know from nineteenth-century sources that by now, during the sixteenth century, Acerra was reduced to an almost depopulated village, due to the presence of extensive marshes, fed by stagnant water, flowing from the territories of Cicciano, Nola and Marigliano, which, at the height of Bosco Fangone, met in a single riverbed. Likewise, Leandro Alberti, in the Descriptor of all of Italy, writes: «Il che dichiarando Servio dice essere Acerra una città di Campagna non molto da Napoli discosto, appresso cui passa il fiume Gladio, il quale rovina il paese di quella per le continue inondazioni. Et per questo è sì come priva d'habitazioni, come dice Probo, et si vede, che più tosto pare una male abitata villa» (Alberti 1561: 189)..
In the Galiani parchments no swamps or marshes are reported, but the path of the Clanio river appears regular and its channels cross large wooded areas. The plain appears to be governed by a rational arrangement of water resources, the result, in all probability, of the Aragonese intervention.
Between the sixteenth and seventeenth centuries, the construction and arrangement of the canals called "Regi lagni" made possible the regular flow of rainwater towards the sea and thus favored the gradual recovery of the very fertile territory that stretches from Nola to the Patria lake.
The consequences were considerable: from the break in the centuries-old isolation of the capital from its hinterland, to the productive resumption of centers such as Acerra, Aversa, Marigliano, Nola, up to the reduction of contagion from malaria epidemics and the introduction of other crops in these territories, beyond the traditional one of hemp. In this way, moreover, the foundations were laid for the creation of that new, grandiose infrastructure that was the Carmignano aqueduct.
The most substantial phase of work was started by Don Pedro di Toledo (1484-1553), was completed by Ferdinando de Castro (1548-1601), was carried out under the direction of Domenico Fontana (1543-1607) and involved the tracing of an orderly network of canals, which constituted the largest hydraulic enterprise of the time.
The very serious epidemics which occurred, in particular, throughout the course of the 16th century, especially in the final decade, when the recurring series of famines were added to accelerate the realization of the works. However, the reclamation plan encountered a series of obstacles, determined above all by conspicuous private interests, belonging to the feudal lords of the areas involved, for whom water was both a source of energy for the milling activity and an indispensable resource for the processing of linen and hemp.
Precisely the disorderly proliferation of industries linked to these sectors represents one of the causes of the swamps, so much so that, several times, the dismantling of a series of mills was decreed, some of which owned by the convents of San Lorenzo in Aversa and Monteoliveto in Naples.

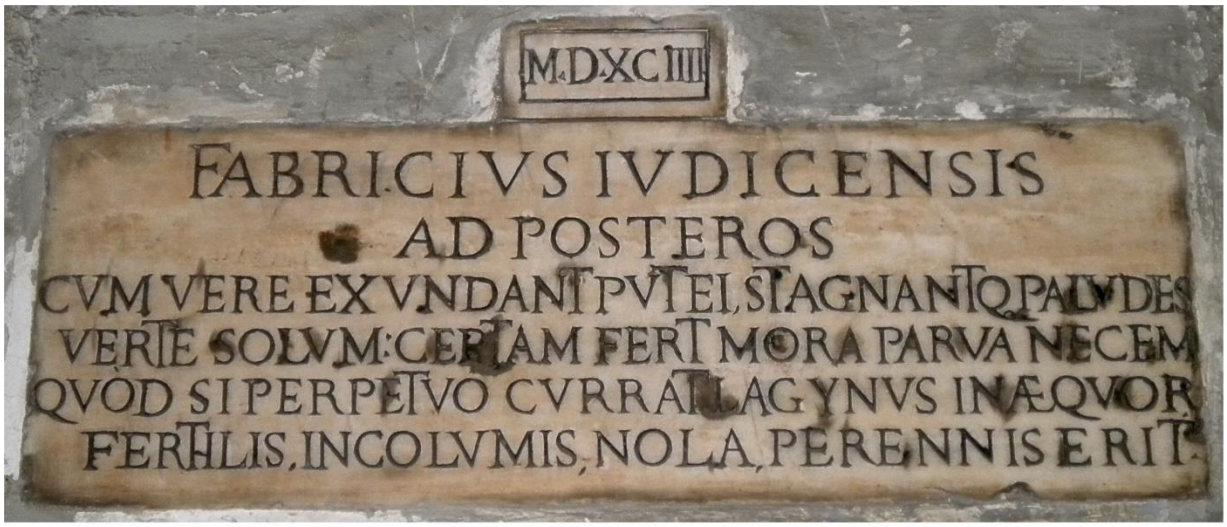

Fig. 5: Nola, Del Giudice-Mazzeo Palace. Epigraph from medieval "Sedile" of the city.

2. Giovan Battista Cavallari and *De morbo epidemiali nolano*

A period of stagnation in the works occurred in the winter of 1600, when, due to continuous flooding, an epidemic occurred, which involved the entire ager nolanus. Indeed, such incidents were not uncommon in the area. The learned humanist Ambrogio Leone (1548-1525), in the “De Nola”, a work dedicated to his hometown, explains that, due to the stagnation of the marshy waters, epidemics of fever occurred constantly.

An epigraph from the medieval “Sedile” of Nola city, dated 1594, now recovered in the historic city center, confirms the cyclical recurrence of epidemics linked to the poor state of the territory and considers the construction of “lagni” the only possible remedy.

The comparison between archival documents, published over the last twenty years, and a text, composed in 1600, written by the doctor Giovan Battista Cavallari, allows us to reconstruct, in parallel, the history of that imposing hydraulic work that takes the name of "Regi lagni", which they are part of a huge environmental rehabilitation work, with which an attempt was made to solve the problem linked to the course of the Clanis, allowing not only sanitary but also economic recovery of the territory.

The epidemic of 1600 is, however, particularly important for us, because we have the report of the doctor of Venetian origin who was invited by Viceroy Ferdinando Ruiz de Castro to treat the sick. In fact, the following year he published a text entitled "De morbo epidemiali nolano", in which he described the symptoms of the epidemic, which consisted of a continuous fever that caused the death of the infected after a few days.

The doctor reconnects the spread of the disease to bad environmental conditions, in particular to the hydrogeological situation and the effects it also had on the atmosphere.

The description of the disease is detailed: Cavallari refers to some of the more complex cases, such as that of a nun who suffered from fever for six months before recovering (p. 20) or that of a Jesuit who died after three months of illness (p. 21).

It is important to note that the doctor identifies the cause of the disease in the conformation of ager nolanus, which, surrounded by mountains, is «veluti sentina et cloaca palustris propter locum depressum» (p. 23).

The natural conformation of the territory, the recurrence of epidemics, the absence of a precise channeling and careful reclamation are topics on which the author dwells at length.

The fact that the infection did not spread to Naples, a much more densely populated city, is explained by the doctor with the presence in the city of the fires of the houses that purified the air.

On the other hand, the author himself shows the increased awareness on the part of citizens and health representatives of the danger represented by waters, when he first identifies in them one of the causes of the epidemic, connected to nature itself of the city and its location; then he focuses on the problems related to the nature of water and air; finally, at the end of the work, he tackles the problem of prevention and insists on the need to dig a pit, connected to the "master" one, to convey the waters that came down from Cicala hill.

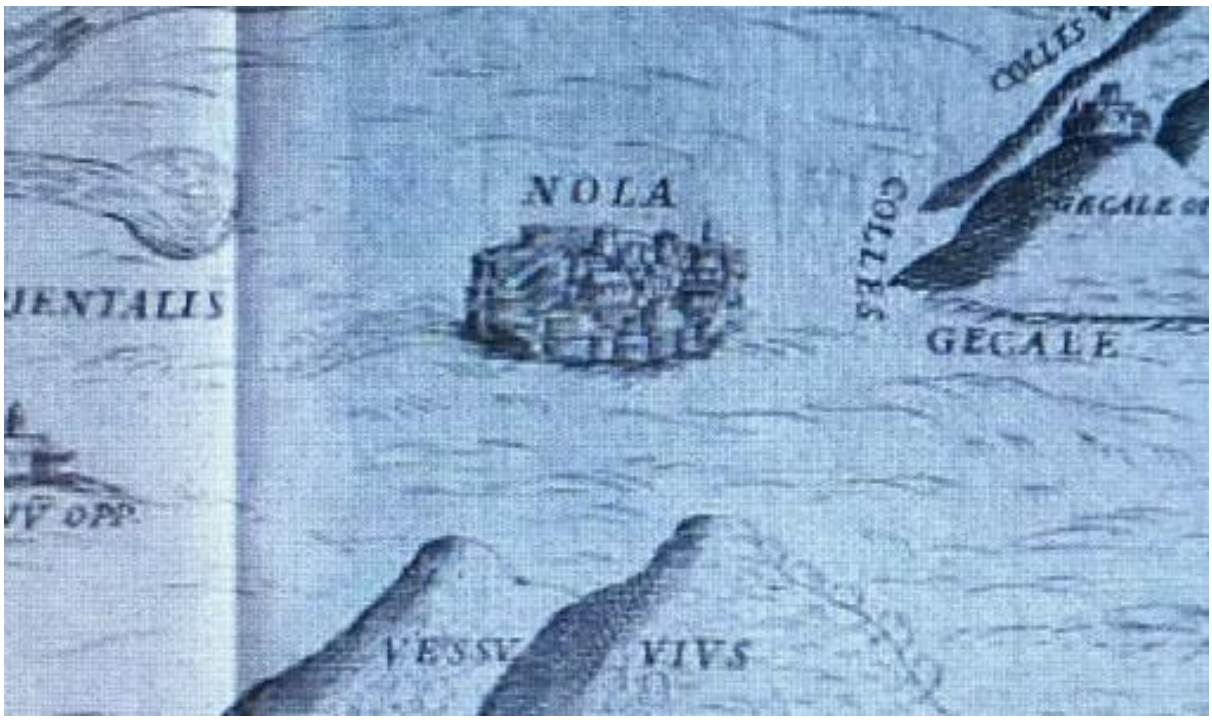

Fig. 6: G.B. Cavallari, *De morbo epidemiali nolano*. 1600. *Ager nolanus* map, (detail).

A strong indication of the high mortality in these areas is proven by the numerous defections found in that year among the master builders, which can be explained by the very high incidence of fatal diseases among the operators, forced to reside in such unhealthy areas.
The news transmitted by the medical scholar is confirmed by archival documents, which testify to a slowdown in work in 1600 and a strong recovery the following year. Not surprisingly, 1601 is generally considered the year of the final take-off of the hydraulic reclamation in Terra di Lavoro. Through the reclamation of the Regi Lagni, the Spanish government offered a rare demonstration of efficiency and, using the authoritative intervention of Domenico Antonio Fontana, implemented one of the most impressive territorial interventions of the time, carrying out hydraulic rebalancing, sanitation and agrarian recovery of the "province of Terra di Lavoro", coinciding with the most fertile part of *Campania felix*. At the same time, he laid the foundations for the urban revival of the capital.
Further confirmation of the positive impact that the construction of the "lagni" had on the lives of local populations comes from two epigraphs present in the Nola area and coming from the medieval seat of the city, which indicate, as the only salvation for citizens in the future, correct maintenance of the “lagno”.
Cavallari’s text, which is also a scientific essay, is part of that series of studies dedicated to the territory and its evolution.

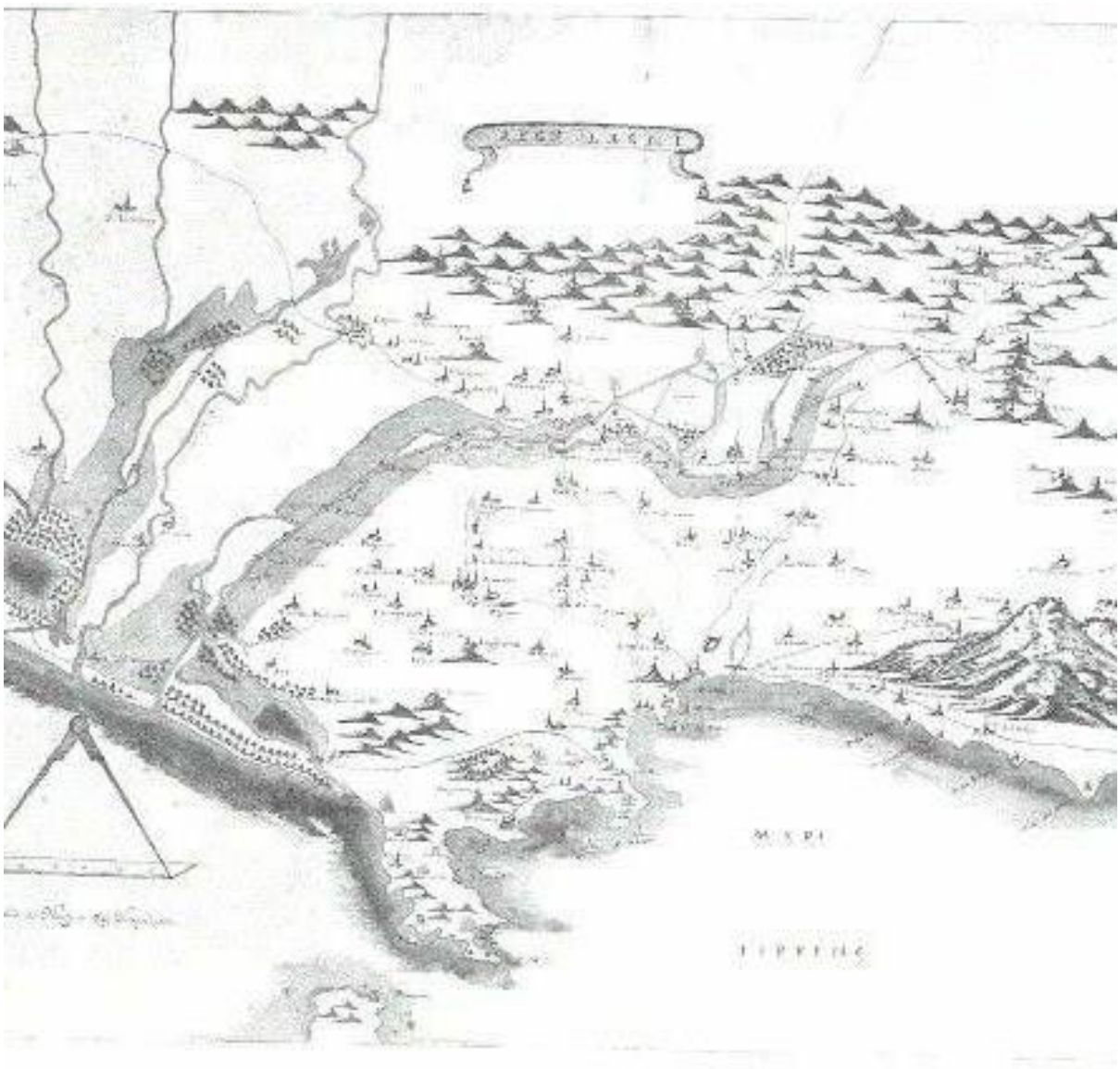

Fig. 7: M. Cartaro, Regi Lagni. 1615, (detail),

Still little known, it deserves to be studied for the important implications with the history and development of the territory.
Due to its attention to the territory and urban development, it is part of the "homeland histories" which, flourished in the Renaissance, had found an important witness in Ambrogio Leone's "De Nola".
In the wake of a semantic evolution already attested in the course of the Middle Ages in Dante and in Villani's Histories, these texts used the term "homeland" in strict adherence to the city scenario, so that the concept of "small homeland", referring to urban centers of the Peninsula, gradually acquires attributes characteristic of the great homeland.
The notion of homeland as a native place (especially a small territory, city), with which one identifies first of all on the genealogical and cultural level, is therefore prevalent for most of the modern age and does not always coincide (for reasons of political or cultural-affective) with that of natione (State), a concept that can indeed be very weak and sometimes absent. Thus in the case of many peasant cultures, where the homeland is the village, the country or the valley in which one is born and dies, while the natione is at best perceived as a distant and abstract entity, as a sum of ambiguous values, obscure and even oppressive, especially on a fiscal and regulatory level.
All this is evident in De morbo, which, despite being a medical text, analyzes the episode of the contagion that occurred in the *ager nolanus*, as a phenomenon relating to the hygienic-sanitary conditions of a specific urban center, also characterized and identified by a map of the territory, very faithful to that of Leone.
Overall, the text is presented as an epidemiological treatment of the pandemic, which, starting from the causes and diagnosis, also envisages its treatment, in which a more specifically historical-geographical and topographical part is inserted, useful for reconstructing the geological situation of the pandemic. 'ager nolanus, when it was affected by the great hydraulic work that goes by the name of "Regi lagni".

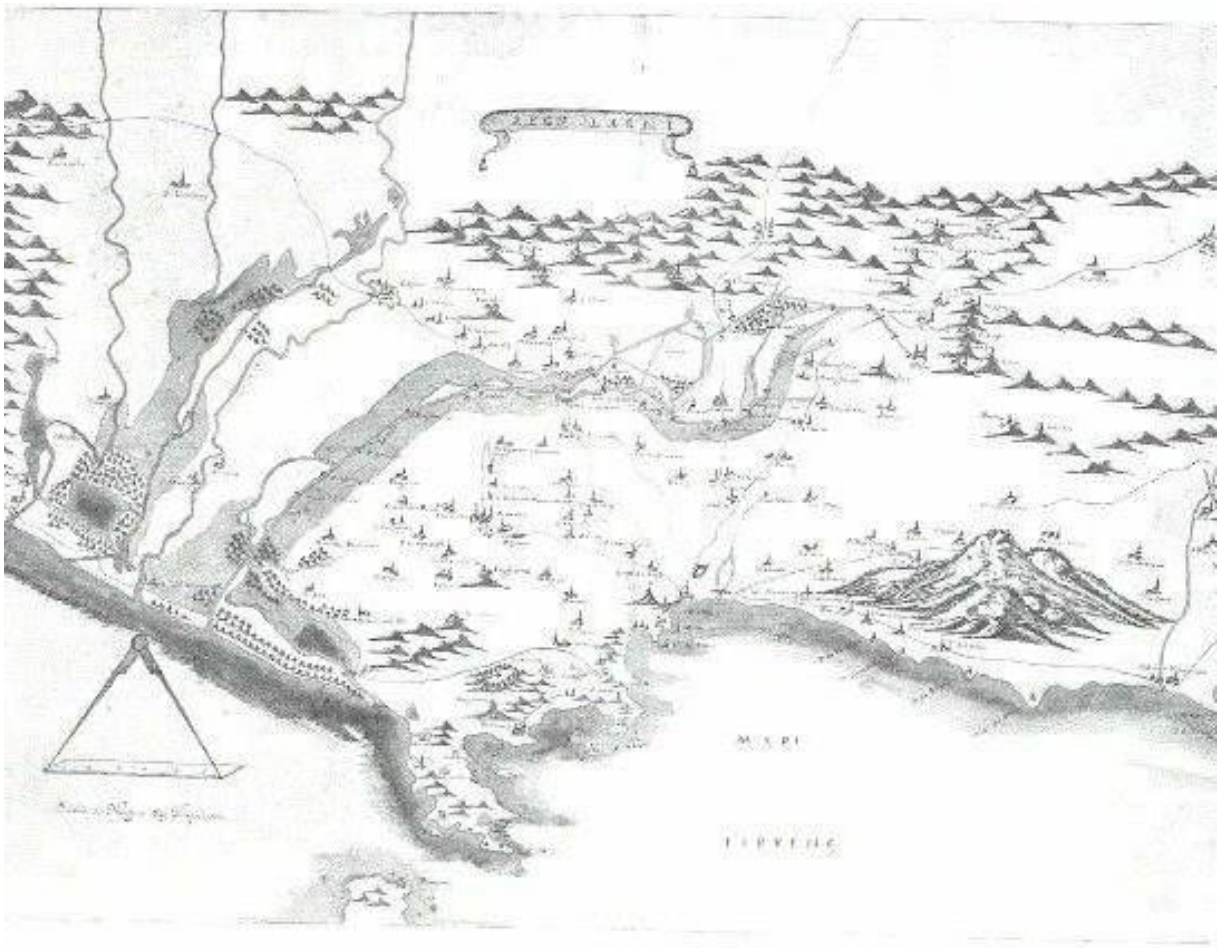

Fig. 8: M. Cartaro, Regi Lagni. 1615.

3. I lavori durante il XVII secolo

T he comparison between Cavalalri's testimony and archive data confirms the serious crisis of the year 1600 and the resumption of work in 1601.

In fact, 1601 is generally considered the year of the definitive take-off of the hydraulic reclamation in Terra di Lavoro: in fact, while the crossing bridges were being strengthened, Francesco Longo, already involved in the construction of the Avella pit, began the tracing of a canal in the countryside of Nola, from San Paolo Belsito to today's Ciccione bridge, which still exists today; at the same time, Giulio Sangio and Gioannello Pellegrino undertook the "cavamento" of the lake of Marigliano; Biagio and Giovanni Carlo di Guida worked on the “delli Cani” bridge. The latter (today's Frezza lake) had the purpose of letting the waters from San Paolo Belsito, Nola and Cimitile flow into the master lake, avoiding the tortuous riverbed of Bosco Fangone.

Finally, during the summer months the rectification of the course of the Clanio from Nola to the lake of Patria was begun, with the opening of twenty-five construction sites, coordinated by the Casale and the creation of a new mouth, whose project is assigned by Fontana himself, to the first Earl of Lemos.

His work was adequately continued during the eighteen months of his son, Francisco Domingo Ruiz de Castro, who allocated fifty-three thousand ducats for the continuation of the work, proving how much the water-sanitation problem of the Campania hinterland was dear to the members of the de Castro family, the most attentive to solving the age-old problem, which also explains the enthusiastic tones with which the figure of Lemos is outlined by Cavallari.

A strong indication of the high mortality in these areas is proven by the numerous defections found among the master builders, which can be explained by the very high incidence of fatal diseases among the operators, forced to reside in such unhealthy areas.

Despite the new setback marked at the beginning of the viceroyalty of the Count of Benavente, one cannot fail to recognize that, at the turn of the sixteenth and seventeenth centuries, the Spanish government, offering a rare demonstration of efficiency and making use of the authoritative intervention of Domenico Antonio Fontana , implemented one of the most impressive territorial interventions of the time, realizing the hydraulic rebalancing, hygienic rehabilitation and agrarian recovery of the then province of Terra di Lavoro, coinciding with the most fertile part of *Campania felix*, while laying the foundations for the revival urban planning of the capital.

De morbo epidemiali constitutes an important step in the knowledge of the hygienic situation of this area in a crucial phase of the necessary remediation action.

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Redesign the present

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Redesign the present

While we wonder about possible future scenarios, the global pandemic condition has already changed our way of working, our way of giving meaning to the house and of living in space, undermining the relationship between man and space which, according to Heiddegher, “it is nothing other than living thought in its essence”.
In the perception of reality our conscience plays a fundamental role, what allows us to choose the best way depends on the personal level of culture and intellect.
We want to go back to normality but perhaps this is the problem; we need to ask ourselves what is wrong with our daily lives based on an entropic and energy-intensive development model and to modify individual and collective choices.
Considering the objectives of the 2030 Agenda, according to a holistic approach, all the dimensions of sustainable development must be taken into account, from environmental to social ones, to redesign the present (because the future is too distant) in a perspective of "transformative resilience".

Keywords: living, recognition of meaning, model of development

1. Permanent crisis

The global pandemic condition, which occurred a year ago, has confronted us with all our limits. During the special prayer for the health emergency, Pope Francis said: "We did not listen to the cry of our seriously ill planet, we continued undeterred thinking of always remaining healthy in a sick world"; this small infectious particle of submicroscopic dimensions has made us aware that the dimension of the unknown is such as to eradicate all our certainties in a few days, bringing us back to a condition of fragility. Contaminated nature has shown itself to be violent and preponderant, passing from one body to another through this microorganism and today this reality is part of our contemporary awareness. One of the most significant changes that has occurred is linked precisely to the relationship between space and time. What has changed in our contemporaneity is the relationship that man has established over time with his spaces in the meaning of the ethical dimension of living, the set of norms and values, being familiar with one's world, take care of your own space and be in relationship with the space. "The real housing crisis consists in the fact that mortals are always in search of the essence of living, that they must first learn to live" writes Heiddegher; the sense of living and being in the world is understood by the philosopher as taking care of the Quadrature (Geviert) of heaven, earth, divine and mortal.Leave one blank line between abstract and keywords, and two blank lines between keywords and the first section.
The "crisis of living", the question that man has not yet learned to live as a mortal near things and places, taking care of the Quadrature, unfolds in its double modality, that is as a risk and, at the same time, as possibility of reversing the course towards an authentic dimension of one's own existence and living. The profound meaning of the term build therefore lies in staying as a condition of the possibility that mortals reach the appeal that calls them to live.

We realized that in the last century we have severed the relationship with nature, this fracture has shown itself in a sudden and preponderant way, changing our way of life, therefore of living, desiring, consuming, opposing, seeing and producing, in a difficult emotional condition between forced closure of activities, social isolation and smart working. The ITCs have proved to be a tool to overcome this emergency which to date is not yet over.
For some professions such as entrepreneurs, teachers, executives, officials, freelancers and managers, these tools have represented an opportunity, they have made us discover new ways of interaction and have also had implications for sustainability. In the social sphere, however, the use of ITCs has highlighted the "divide" (cultural divide, digital divide, ...) for different categories, in the meaning of distance from a situation of "normality", I refer to fragile users where this distance it must be filled with the tools of capacity and interpretation and where it is necessary a transversal design thinking approach, in a human key, which interprets the opportunities.
To date we ask ourselves whether this housing crisis in a broad sense is pandemic or endemic.

2. Paradigm Change

Thomas Kuhn in 1962 published his great work "the structure of scientific revolutions" in which he coined the expression "paradigm shift", the meaning of which today more than ever is transversal to the various disciplines and current.
In the author's view, the term paradigm does not represent only a theory but a total vision of the world within which the theory and all the cognitive characteristics and implications that derive from it are shared.
Our altered world has made us violently aware of its latent problems, showing itself in its complexity between ambiguities and dichotomies, requiring us to survive the recognition of problems, weaknesses and the need to establish a constant interdisciplinary dialogue, not of unilateral advancement, but of coaching and sharing, in a non-additional but multiplicative perspective, where the center is the human dimension through the recognition of the democratic value of social inclusion and sustainable growth.
"Green is the New Black" says Tamsin Blanchard, provided however that it is not a greenwashing as the design in all scales can no longer be resolved in a functionalist perspective or in pure empty aesthetics but must emerge and give concreteness to the needs sustainable and responsible development. Turning to the past is not to be understood in the sense of "retrotopia", which the philosopher Zygmund Bauman uses to explain the nostalgia for the lost times of a mythicized past in the face of an uncertain and catastrophic future, but in terms of know-how that arises from a reflection on the flows of interdisciplinary knowledge exchange to encourage a change that has solid roots and is not at the mercy of the "temporary" but which is a turning point with respect to the world lived up to now.
In the document published by the ADI (Association for Industrial Design) "DESIGN memorandum 2.0" it is highlighted that already in the small-scale design project, multidisciplinarity is a fundamental element for the creation of value that summarizes "the proposal of a territory , skills, shared aspirations on which to build a personal and responsible itinerary "... .." As in the metaphor of the archipelago, the islands represent as many conceptual landing places from which to draw and leave experience, the sea represents the work of connection and synthesis
of the designer, it is the connective element that facilitates the transmigration of knowledge. Sharing an attitude capable of understanding personal and collective responsibility is the only guarantee of success for a concrete development of human living conditions ".
The thematic exhibition "Broken Nature: Design Takes on Human Survival" which took place in the pre-covid era is an example of how to deal with contemporaneity trying to look ahead. Starting from the awareness of the aggressiveness with which our species has tried in vain to prevail over nature, we try to give an answer to living species and to reconstruct, mend this relationship, compromised over the years between man and the natural environment, through the project at various scales of architecture and design.
“The XXII Triennale di Milano, Broken Nature: Design Takes on Human Survival, highlights the concept of restorative design and studies the state of the threads that connect humans to their natural environments—some frayed, others altogether severed. In exploring architecture and design objects and concepts at all scales and in all materials, Broken Nature celebrates design’s ability to offer powerful insight into the key issues of our age, moving beyond pious deference and inconclusive anxiety. By turning its attention to human existence and persistence, the XXII Triennale will promote the importance of creative practices in surveying our species’ bonds with the complex systems in the world, and designing reparations when necessary, through objects, concepts, and new systems. Even to those who believe that the human species is inevitably going to become extinct at some point in the (near? far?) future, design presents the means to plan a more elegant ending. It can ensure that the next dominant species will remember us with a modicum of respect: as dignified and caring, if not intelligent, beings” (http://www.brokennature.org)

The 23rd International Exhibition “Unknown Unknowns” scheduled from May 20 - November 20, 2022, will try to give a further response in the international arena through an interdisciplinary dialogue. Starting from the awareness that the dimension of the unknown is infinite and that therefore there is a series of phenomena that man does not know, he must not necessarily aspire to cognitive conquest, but aware of his own limits, through the relationship with culture and innovation. , through creativity he can try to coexist in a new dimension.
The construction of new scenarios in a multidisciplinary and international context, according to a multiplicity of points of view, perspectives, expectations and needs, starts from a reflection on the habitat in which biodiversity acquires a fundamental value in the design of the space and in the relationship of this with the other living species that inhabit the earth and with nature. Just think how during the lookdown, a period in which we were absent from public spaces, we witnessed a progressive recovery of this space by different species of non-domestic animals.
"The modern city with the distribution of work and free time is already anachronistic today, often the residences coincide with the workplace, the times of the city could be changed and those chronologically simultaneous forms of commuting could be avoided that make cities a place of risk. The office there will be far fewer places with individual workspaces, more and more jobs where people meet to share work experiences that are conducted individually, tendency to have more open spaces, balconies and terraces, rooms with ambivalent functions, trends that are being generated and are a challenge "(Stefano Boeri 2021)
"The pandemic teaches us that we must go back to designing to regenerate" (Maurizio Carta 2020) the crisis has shown us that it is necessary to imagine a project that abandons the functional separatism of the living machine and the idea of the polarization of development in favor of an inclusive society and a dialogue between different cultures, where the sharing of knowledge and expertise represent a strength in a dimension of relationship and exchange.
The attracting power of the city in the past was configured as linked to large crowds gatherers such as large general markets or shopping centers, but precisely being places of congestion and pollution caused them to spread the contagion. In the wake of the proposal by Anne Hidalgo, Mayor of Paris, the city of fifteen minutes contrasts with the crisis attributable to functional, economic and social dyscrasias (Fistola 2011). "A city that has a neighborhood life returns to being a city that functions as an archipelago of villages, where you can rebuild a community relationship and where you can take advantage of an opportunity for decongestion, a possibility and an improvement" (Stefano Boeri 2021). As a connector of the urban fabric, "the centrality of the neighborhood as a microcosm that children and young people identify as a primary form of identity and social life is important: it is often within reach by bicycle, simpler and closer than the city center, surrounds and brings together friends, family, school and sport.
The neighborhood thus becomes educating and a frame of meaning, a fascinating space full of functions and memories: from commercial activities and services that mark its geography, to the stories of grandparents who expand them over time and space. A place where the strength of the community emerges, which is constantly found and regenerated in it. Almost a city within a city, the neighborhood often represents the living environment, determines the coming-of-age novel of its youngest inhabitants who here consolidate, experience and build their first feelings of belonging and a sense of being a community "(Carla Rinaldi, Abitare the country) . Polycentric cities rooted in the territory as planning communities. “If you don't accept the changes of your time, maybe you will take the worst part” Voltaire
In the "Cities Policy Responses" report (2020), the OECD states that "COVID-19 has accelerated the transition to a new urban paradigm towards inclusive, green and intelligent cities"

3. Best practices

A virtuous example of the circular economy with repercussions in the local area is the project of the entrepreneur Brunello Cucinelli who decided to create his business in a village near Perugia, Solomeo.
This small village has rediscovered the ancient beauty, an ecological beauty thanks to an economy on a human scale that has produced an increase in the value chain, has recovered the value of memory and restored its ancient splendor in 30 years of restoration that concerned the new construction of a theater and a public space, the arrangement of the streets, the square and the castle and some houses, thus creating an example to imitate and just as the theory of "Broken Windows" claims spontaneously the care of details has spread like a contagion, like protemporary custodians of a place that they try to embellish to improve people's lives.
"Beauty does not make revolutions but sometimes revolutions need beauty". (A. Camus)
The inclusion of the entrepreneurial fabric in the local community through taking root in the territory was based on the enhancement of one of the many craft activities that characterize Italian history, making it an international success thanks to the narration of the identity of the place, of the genius loci, of the centuries-old art of manufacturing tradition, style and people all inside an object.

"An artisanal product when imbued with identity can compete and win in the globalized market, the world comes here and brings with it a piece of ancient tradition made in modern times, all in the shadow of the village without having to go far"
When asked if you can work in a village, which are posed by several entrepreneurs all over the world, like about fifty Japanese industrialists, BC replies yes because there is internet, "it is easier to go to work and park the car because we are connected, and working in a village does not involve any disadvantages "but it improves the quality of life, this experience can be replicated anywhere in the world because we are connected.
A village has come back to life thanks to a job that restores pride and dignity and allows you to no longer have to leave but to return to the homes of the fathers thanks to the recovery of ancient professions that young people return to learn thanks to the institution in the village of a school of tailoring and tailoring to resume a profession that was disappearing and that instead is handed down from generation to generation, ancient crafts that have taken the place of those of the industries that had left rubble and abandoned warehouses that BC has transformed into vineyards and hills designed by artists, "nature, landscape and harmony"
We use the most innovative technologies available but make a gentle use of them, we try to move as if we were humanist artisans, we must start from the joy of life, from esteem, from humanity, because perhaps the great theme of life is to have respect for people. others, especially those who are a little further away in your thinking.
In a sort of humanistic capitalism, Brunello Cucinelli faces the great challenge of producing profit, just growth with human dignity (working eight hours a day, not being connected on Saturdays and Sundays and having a fair remuneration) dignity, respect, humanity . Marcus Aurelius says: "humankind, give yourself peace". (...)
"The Work, the care of the mind, the soul because we need to find ourselves together.
Govern technology so that it does not steal our soul, we need to return to having respect for the human being, respect for his nature and his culture, we need certainty, fairness and esteem because technology has changed something but not human feeling, we need to mix mind and soul.
We need to smile, to esteem ourselves, to compare ourselves and not to judge ".
This is an example of how the project is placed in terms of cultural mediator of a territory, transmits culture, the artisan culture and through the production, ethically oriented, perfectly interprets what is assumed.

4. Conclusions

If we consider Goal 11 of the 2030 Agenda "Making cities and settlements human, inclusive, safe, long-lasting and sustainable" we consider that currently over half of the world's population lives in cities and it is estimated that in 2030 six out of ten people will live in metropolises ; in Europe the urban population is close to 70% of the total and by virtue of this there will be an intensification of the housing problem. From 2014 to today, if we consider the precarious housing conditions, 30% of the urban population lived in slums and in precarious conditions, a percentage that rises to 55% in sub-Saharan Africa. The unplanned growth of cities has resulted in + 5.7% per capita carbon dioxide emissions for every 10% increase in urban population, + 9.6% in fine dust pollution and also the management of municipal solid waste is a growing problem in densely populated areas; in 2014, about half of the population was exposed to pollution values 2.5 times higher than those indicated by the WHO. Target 11.4: strengthen commitments to protect and safeguard the world's cultural and natural heritage (1052 sites and 165 nations). In Italy there are 53 Unesco sites, Italy has the largest number of Unesco World Heritage sites and countless villages that make up the "nervous system of our country" (Anna Laura Orrico 2020).
In the world, more than half of the world's population lives in cities, Raf Tuts of UN HABITAT (the United Nations program for human settlements, whose task is to promote socially and environmentally sustainable urbanization, as well as guaranteeing everyone the right to have a dignified home; in an interview to the question: The goal is to create inclusive, safe, resilient and sustainable cities. What does it mean? He replies: "Starting with inclusion is basically the concept: we should not leave anyone behind the entire 2030 Agenda is supporting it. This means involving people in the decisions that will influence their future, their urban future, but also enhancing access to services for all citizens. The stable elements deal with "physical" security, fighting crime and creating safe public spaces in cities. Elasticity is a broad concept that is reflected in the ability of a city to recover from a disaster. po an economic crisis, while sustainability is a concept that not only focuses on the economic aspects of urban development, but also takes into account the social and environmental dimensions when designing urban development.
While 30% of the world's urban population lives in slums, in Italian cities 10.4% of the population is in poor housing conditions. (ASviS website - Goal 11)

Considering what was estimated by the ASviS analysis, it can be safely said that the entire Italian national territory is a heritage of humanity that must be preserved and handed down to future generations.
Here is the list of Italian world heritage sites:
• 1979 Rock Art of the Camonica Valley
• 1980 (and 1990) Historic center of Rome, the extraterritorial properties of the Holy See in the city and San Paolo fuori le Mura
• 1980 The Dominican church and convent of Santa Maria delle Grazie and Leonardo da Vinci's 'Last Supper'
• 1982 Historic center of Florence
• 1987 Venice and its Lagoon
• 1987 Piazza del Duomo in Pisa
• 1990 Historic Center of San Gimignano
• 1993 The Sassi and the Park of the Rupestrian Churches of Matera
• 1994 The city of Vicenza and the Palladian villas in Veneto
• 1995 Historic center of Siena
• 1995 Historical center of Naples
• 1995 Crespi d'Adda
• 1995 Ferrara, city of the Renaissance, and the Po Delta
• 1996 Castel del Monte
• 1996 Trulli of Alberobello
• 1996 Early Christian monuments of Ravenna
• 1996 Historic center of Pienza
• 1997 Archaeological areas of Pompeii, Herculaneum and Torre Annunziata
• 1997 The Royal Palace of Caserta of the XVIII century with the Park, the Vanvitellian Aqueduct and the San Leucio Complex
• 1997 Amalfi Coast
• 1997 Modena: Cathedral, Civic Tower and Piazza Grande
• 1997 Portovenere, Cinque Terre and Islands (Palmaria, Tino and Tinetto)
• 1997 Savoy residences
• 1997 Su Nuraxi di Barumini
• 1997 Archaeological Area of Agrigento
• 1997 Piazza Armerina, the Roman villa of the Casale
• 1997 The Botanical Garden of Padua
• 1998 Archaeological area and Patriarchal Basilica of Aquileia
• 1998 Historic Center of Urbino
• 1998 National Park of Cilento and Vallo di Diano, with the archaeological sites of Paestum, Velia and the Certosa di Padula
• 1999 Villa Adriana (Tivoli)
• 2000 Aeolian Islands
• 2000 Assisi, The Basilica of San Francesco and other Franciscan sites
• 2000 City of Verona
• 2001 Villa d'Este (Tivoli)
• 2002 The late Baroque cities of the Val di Noto (south-eastern Sicily)
• 2003 Sacri Monti of Piedmont and Lombardy
• 2004 Etruscan Necropolis of Cerveteri and Tarquinia
• 2004 Val d'Orcia
• 2005 Syracuse and the rock necropolis of Pantalica
• 2006 Genoa, the Strade Nuove and the Palazzi dei Rolli system
• 2008 Mantua and Sabbioneta
• 2008 The Rhaetian Railway in the Albula and Bernina Landscapes
• 2009 Dolomites
• 2010 Monte San Giorgio
• 2011 The Lombards in Italy. Places of power
• 2011 Prehistoric pile dwellings in the Alps
• 2013 Medici villas and gardens in Tuscany
• 2013 Mount Etna
• 2014 Wine landscapes of Piedmont: Langhe-Roero and Monferrato
• 2015 Arab-Norman Palermo and the cathedrals of Cefalù and Monreale
• 2017 Venetian defense works of the 16th and 17th centuries. State of Land-Western Sea State (transnational asset, for Italy Peschiera, Bergamo, Palmanova)

• 2017 Ancient primordial beech forests of the Carpathians and other regions of Europe (transnational asset, for Italy National Park Lazio, Abruzzo and Molise, Sasso Fratino, Monte Raschio, Foresta Umbra, Cozzo Ferriero, Monte Cimino)
• 2018 Ivrea, an industrial city of the twentieth century
• 2019 Prosecco hills of Conegliano and Valdobbiadene

In the light of what has been underlined so far, we can speak of the attractiveness of the Italian System as a System of Culture where the driving innovations of the territory can take place thanks to creativity where a polycentric approach favors a multipolar model that sees in the distribution of knowledge and competence a point of strength capable of "guaranteeing greater sustainability and resilience in the event of pandemics" (Claudio Farlasca 2021), of maintaining a relationship with the territories that constitute an element of added value for Italy.

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WORLD HERITAGE and DESIGN for HEALTH
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Le Vie dei Mercanti XIX INTERNATIONAL FORUM
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Centuria Medical And Wellness Park

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Abstract
Centuriation is the soil tracing system used in the Roman world for the division of the lands assigned to settlers of proven Roman or Latin citizenship, sent to guard conquered territories and establish new settlements. From the design point of view, the division of the territory was based on the layout of parallel and perpendicular streets called decumani and cardines.
The decumani were usually arranged either along the main axis of the territory or were parallel to a large communication route. Decumani and cardines were called limites, while the terms decumanus maximus and cardo maximus identified the main axes, wider roads, that crossed at a point which was the ideal centre of the centuriation. The centuratio from an ancient agricultural division of the soil, of Roman origin, becomes a system of "great territorial ordering design", an assumption that inspired the project of the "Centuria Medical and Wellness Park" which was created as a design experiment of a cardo-decuman system of a city of services. A Park for the care and well-being of man, with the pilot project being in the Agro-Aversano, in the province of Caserta, but designed as a repeatable project even under different environmental conditions, adaptable to the shape and characteristics of the places. The idea is inspired by Superstudio's Continuous Monument and exploits the characteristics of the infrastructure for crossing a place, such as an Architectural Viaduct, in the form of a monumental square structure that resemantizes the old route of the Roman centuriation.

Keywords: Centuriation, Continuous Monument, Wellness, Medical

1.

Centuriation is the soil tracing system used in the Roman world for the division of the lands assigned to settlers of proven Roman or Latin citizenship, sent to guard conquered territories and establish new settlements. From the design point of view, the division of the territory was based on the layout of parallel and perpendicular streets called decumani and cardines.
The decumani were usually arranged either along the main axis of the territory or were parallel to a large communication route. Decumani and cardines were called limites, while the terms decumanus maximus and cardo maximus identified the main axes, wider roads, that crossed at a point which was the ideal centre of the centuriation.
The limites were 20 actus distant from each other, about 700 m (the actus is an agricultural unit of measurement and equivalent to about 35 m). Numerous rectangles were set out, called centuriae, which had a side of 20 actus and covered an area of 200 jugers.
The urban agglomerations within the "centurie" grew over time and rather than remaining within the network, they freed themselves and expanded autonomously. Cities resulted from these growth processes, each one with its own individuality, with centuriation regulating the transformation of places as a fictitious physical limit and determined the ways of agrarian organization, conditioning the development of inhabited centres for the future.
An analysis of the still legible traces of the agrarian subdivision made by the Roman surveyors allows to bring out the surveying grid of the area in question which is still evident and

typographically measurable. The constant distance from the perpendicularly intersected roads is tangible proof of the limitatio agrorum, with this approach being indispensable whatever the site, given that almost all the Italian territories were built on Roman tracks.
The centuratio from an ancient agricultural division of the soil, of Roman origin, becomes a system of “great territorial ordering design”, an assumption that inspired the project of the “Centuria Wellness Park” which was created as a design experiment of a cardo-decuman system of a city of services. A Park for the care and well-being of man, with the pilot project being in the Agro-Aversano, in the province of Caserta, but designed as a repeatable project even under different environmental conditions, adaptable to the shape and characteristics of the places. The idea is inspired by Superstudio’s Continuous Monument and exploits the characteristics of the infrastructure for crossing a place, such as an Architectural Viaduct, in the form of a monumental square structure that resemantizes the old route of the Roman centuriation.
This territorial architecture with its infrastructural features is incorporated together with the agricultural traces that still survive on that part of the territory, creating a tension between new signs, stratifications and infrastructures that together draw the local landscape, constituting an unprecedented image of a built landscape. Here the architectural dimension contaminates nature with Cartesian spaces, highlighting all its figurative and evocative potential.
The various functions of the wellness park include: a medical centre, a university campus, a centre for children with autism, a centre for social reintegration, a fitness centre, a farmhouse and a hippotherapy centre. The system is designed in such a way that it can be fully enjoyed in all its functions by walking through it or using the driveways which are then connected to the main fast communication routes.
The aforementioned functions are all united in the design approach based on the “void”, on the concept of the container in which suspended volumes are interspersed that contain multiple functions, the spaces are designed without binding elements in order to make the environments as flexible as possible. The part relating to the connective plays a fundamental role from the point of view of the architectural elements, vertical and horizontal paths are designed to always provide a sensory experience, not simple connecting tools but paths that stimulate emotions and suggestive points of view. The connecting spaces act as catalysts for social interaction and for the waiting of the users of the structures.
The entire project develops along the traces of the cardines and decumani and can be extended without precise limits but with the constant width of 20 metres. The various function blocks, designed with variations on the theme, are united by the intention of providing an unprecedented way to enjoy a public space, appreciating its spatial and architectural qualities and promoting a peaceful interaction with the surrounding environment.



Fig. 1: intervention area with centuriation

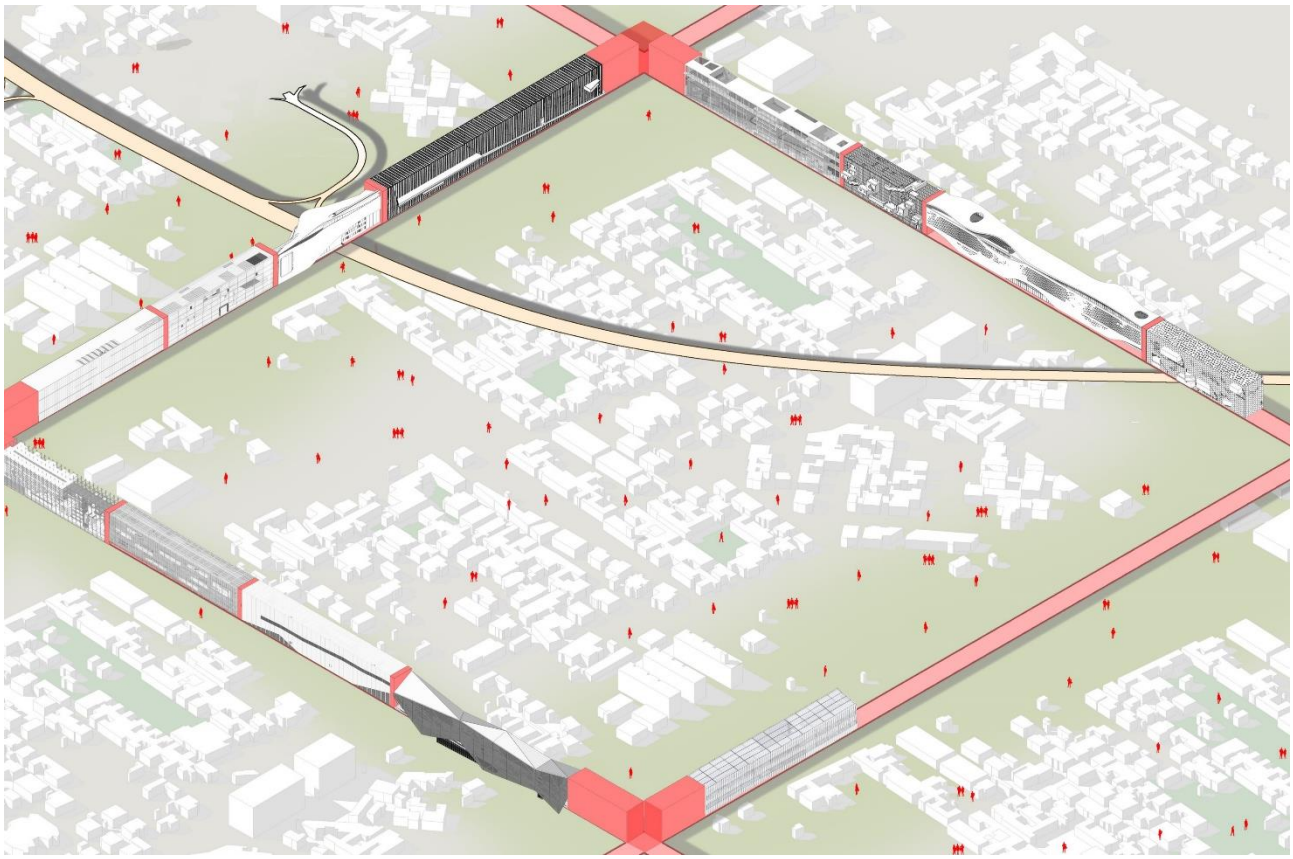

Fig. 2: Masterplan

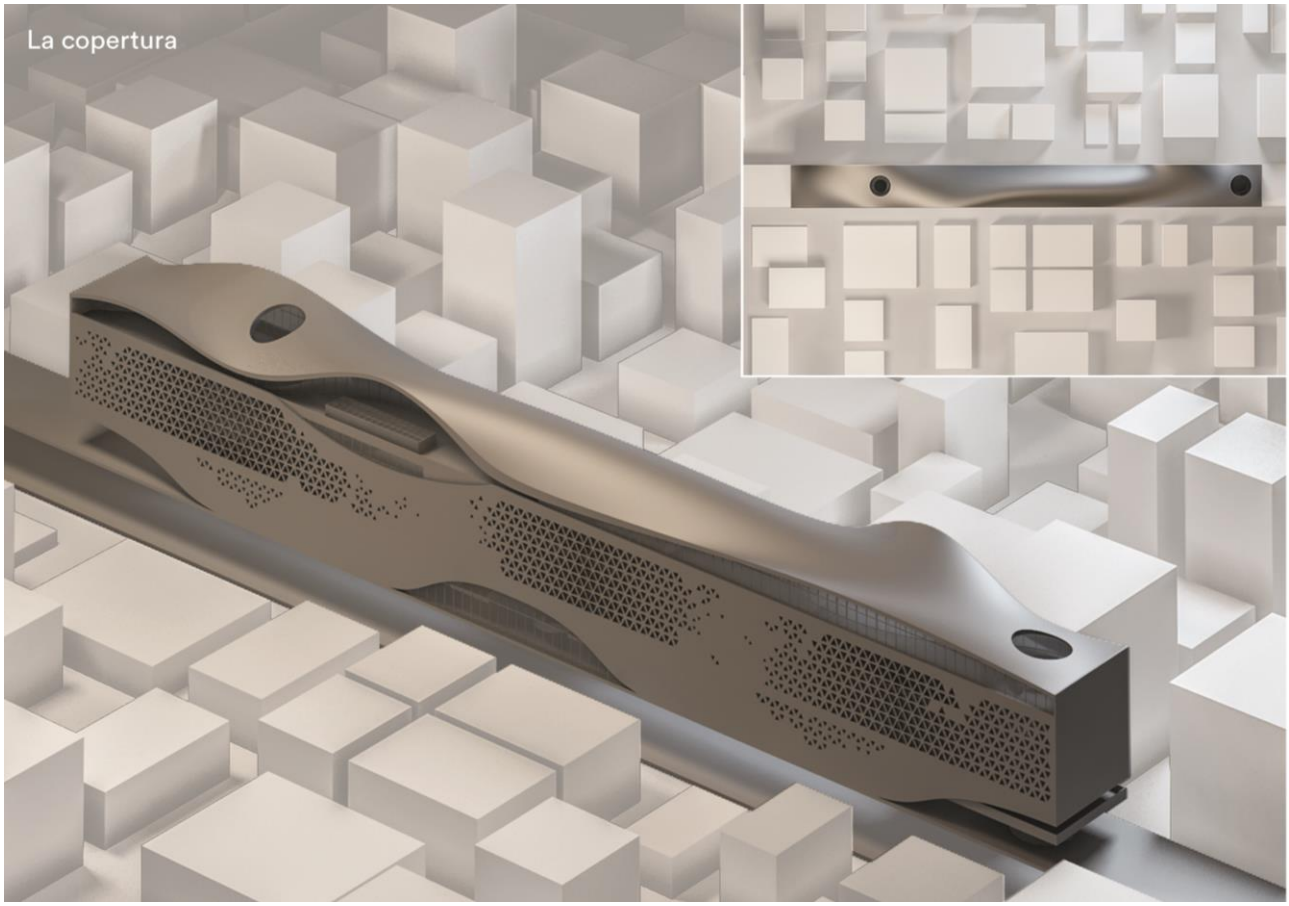

Fig. 3: Wellness and Fitness Centre - 3d

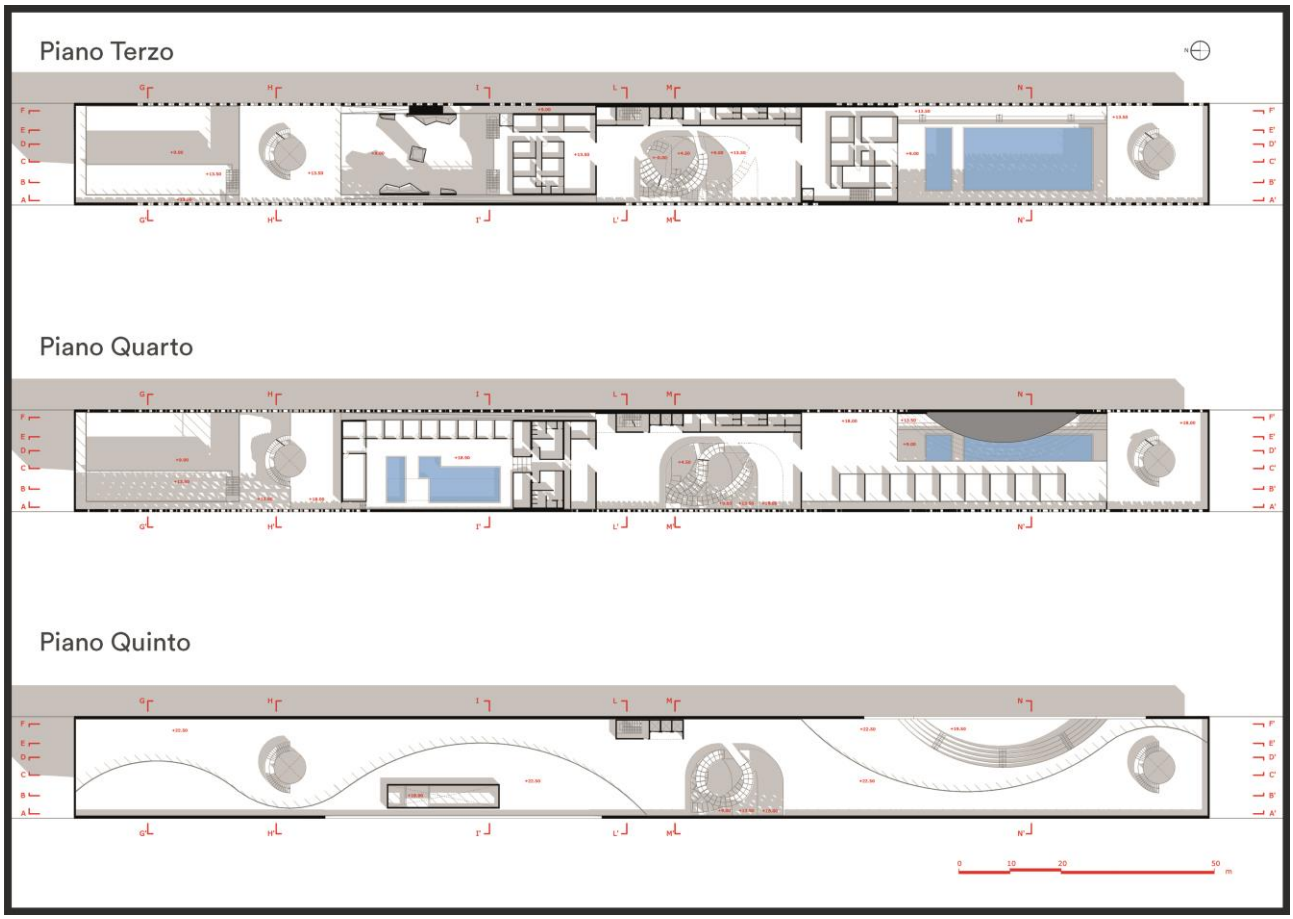

Fig. 4: Wellness and Fitness Centre - Floor plans

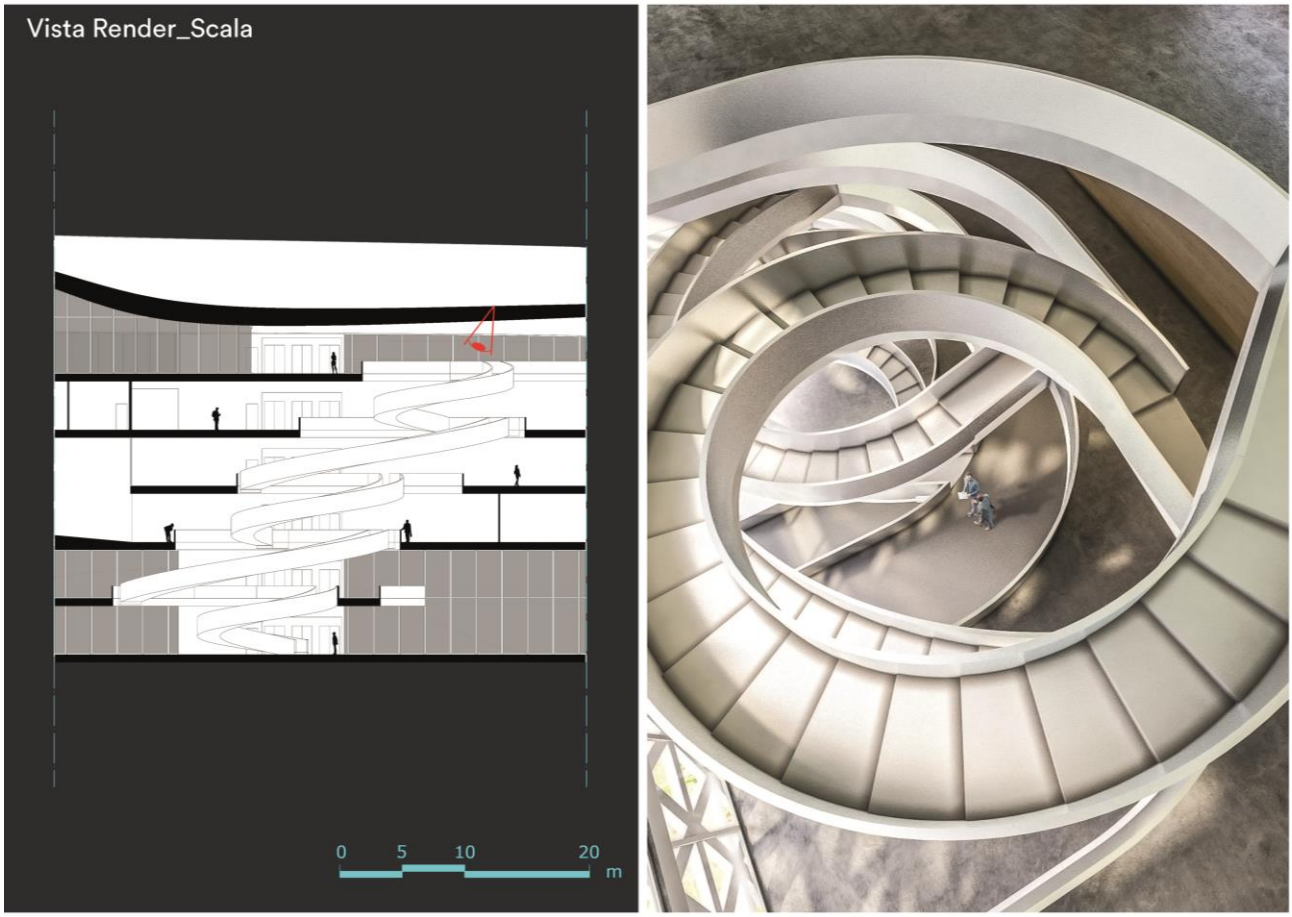

Fig. 5: Wellness and Fitness Centre - Staircase detail

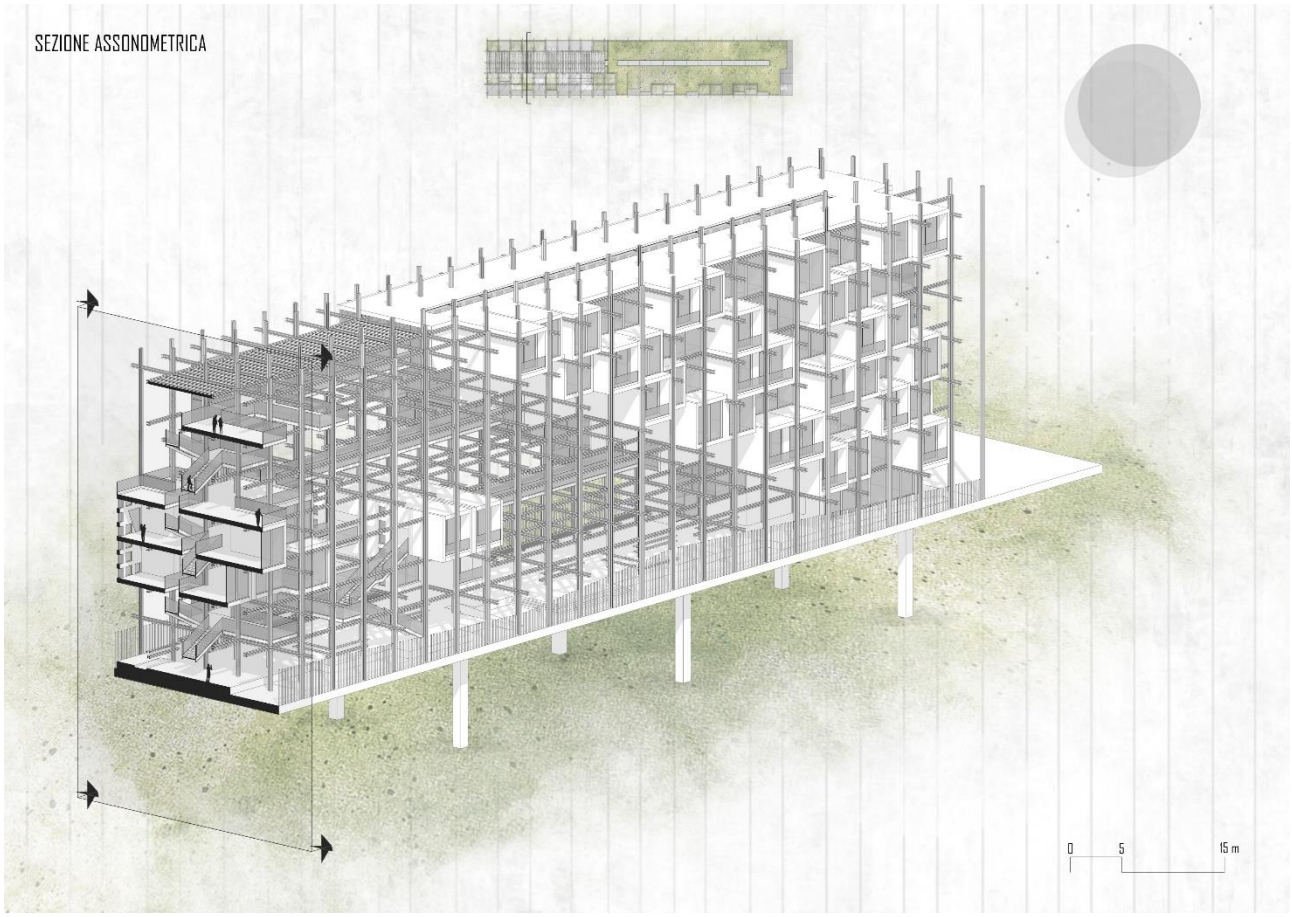

Fig. 6: Health Residences



Fig. 7: Health Residences - Detail of the facade



Fig. 8: Health Residences - Connection spaces



Fig. 9: Health Residences - Connection spaces

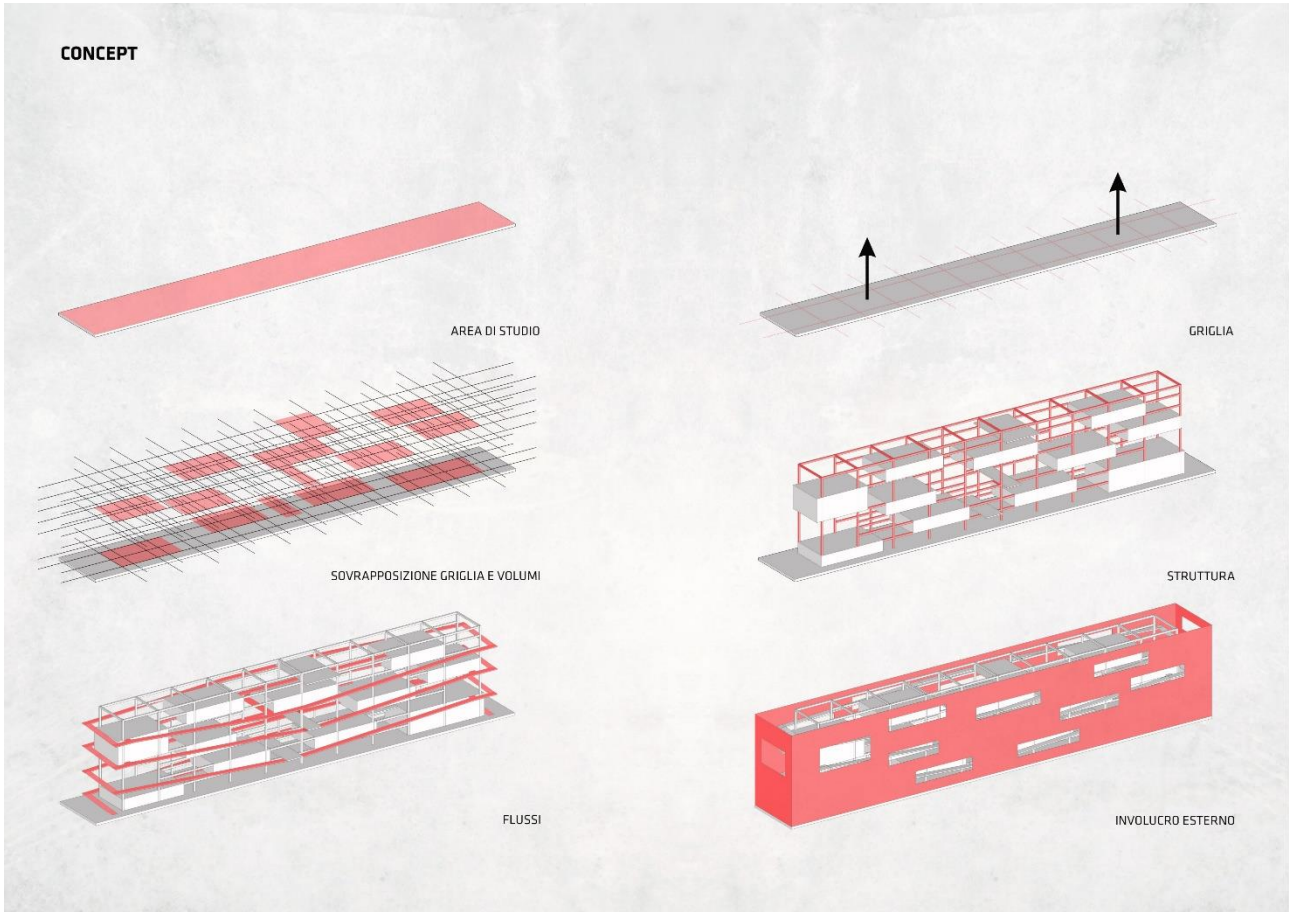

Fig. 10: Rehabilitation Center - Concept

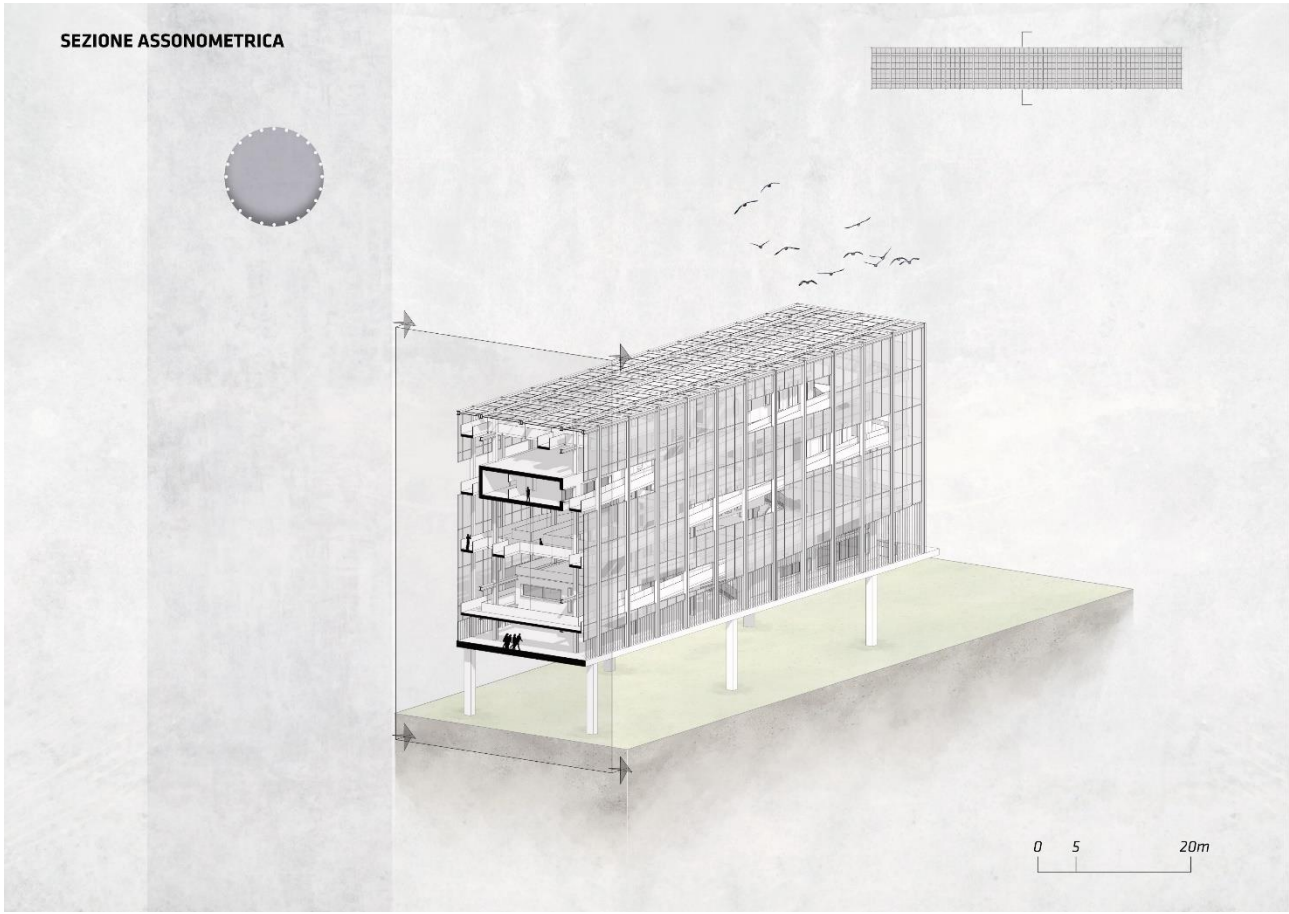

Fig. 11: Rehabilitation Center - Axonometric section



Fig. 12: Rehabilitation Center - Connection spaces



Fig. 13: Rehabilitation Center - Connection spaces



Fig. 14: Rehabilitation Center - Therapy room

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Multimedia experiences for inclusive communication of archaeological heritage

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Abstract
The museums, sites and collections closed due to Covid-19 have highlighted the importance of heritage not only for cultural learning but also for the well-being of people. The impact of the Pandemic on cultural heritage and on archaeological heritage in particular, offers an opportunity to reflect on the effectiveness of communication systems. The accessibility of archaeological heritage is particularly complex, and the visit is a key element of its use.
However, it has to be said that archaeological sites and museums have long been a privileged field of experimentation with multimedia products and digital reconstructions. These, however, were only proposed and integrated into the visit itinerary or used in cases of particular interest and exceptionality for mass dissemination purposes.
The pandemic has made it essential to rethink the way in which the cultural content of heritage is constructed, shared and enjoyed. Digital technologies have proved indispensable to create new virtual spaces in which cultural sharing, even if not enjoyed, continues to be alive and engaging.
The paper aims to analyze what has been done by archaeological sites and museum institutions by comparing the different experiences and analyzing the changes between before and post lockdown. The analysis will examine the communication tools used but, above all, the contents transmitted, focusing on multimedia digitalization as an indispensable tool for inclusive communication.

Keywords: Archaeological heritage, inclusive communication, virtual accessibility, Pandemia

1. Introduction
During periods of deep crisis, processes that may already be latent are usually accelerated, spreading and strengthening in a sudden and sometimes impetuous way, changing scenarios and creating new opportunities. This is the case of the historical moment in which we are living, due to the lockdown, in the field of cultural heritage management and enhancement there has been a rapid and significant increase in digitalization. In order to keep alive and dynamic the link between visitors and cultural heritage, made inaccessible by the coronavirus emergency, more than 60% of the world's museums have strengthened their remote visibility. According to a survey by the Network of European Museum Organisations, this action is taking place especially on social platforms (80% on Facebook and 20% on Instagram), with an increase in online visits of 40% [1].
Italian museums have also been following this trend. According to a study on the visitor experience on a sample of 430 Italian museums, archaeological sites and monuments [by the Osservatorio Innovazione Digitale nei Beni e Attività Culturali of the School of Management of the Politecnico di Milano] 76% of them have at least one profile on social networks, with Facebook being the most popular (76%), followed by Instagram (45%, compared to 26% the previous year) and finally by the most recent TikTok. While 85% of the museums have a website related to the individual institution or are present on other websites, such as that of the municipality, only 24% have a strategic plan for digital innovation.
Although very often museums have both a website and a social account, few of them have a digital catalogue of their heritage and even less of them offer a virtual tour or interactive tools such as video games to stimulate curiosity and prepare for the visit.

"If with open museums, digital technology was a complement to the visitor experience, with the closure of cultural institutions, digital technology has become a necessary tool for offering cultural content. This has inevitably led to a different use of the online channel, first and foremost social media, but also websites, which have gone from being tools for communication and preparation for the visit, as they were until now, to tools for the actual delivery of content," said the Observatory's scientific director [2].
For many museums and archaeological sites, the Google arts&culture experience has represented a first step in the field of digitisation. The aim of the project, which started in 2011 as a high-definition collection of works of art exhibited in the world's major museums, is to provide a virtual tour. The project in most cases only provides the possibility to move around the collections with an exploration exploiting the technology used by Street View. The material uploaded from all over the world can be found through different search keys: categories, date, means of expression, artists and collection to which are added thematic insights, artistic movements, events and historical figures. The primary aim is to offer visibility to museums, foundations, organisations and theatres, also through the function of geographic localization of places. The contents, although set out in a common structure, are very heterogeneous.
However, the discovery of places for travellers and Internet users is very limited, both in terms of the possibility of finding one's way around physical places and the organisation of content, especially for users with different needs. The richness of the database has however made it a valuable tool during the lockdown, both for the use of content and as an experience from which to build new communication projects and public involvement. Although not generalised, the project is considered to have represented a starting point to digitisation. Among the few Italian sites that have joined the project we find some of the museums considered of interest for the present work. For others, however, digitisation was the result of a different experience; it should be stressed, however, that the contents presented online are still unstructured products, organised in an extemporary way reusing material prepared for different purposes, without any programmatic action either in the choice of contents or in the identification of the most appropriate technological instrumentation for its administration. It is also important to note that very often museums do not have the possibility of employing specialised staff with digital skills.
This situation of digital insecurity was accentuated during the lockdown. Although on the days of the lockdown many museums increased the offer on their websites and social channels in order not to interrupt the relationship with their audience, very often the online initiatives were carried out without a precise communication plan.
The resulting response from visitors reflects the different levels of museum offerings. On the one hand, large museums such as the Uffizi [3] have seen an exponential increase in the number of online users with a rich and articulated offer, created ad hoc for remote use, while in other cases the response from the public has been modest and disengaged. This is the particular case of museums and archaeological sites, which, according to the data of a survey commissioned by Impresa Cultura Italia-Confcommercio to analyse "cultural spending" during Covid closures, were poorly visited (flop of virtual visits to museums and archaeological sites: only 4% have made a full virtual visit, 28% did not know of their existence and 51% knew but did not use them) [4].
In order to provide an organic response to this increasingly pressing need, the Mibact has presented a specific plan for the digitisation of heritage worth around 2.5 billion, using Next Generation EU funds. At the same time, as declared by Dario Franceschini, Minister for Cultural Heritage, other funds have been allocated for a public digital platform, "the Netflix of culture", through which the entire cultural offer of our country can be presented in Italy and worldwide.

2. Case study

In this situation, those museums or archaeological sites that were already technologically equipped before the pandemic and already had the possibility to offer visitors virtual tours were certainly at an advantage compared to others.
An example of this is the MAV, the Virtual Archaeological Museum of Herculaneum [5], a young museum, which was created 12 years ago not far from the archaeological excavations of ancient Herculaneum. Thanks to its laboratory of technology applied to Cultural Heritage and communication, considered among the most avant-garde in Italy, since the end of 2019 it has already proposed a virtual journey into the life of the main archaeological areas of Pompeii, Herculaneum, Baia, Stabia and Capri. Today, its MAV 5.0 - Virtual multiReality can also be viewed remotely, allowing a complete fruition of the museum offer in a double weekly appointment. In fact, an interactive Virtual Tour of the museum is offered, accessible on the ZOOM platform, for school groups, adult groups or individuals, supported by a guide who, interacting with digital visitors, can accompany them in their discovery of the past by answering questions and curiosities live.



Fig. 1: Three-dimensional reconstructions of the Roman villas in the Gulf of Naples for the virtual tour proposed by the MAV.

The guided tour, also available in English and French, lasts between 60 and 90 minutes and includes films, images and virtual reconstructions created not only to get to know the ancient Roman cities before the devastating and tragic eruption of 79 AD, but also to understand the daily life of their inhabitants.
Although it is not a complete immersive experience as could be enjoyed by visiting the archaeological remains and the MAV live in parallel, it is still an effective means of reaching thousands of users around the world.
One of the museums whose exhibition design uses "les dernières technologies, pour appréhender de manière ludique et guider au mieux les visiteurs" is the Musée de la Romanité in Nimes. Opened in 2018, it is the result of a successful mediation operation between archaeology and virtual reality. This has allowed the museum to find itself at an advantage at this time of pandemic and, in anticipation of reopening its doors to the public, it has made available a 360° virtual tour, accessible from computers, tablets and smartphones, to walk through its museum rooms in a vivid, immersive and diverse way. The tour, divided into six sections, allows visitors to admire some of the 5,000 archaeological artefacts and objects on display, which, alternating with models, videos, real and virtual reconstructions, make for a spectacular journey through Roman history.
By alternating complete panoramas, in-depth studies of some of the works, spectacular views and specific comments by museum staff that materialise along the way, the tour becomes a formidable means of accessing the museum's contents for the most distant visitors, responding to the demand to make culture more accessible to all. In addition, the digital tour aims to encourage the creation of specific didactic contents, adaptable to the educational path of the school public. As the museum director says “A long terme, ces objectifs pédagogiques seront repris à des fins touristiques: encourager, grâce à un outil consultable dans le monde entier, un public éloigné à se rendre au musée.La virtualisation permet à des publics de découvrir le musée et déclencher l'envie de venir le visiter. Elle valorise l'emplacement face aux Arènes et au cœur du patrimoine, fait découvrir la beauté du lieu, le geste architectural, permet de se rendre compte de la richesse des collections et des savoirs qu'offre le musée et met en valeur l'articulation du patrimoine avec le territoire” [6].

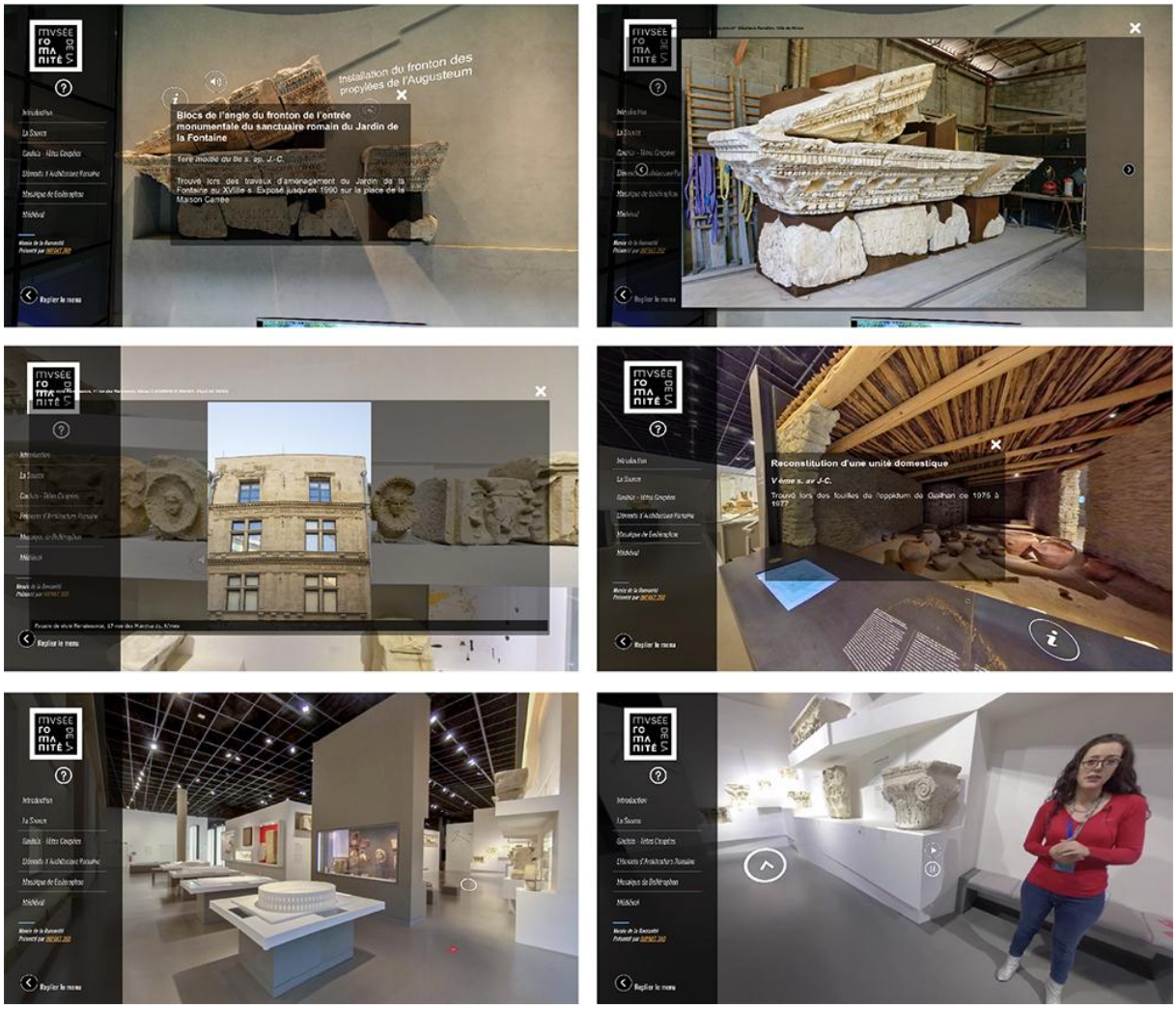

Fig. 2: Virtual reality and archaeology offered by digital tour in the Musée de la Romanité in Nimes.

With the aim of maintaining contact in particular with children and young people who, because of the pandemic, have seen since last spring the blocking of all trips and cultural initiatives planned by and for schools, many museums are proposing new projects of remote educational visits using the new digital technologies.

This is the case of the Fondazione Aquileia [7] which, together with the Friuli Venezia Giulia Region, is offering primary and secondary schools in the region the opportunity to take advantage of about a hundred online guided tours and a dozen remote workshops, led by an archaeologist, to discover the epigraphist's trade starting from the inscriptions in the Lapidary Galleries of the National Archaeological Museum. Through technology it will be possible to take part in the event "Let's go on a trip to Aquileia with the Talking Map", remote visits conducted by an expert that will allow participating classes to experience, albeit virtually, the experience of a real visit to the UNESCO site of Aquileia, one of the largest cities of the Roman Empire. With the support of the Talking Map, which will be sent to the booked classes, a useful cognitive tool already used in the past for in-person visits, the remote tours will take place with the participation of experts and actors and with the help of multimedia material.

These new ways of disseminating culture do not replace traditional educational trips and guided tours in absolute terms, but propose a reflection on how to do educational tourism in an innovative way, through the use of technology and digitalization. It is hoped that augmented reality and virtual reality courses, used in a complementary manner to the real visit, will continue to be valuable allies in educational tours of cultural heritage, both in the preparation phase and during the actual visit.

Since a few days (March 2021) it has been possible to visit eight of Rome's museums [8] virtually using augmented reality and new multimedia content, with more than 300 rooms and thousands of works, available in both Italian and English. These are online virtual tours of Rome's cultural heritage, also accessible via mobile devices, which have become an indispensable resource in this period of lockdown to allow museums to be visited from a distance.

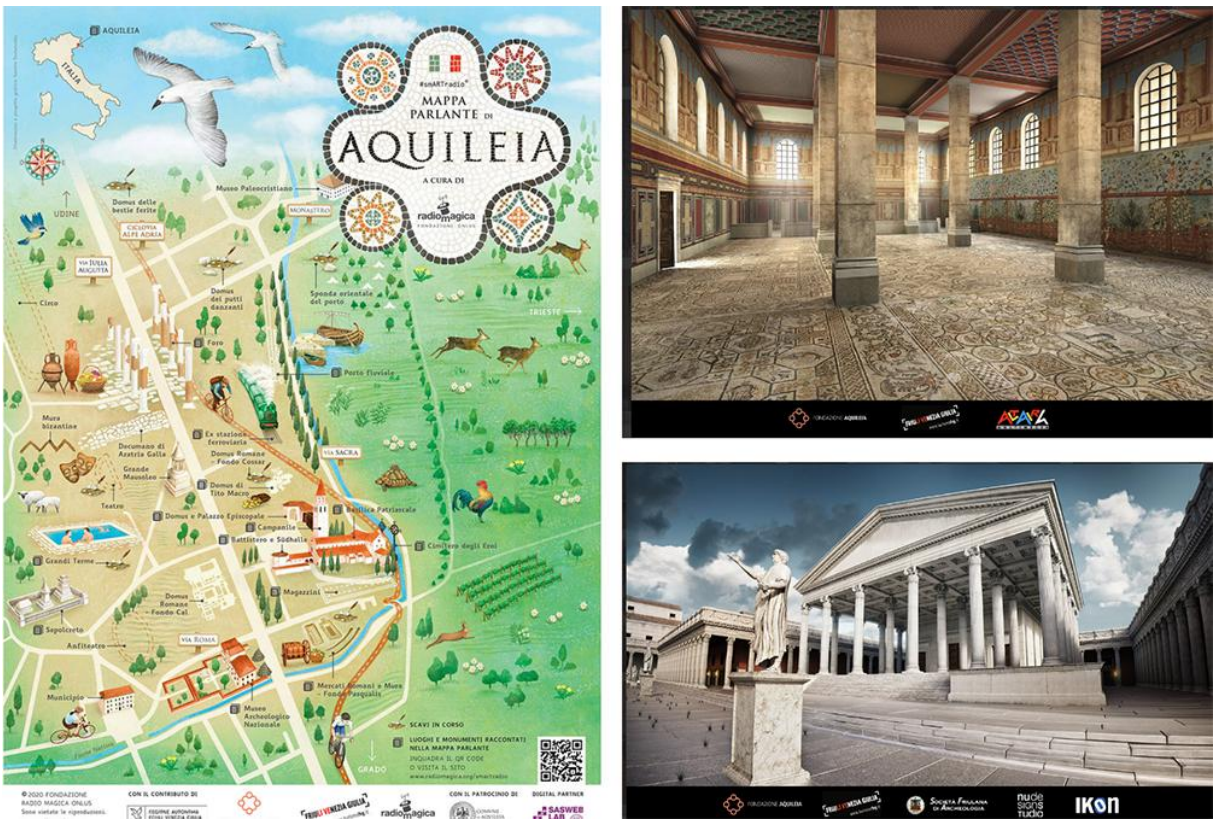

Fig. 3: Multimedia supports for the virtual didactic tourism proposed by the Aquileia Foundation.

By means of new digital capabilities, new multimedia content and new technologies that improve the enjoyment of the visit itself, the tours have been revised, expanded and updated from the previous version, offering the opportunity for highly immersive virtual tours.
Through the use of a more innovative and performing technology, the visit proposal, already present before the pandemic but offered only by some museum sites, (in addition to the Capitoline Museums, Ara Pacis Museum, Napoleonic Museum, Mercati di Traiano - Museum of the Imperial Forums and Casino Nobile of Villa Torlonia, three other museum sites have been added: Centrale Montemartini, Museum of Rome and Museum of the Walls) has been renovated, making it possible to use it from any type of device, including smartphones and tablets, supported by new tools such as special cardboards or VR viewers. The virtual tours, which allow visitors to navigate through almost all of the museum's rooms, are enriched with videos, photo galleries, images that can be navigated using a special control panel to move around the spaces virtually, zooming and rotating through 360°, in-depth information with texts about the rooms and works of art, maps of the routes and finally audio descriptions.
There are numerous animated three-dimensional models that deepen the knowledge of the archaeological sites: from some of the museum rooms it is possible to view, full screen, the videos of the digital reconstructions already used through special monitors in the real visit routes, now also shared online.
There are two tools for quick and easy navigation through the works on display. The first is the Points of Interest section, which lists places and objects that can be viewed without having to travel virtually through the museum, and the second is the "not to be missed" section, where you can find a selection of works and rooms. This tool is very useful and practical for those who do not know the museum and are visiting it for the first time. Thus, by selecting a work on the list, the visitor is virtually transported to the room containing the chosen work. In addition, an 'intelligent map' guides the user throughout the visit, providing a physical yet virtual overview of the places visited, so that they do not get lost in the museum space, pointing out rooms or works not yet displayed.
Finally, the new Virtual Tours of the Centrale Montemartini, the Museum of Rome and the Museum of the Walls, using the latest generation of drones, allow users to view the rooms and artworks from above, offering an additional and unprecedented perspective on the museum and also on the city.

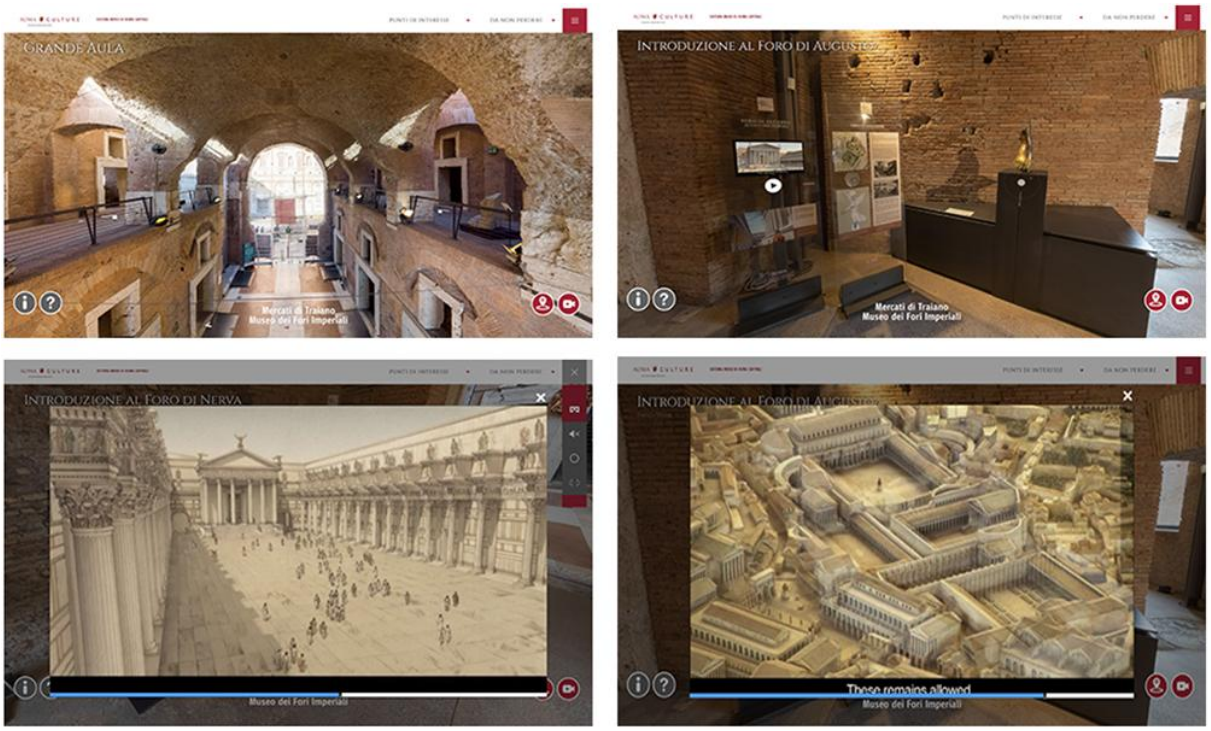

Fig. 4: Augmented reality and new multimedia content at the Imperial Forum Museum in Rome.

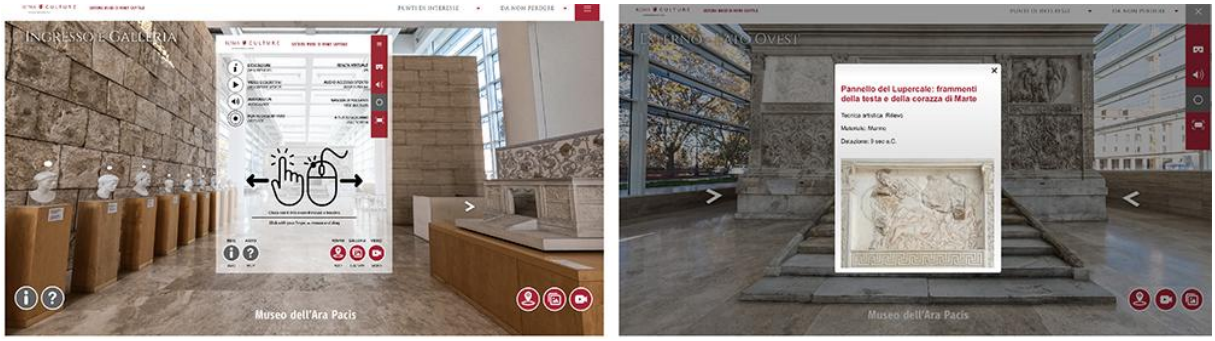

Fig. 5: Virtual tour of the Ara Pacis Museum in Rome accessible from all devices.

The National Etruscan Museum of Villa Giulia [9] has also joined the Mibact's campaign #iorestoacasa, to maintain a dialogue with its public using social channels (Facebook, Instagram, Twitter), its website and the Etruschannel Youtube channel.
The ETRU was one of the few museums that before the pandemic already used technology and social channels as a communication system. During the lockdown, the Facebook and Instagram profiles were always punctually updated and the YouTube channel dedicated to the museum was implemented with engaging content.
The institutional website, which has been made even more accessible to virtual visitors, is full of initiatives, particularly for children, with educational activities and themed games.
As Valentino Nizzo, director of the museum, says, "during this period we have played a lot on irony and amusement as narrative keys, to generate well-being in people connected from home in a difficult situation like last year. Technology has made us horizontal, accessible to people with difficulties and those who live abroad, therefore to those with contingent but also permanent limitations" [10].
The goal is clear: 'museums must welcome, not elevate. It is we cultural operators who have to elevate ourselves to the level of the public in order to convince people to spend their time with us, persuading them that museums are interesting and stimulating places, because here we cure people in the absence of disease'.

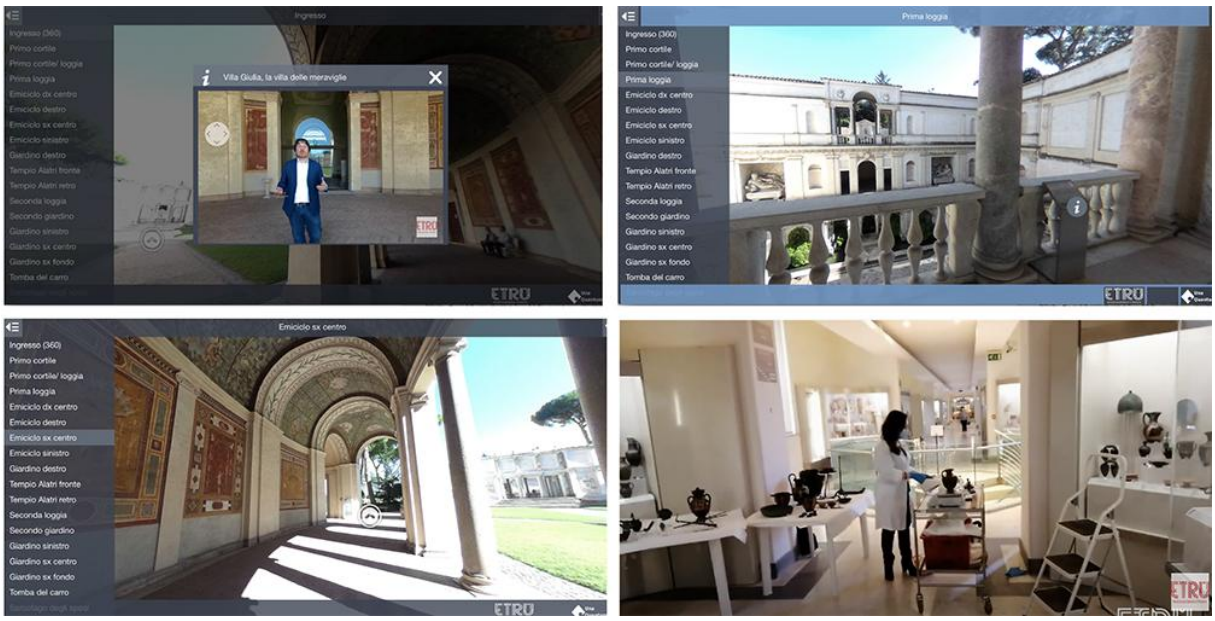

Fig. 6: Virtual tour 360° of the National Etruscan Museum of Villa Giulia in Rome.

In this way, new and specific content has been shared concerning both the works conserved and the place where they are housed, as well as interesting in-depth videos by the Director. The cultural offer is completed by numerous appointments with the restoration, through connections with the museum laboratory, thematic conferences, interviews and book presentations.For some months now, every Tuesday at 12 noon, the museum director has been online for the weekly appointment with "Intervallo Etru", live on the Facebook page to answer questions about the ancient world from the museum's rooms. In addition, a 360° Virtual Tour of the museum has been made available in order to involve visitors in a more immersive way by narrating the cultural heritage preserved through digital means. Finally, the museum collaborated with a specialized company to create "Mi Rasna - Io sono etrusco", a cultural video game for smartphones set in the Etruscan era. This video game also brought the museum and its collection live on a social network dedicated to games (Twitch), dialoguing and answering questions from young people, with the aim of entertaining them by telling them about historical content and inviting them to visit the museums.

3. Conclusion

Although the pandemic situation presented itself as an opportunity to modify and broaden the approach to the digital transmission of content, the current landscape presents solutions in which there has been no rethinking of modes in an inclusive way. However, the crisis can be taken as an opportunity to define new approaches to make sites and museums more accessible.

An example of this is the activities that some museums are initiating to make their contents accessible in view of the approaching period that for schools corresponds to the planning of educational trips. In this sense, the proposals of, for example, the Museo delle Navi in Pisa or the South Tyrol Archaeological Museum - Ötzi are new ways of involving students in the knowledge of museum contents, even if at a distance.

Certainly, the live cultural experience cannot be equated with the distance experience, but it must be said that it may represent a new form of content dissemination which, also in the future, may meet economic and organisational needs which are still critical by expanding the user base of museums and sites to distant audiences.

If the offer of free digital content is certainly not sustainable in the long run, the offer of innovative proposals, even paid ones, opens up new scenarios that provide space for a new way of designing. The lockdown period has shown how the demand for access to cultural content is an important component that requires, however, attention to mediation aimed at inclusion and the definition of diversified proposals according to possible users and their difficulties.

This process requires a careful analysis of needs, and digital accessibility overturns some of the stereotypes linked to accessibility that are still too often associated with the possibility of physically accessing places.

The current lack of physical accessibility to places must therefore make us reflect on the importance of access to content and its mediation, which are substantial and essential aspects for satisfactory use. If the possibility of experiencing spaces physically, actually or virtually, can contribute to the well-being of

individuals, the narration, participation and sharing of content gratifies and strengthens the link with history and our roots. Cultural heritage and the values it embodies are therefore a resource which, by learning from the current situation, may open up in the future to multiple accessible and more inclusive solutions.

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The environment resource and public intervention: Ecological networks and local development. Case study Calabria Region

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Abstract
In the compatible development of the territory of the Calabria Region, an objective of common and specific interest is identified in the protection and sustainable development of protected areas, a meeting ground for qualified activities and initiatives, including economic ones, which contribute decisively to the implementation of the Calabrian ecological network. According to the principles of the natural ecological network, a programming tool aimed at guiding the new territorial governance policy towards the management of development processes, integrated with the environmental specificities of the various areas, this work aims to study the dynamics expressed above which will inevitably lead to significant changes in all aspects, economic and social, as well as the morphological and environmental ones. The ecological network, intended as a territorial infrastructure, connects the different areas, with a bigger presence of naturalness and with a high degree of integration between local communities and natural processes, mending natural quality in our region.

Keywords: ecosystem balance, environmental protection, territorial development

1. Objectives and main arguments

A common objective of interest is identified in the compatible development of the territory of the Calabria Region, and specifically in the protection and sustainable development of Protected Areas, a meeting ground for qualified activities and initiatives, including economic ones, which contribute decisively to the implementation of the Calabrian Ecological Network. Within the principles of the National Ecological Network, a programming tool aimed at orienting the new territorial governance policy towards the management of development processes, integrated with the environmental specificities of the various areas, this work aims to study the dynamics expressed above that they will inevitably lead to significant changes in all aspects, from economic and social ones, as well as to morphological and environmental aspects. The ecological network, understood as a territorial infrastructure, connects the different areas, endowed with a greater presence of naturalness and with a high degree of integration between local communities and natural processes, mending the natural quality in our Region. The general objective is to pursue the conservation of the natural and landscape heritage through the recovery and environmental restoration and the enhancement of forms of social aggregation for the maintenance of the local identity, creating compatible scenarios of use and transformation of the territory and its resources. . Objectives can be represented by three components:

1. the enhancement of immovable resources: creating new opportunities and possibilities for development through the protection and compatible use of cultural, natural and human resources of the lagging areas;

2. building a social environment suitable for development: improving the quality of life in lagging areas; favour the recovery processes of social trust; encourage the offer of innovative and qualified services for people; make institutions, markets and rules more flexible by adapting them to the European context;

3. the creation of conditions for the promotion and localization of new entrepreneurial initiatives: to increase and enhance the attractiveness factors of productive initiatives, linking them to the specificity of places and cultural traditions.

2. The environment resource and public intervention: methodology followed

The development of a regional strategy for biodiversity is part of the commitments undertaken by the Calabria Region. This is why the case studies of Protected Natural Areas, marine reserves, as well as the SPA (special protection areas) and SIC (sites of community importance) areas of Calabria will be studied in depth, comparing the environmental and landscape context with other case studies in Europe and in Italy. Parks, terrestrial and marine reserves, historic centers and more generally the elements of the environmental structure, are the subjects of this policy of attention, aimed at combining the objectives of protection and conservation with those of compatible and lasting development, integrating the economic and social issues of the territories affected by the protected areas, with the overall policy of conservation and enhancement of environmental resources. With reference to strategies, we can refer to protection, in the sense of defending, re-establishing and connecting resources in a balanced network; development, in terms of restructuring and strengthening of weak areas, as well as balance, aligning living and working conditions between areas of different levels. Strategies linked to the creation of skills, the dissemination of knowledge, the strengthening of project skills, linked to the specificities of individual situations and operating in an integrated and systemic vision, acquire an important role.

2.1 The general picture

In the previous programming phases of the Structural Funds for the Calabria Region (1999-2013), the interventions financed under the Environmental Measure were aimed at coping with environmental emergency situations widespread in the area. The objective of the measures was the reduction of pollution phenomena through:

- improving the quality of bathing water;
- the development of separate collection systems for Urban Solid Waste (MSW);
- interventions on situations of environmental degradation;
- the enhancement of areas of environmental value threatened by wild[1] urbanization phenomena

The Regional Operational Program (POR) 2014-2020 marked an important change of perspective in this regard. In fact, in the new POR, it is stated that*: the implementation of socio-economic development strategies that are sustainable from an environmental point of view can, in the new community planning, become the strong point in a region like Calabria which, despite always consistent implemented over the previous years, it preserves natural and environmental emergencies of the highest level[2].*

In this perspective, the value of a real resource for regional development is attributed to the environment. This approach has found expression in the Ecological Network subsector, which has set itself the goal of promoting the integration of development processes with the environmental specificities of the areas concerned. In this way, environmental protection should become not only an integral part of development policies, but also a potential and a resource to be exploited for the purposes of development itself.

2.2 Ecological network and local development

Based on the analysis of the Calabrian territory and the study of experiences made in other Italian and European areas, the research work aims to identify some territorial systems of Calabria particularly suitable for hosting pilot-experiences of integrated development based on environmental

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[2] Calabria Region - Structural Funds 2014-2020, Regional Operational Program, 2013.

enhancement and to provide policy indications for the design and implementation of these experiences. The goal of promoting sustainable forms of socio-economic development linked to the enhancement of environmental resources is one of the institutional purposes of the National and Regional Park Bodies. The National Ecological Network project can make it possible to extend this logic even outside the park areas, in search of development models compatible with the protection of natural resources. As for the content of local development projects in the environmental field, the experience of the park areas shows that the potentially more interesting economic sector is tourism.

3. The Ecological Network in Calabria: the choice of pilot areas

With reference to the framework outlined so far, the intent of the work is therefore to identify some areas with specific potential development, based on the enhancement of natural resources. Specifically, for this area, possible development paths will be indicated, linked to local specificities but which are also able to reconnect to the broader national and European context. The choice of pilot areas was made taking into account several factors:

1. the presence of naturalness;

2. the level of anthropogenic pressure;

3. local development experiences already underway.

The criterion used was to select areas that had a good endowment of valuable natural resources, but that were characterized by different levels of anthropogenic pressure, so as to take into consideration the different types of areas identified by the Ecological Network Project. Among the areas that met these requirements, three, or at least sketched out, have been selected, autonomous development paths based on the enhancement of local resources. As regards the first factor, the presence of naturalness, reference was made to the location of the Bioitaly sites (Natura 2000) in the Calabria Region. The selection was therefore made among the areas considered more interesting both for the extension of the surface affected by Bioitaly sites, and for the presence of particularly important habitats. We also tried to represent habitats of different types (mountain, hilly, marine and river). As regards the level of anthropogenic pressure, it should be emphasized that the problem of enhancing natural and environmental resources does not only concern areas where these resources are still relatively intact, but also those areas where instead the environmental heritage is subjected to pressure and exploitation. This consideration is the basis of the identification within the National Ecological Network project of two territorial areas of reference: marginal areas with under-use of natural resources and areas with over-use. In choosing the pilot areas, this distinction was also taken into account, trying to represent both types of territorial area. Finally, with regard to the third point, in line with the guidelines of the POR 2014-2020, particular attention was paid to those territorial contexts that already present forms of densification of entrepreneurial initiatives (proto-districts) or forms of synergy between local actors for the activation of bottom up development. The joint consideration of these factors has led to the identification of three areas:

a. Area of Lake Tarsia and the mouth of the Crati,

b. The coastal system around Tropea

c. The hilly - coastal area south east of Reggio Calabria.

4. Case studies, comparison and future developments

4.1 The area of Lake Tarsia and the mouth of the Crati. The role of protected areas for teaching and environmental education

4.1.1 The area in detail

The area considered in this case constitutes a marginal part in terms of surface compared to the municipalities considered. In summary, it is the Tarsia dam and the Crati river belt located between the dam itself and the mouth. The fluvial and humid environment, linked to the presence of the Crati river, has so far never been considered as a potential resource for development, other than as a water

resource useful for agriculture. In this case, the value to be linked to the presence of biodiversity, scientific knowledge and environmental education is mainly considered. The analysis, given the lesser importance in terms of the area considered, is dimensioned to an objective which is to identify specific entrepreneurial experiences that can be promoted for the enhancement of the river belt. The sectors of intervention will therefore be both that of naturalistic tourism and that of environmental education.

4.1.2 Naturalistic and historical-cultural aspects

The Crati river constitutes the main watercourse of Calabria, in terms of length and flow of water and contributes to forming the main plain of the region. It differs from the catchment areas of Calabrian waterways, usually narrow and elongated towards the sea. The Crati is one of the few exceptions, with an area of the catchment area exceeding 2000 sq km. At the Casoni di Sibari site, about 35 different species of birds are reported and about 20 in Lake Tarsia. The type of use for this type of natural resource should be of didactic orientation (environmental education, birdwatching, etc.). With regard to the historical and cultural heritage, the main resource of the area is associated with the finds of the Greek and Roman presence in the area, with the cities of Sibari, Thuri.

4.1.3 Socio-economic framework

The area in question presents the characteristics of the rural economy: advanced in the areas near the river and in general in the plain of Sibari, traditional and marginal hills. The rich rural economy features intensive farming, to which agro-industrial establishments are associated, where local products are processed. The agricultural economy, near the coast, Cassano allo Ionio and Corigliano Rossano, integrates tourism development, based mainly on the bathing resource. Of lesser importance is the cultural tourism linked to: Magna Graecia, with the Sybaris Archaeological Park, the Magna Graecia Museum; to the historic center of Corigliano Rossano; to the Albanian culture of communities of Albanian origin.

The classification as an intermediate node is attributed to municipalities that are characterized as nodes, in fact, of the hypothetical network of the economic-productive circuits of the Region. The marginal economy of the hill towns, which gradually depopulated after World War II, is contrasted by the economic development of the lowland areas, in particular Cassano allo Ionio and Corigliano Rossano, which recorded a considered demographic growth. However, the economic development of the plain is not sufficient to solve the employment problem, which is a constant of the entire area. Specifically for the hill towns, it can be said that the area is characterized by a progressive increase in the average age, a constant migratory balance and a high unemployment rate.[3]

4.1.4 Local development experiences

The experiences of local development that aim to enhance the Crati river basin are almost nil. The environmental education activities that take place in the area of the Tarsia dam are essentially part of the cultural and voluntary activities. The area, as has been said, is the recipient of a Leader II rural development project, which places among its objectives the promotion of rural tourism and the enhancement of typical products. The interventions carried out with the Structural Funds reflect the specialization of the local economy. The interventions in agriculture and in support of small and medium-sized enterprises are those prevalent and widespread throughout the territory. The Environmental Measure concerned aqueducts and sewage systems, confirming what was previously noted regarding the lack of primary infrastructures.

4.1.5 Problems and potential for development

There are important potentials for the enhancement of the river resource from the point of view of the Ecological Network. It is an area with overused resources, which can aim to reduce the impact of human activities, also favoring the creation of companies that enhance the use of the river and the environment in general. To characterize this area on the basis of a specific theme, so as to make it a sort of pilot project, it was decided to focus the analysis on the theme of environmental education. The most suitable area for the development of this type of activity has been identified in the Natural Reserve of Lake Tarsia. The design indications phase will primarily concern business opportunities to

[3] Source: analsis by the Sibaris Local Action Group (Inea, http://www.inea.it/reteleader/leader.htm).

be implemented in the area. River protected areas are generally particularly suitable for hosting environmental education projects and initiatives, especially thanks to the particular wealth of habitats and fauna that characterize them and the accessibility that is generally better than mountain protected areas. The development of a rich and organized offer of environmental education and teaching services can become an effective engine for local development, as the presence of such services is able to attract significant numbers of visitors. With a view to tourism development, the natural reserve of Lake Tarsia could also be connected to the historic centers of Tarsia and Santa Sofia d'Epiro, as well as to the interesting area of the former Ferramonti concentration camp, in order to offer tourist itineraries capable of integrating the naturalistic component with the historical-cultural and architectural one. The connection system between these elements of the tourist offer should be centered on the Crati river, as an ecological corridor for local fauna and flora and a resource to be exploited in its complexity. The Crati river, in addition to being an important element of naturalistic interest to be preserved and enhanced, is channeled into its basin, crossing the heart of the territory of the province of Cosenza, important systems of resources that require a strong attention aimed at the development of the territory concerned. The strategic idea of an Integrated Local Development Plan, according to the logic assigned to integrated projects by Regional Planning, is to favour the activation of integrated interventions that have the purpose of acting on the entire local system, i.e. on the economic variables, social and territorial. Following this indication, the territorial area of influence of the Plan appears to be the first variable to be considered as strategic in order to achieve the most significant impact on the territory. In this regard, at the basis of the Integrated Local Development Project, a territorial delimitation criterion is placed which sees the implementation of two districts of the area of interest and, within the two territorial districts, the definition of the intervention priorities assigned. The Integrated Local Development Project finds its unity in the basic objective which is the redevelopment of river environments and corresponds, if you want to frame it from the graphic point of view, to two concentric circles that are drawn along the entire course of the river. A first circle groups all the municipalities whose territories are bathed by the River, a second circle which includes the first, which extends the territorial influence of the Integrated Local Development Plan, to all those municipalities in whose territories there are streams that flow into the Crati (Fig. 1). However, the need has emerged to treat the La Via del Crati[4] Integrated Local Development Plan not as an environmental remediation program but as a real moment of overall redevelopment of the area on the river. River requalification is an integrated and synergistic set of actions and techniques, even of a very different type, (from legal-administrative-financial, to structural), aimed at bringing a watercourse, with the territory more closely connected to the river system , in a state as natural as possible, capable of carrying out its characteristic ecosystem functions (geomorphological, physico-chemical and biological) and endowed with greater environmental value, while also trying to satisfy socio-economic objectives. That is, it starts from the recognition and enhancement of the territory and then stimulates the development of the individual local systems already established, to be reconverted or developed. At the base of this recognition and enhancement action an instrument is placed that refers to the already tested principles of negotiated planning, the Agreement for the requalification of the Crati river basin, which will see all the main local actors (public and private) as protagonists headed by the Provincial Administration of Cosenza, and the Calabria Region with coordination function.

4.2 The coastal system and the hinterland of Tropea: the quality of businesses and the territory as a resource for territorial marketing

4.2.1 The area in detail and naturalistic aspects

It is a coastal area and its hinterland, which we have chosen to indicate by referring to its most famous center, Tropea. The naturalistic interest of the area is mainly linked to coastal and marine habitats, in particular to the presence in some sea beds of Poseidonia meadows. From a socio-economic point of view, the area is affected by the rapid development of the tourism sector in the coastal strip, which is becoming the main resource for the local economy. This development, however, is happening not without problems. First of all, the prevailing type of tourism is the classic seaside tourism, highly seasoned and with a high environmental impact. Secondly, the rapid economic growth of the coastal centers is matched by the persistent stagnation of the hilly hinterland, which leads to a worrying imbalance in the development process of the area. In this case, the presence of natural resources must first of all be safeguarded from the threat of intrusive and environmentally unsustainable tourist development. However, it will also be necessary to evaluate the possibility of enhancing these same

[4] Province of Cosenza - Planning and Internationalization Sector, Integrated Local Development Project, La Via del Crati, 2009.

resources, to encourage a redevelopment of the tourist offer. The tourism model to be pursued should be more attentive to the use of the natural and cultural resources of the area and not only to the seaside component. This would not only allow the protection of the habitats present, but could also contribute to the seasonal adjustment of the presence and the integration between the coastal and inland tourist offer. The natural environments of greatest interest are concentrated in the coastal strip, however, for the reasons previously mentioned, reference was also made to the hinterland for the analysis of the socio-economic system. The area considered includes the municipalities of: Tropea, Zambrone, Parghelia, Ricadi, Briatico, Cessaniti, Drapia, Spilinga, Zungri, Joppolo, Zaccanopoli. Figure 2 shows the location of the municipalities. Those affected by the presence of Bioitaly sites are coloured green. The main characterization of these sites is given by coastal habitats and maritime dunes. Overall, the prevailing natural resources are therefore constituted by the coasts and the seabed. The protection of these resources does not appear to be easily reconciled with the development of seaside tourism, which also represents the driving force of the local economy.

4.2.2 Socio-economic framework

Seaside tourism development tends to create, as mentioned, a dualism between the coastal municipalities and those in the hinterland. The considerable dynamism of the former, based on the development of accommodation and services, is in fact contrasted by the relative stagnation of the inland centers, which maintain distinctly rural characteristics, and an economy still strongly based on traditional agriculture and animal husbandry.

4.2.3 Problems and potential for development

In summary, the characteristics of the area considered are the following:

location: coast and hills with coastal gravitation; with respect to the structure of the ecological network it can represent a buffer zone between the protected sites and the seaside tourist system;

typology: area with overuse of resources;

type of intervention: territorial marketing, based on the enhancement of the environment (the improvement of environmental quality becomes a competitive advantage capable of improving the position of the local system in the global panorama).

From what we have seen previously, the driving force of the local economy is certainly tourism, which has as its strong point the considerable natural resources of the coast. The same tourist development, however, if some trends already underway were to become radicalized, could become a threat to the conservation of the natural heritage, as well as aggravate the socio-economic imbalances already present in the area. We have described Tropea as an area with a strong tourist vocation, with a "classic" seaside tourism model, where development is accompanied by some problems:

a. a user that tends to focus on a single tourist segment, the family one, characterized by strong seasonality, high demand for services and an undeveloped spending capacity;
b. an accentuation of the dualism, from the point of view of economic development, between the coastal municipalities and those of the hinterland. The concentration of tourism activities on the coast means that coastal municipalities play a driving role on the local economy, while those in the hinterland are unable to curb the demographic decline and the impoverishment of the supply of services;
c. the risk of degradation of coastal and marine habitats, which are particularly valuable in that area.

From this point of view, the type of projects financed with Community cadres from 1994 to today, has worryingly oriented towards the affirmation of beach tourism, based on hotels and tourist villages and on the continuous expansion of the entertainment offer. However, there are also attempts to diversify the offer and to develop rural tourism in inland hilly areas, essentially to reduce the gap between the coast and the hinterland. Given this reference framework, the strategy to be proposed to promote sustainable economic development in the area must necessarily take note of the importance that coastal tourism has for the local economic system. Without prejudice to the opportunity to intervene for the creation of an offer of rural tourism complementary to the coastal one, and on the enhancement of agricultural production, however, it was decided to focus the attention of this study on the tourist facilities of the coast. Indeed, it is considered appropriate to design a strategy for the ecological

redevelopment of the massive offer of seaside tourism. The impact of unsustainable management of the coastal tourism system could, in fact, have two extremely serious consequences: on the one hand, the compromise of the integrity of the areas of environmental value already identified as Bioitaly sites; on the other hand, an overall deterioration of the territorial system, which would produce a loss of competitiveness of the area, compared to other poles of tourist offer. The study will therefore be dedicated to examples of interventions for the environmental requalification of the accommodation offer, some of which concern areas characterized by intense tourist flows, with the aim of identifying intervention strategies for the minimization of the environmental impacts of the Tropea tourism system. , as well as for the sensitization of the tourists themselves regarding the conservation of natural resources.

4.3 The hilly-coastal area south-east of Reggio Calabria: volunteering and environmental protection

4.3.1 The area in detail and naturalistic aspects

It is an area that goes from the coast to the mountains and which, in the highest part, is part of the Aspromonte National Park. The area has some interesting natural habitats in the hilly and coastal area. In this case, the coexistence of naturalistic and historical-architectural resources in some sites is also of particular importance, as in the case of Pentadattilo. From a socio-economic point of view, it is an area with significant potential development, rich in human and natural resources. For the analysis of the socio-economic system, reference was made to the territorial scope of the municipalities of Reggio Calabria, Melito di Porto Salvo, Bova Marina, Condofuri, Bova, Motta San Giovanni, Bagaladi, Roccaforte del Greco, San Lorenzo, Cardeto, Montebello Ionico. In figure 3, the location of the municipalities is indicated. The municipalities affected by the presence of Bioitaly sites are coloured green. The range of waterways that cross the Aspromonte have, with the exception of the Mesima and Petrace, the characteristics of the rivers; these are semi-dried courses during most of the year, which enormously increase their water flow in the autumn and winter months. Further deleterious peculiarities of the rivers are the shortness of the path, due to the proximity of the watershed to the coast, and the considerable slope of it, due to the strong difference in altitude between source and estuary. The sum of these properties, combined with the high degree of deforestation to which the Aspromonte has historically been subject, means that the power of the rivers is very strong, with serious consequences on the hydrogeological state of the territory. The vegetation of the Aspromonte is rich and varied; descending the massif, all the typical vegetation horizons of the mountains of the South meet. The mountain plain is covered with forests: beech, silver fir, larch pine, etc. At lower altitudes, where there are no crops, the presence of the Mediterranean scrub prevails. Among the most significant agricultural crops in the area, affecting the coastal strip and the hills, there is that of bergamot. The fauna present in Aspromonte is typical of mountain forest environments. The mammal that perhaps more than any other characterizes the Aspromonte is the wild cat, which inhabits the median belt of the massif. The proximity to the Strait of Messina, which is one of the most important routes of bird migration between Africa and Europe, makes the area particularly rich in birdlife. Among the most important species for conservation are: Bonelli's eagle, eagle owl, black woodpecker and honey buzzard, the latter victim of merciless poaching.

4.3.2 Socio-economic framework

In the territorial area of reference there are no distinguishable areas with a precise economic vocation; despite Reggio Calabria's strong specialization in tertiary activities and the increase in tourist arrivals in some coastal towns, it does not seem that the symptoms of a new development have spread throughout the area. As in the past, we are witnessing the inability of the most important centers to promote economic growth processes capable of withstanding in the long term. Our reference area, polarized on the center of Reggio Calabria, affects the peri-urban area of the capital itself towards the southern slopes of the Aspromonte. Internally, the tendency towards a depopulation process that is actually higher than the already significant one detected by official statistics should be recorded for the centers of the interior (the Grecanians, Bagaladi and San Lorenzo), farther from the communication routes. This is due to the habit of moving to nearby municipalities on the coast without registering the change of residence. The demographic dimension of the municipalities considered as a whole has not undergone substantial changes in the last thirty years. A slightly more in-depth analysis, however, reveals how this observation is misleading when the individual municipalities are considered: in the face of a high growth in the population of Reggio Calabria, over 15%, there is a sharp decline in residents in the other municipalities, limited on the coastal strip and dramatic in the mountains. The eleven municipalities considered show employment situations and productive vocations that are not perfectly uniform. For example, the agro-industrial production that more than any other characterizes

the area considered is perhaps that of bergamot and its extracts. This citrus fruit is grown in only two areas around the world: southern Calabria and the Ivory Coast, but the African product is clearly inferior in aroma and organoleptic quality to that of Reggio. Bergamot is widespread throughout the coastal strip that goes from Villa San Giovanni, on the Tyrrhenian sea, to Marina di Gioiosa Ionica, on the Ionian Sea, although the maximum concentration of producers is between Reggio Calabria and Punta Pellaro. There are no industrial districts with a specific vocation in the area.

4.3.3 Problems and potential for development

In summary, the characteristics of the area are as follows:

location: peri-urban area; with respect to the ecological network structure, it can represent a buffer zone between the Aspromonte park and the urban system of Reggio Calabria;

typology: areas with overuse of resources;

type of intervention: involvement of the local society (in particular of the voluntary sector and of vulnerable groups) in development projects based on environmental enhancement.

The development of the internal area close to Reggio Calabria can find the most solid foundations in the environmental wealth (nature and culture) and in the voluntary networks already existing in the metropolitan city. The need for development is limited to the few active residents of the area, who protect it from significant environmental risks, first of all, hydrogeological instability. It is therefore possible to imagine interventions to enhance the local culture, or recovery interventions such as the one underway at Pentadattilo. Alongside these interventions, other interventions can also be associated with the study of the territory and recreational, sporting and tourist enjoyment.

5. Framework of Priority Actions (PAF) for Natura 2000 in Calabria. Parties involved and sources of funding

In this perspective and with reference to the Regional Programming relating to the Structural Funds 2021-2027, the Calabria Region, with DGR n. 72 of 15/05/2020 approved the Framework of Priority Actions (PAF) for Natura 2000 in Calabria pursuant to Article 8 of Directive 92/43 / EEC relating to the conservation of natural and semi-natural habitats and of wild flora and fauna . The Steering Act refers to the multiannual financial framework for the actions to be implemented in the period 2021-2027. The document states verbatim: To date, it is not considered necessary to establish new SACs and SPAs, instead it is necessary to complete the identification of ecological corridors. The PAF (Priority Action Framework) was also approved by the Regional Council with a Resolution of 14 July 2020. The Prioritized Action Framework (PAF) are strategic multi-year planning tools, intended to provide a general overview of the necessary measures to implement the EU's Natura 2000 network and related green infrastructure, specifying the financial needs for these measures and linking them to the corresponding EU funding programs. In accordance with the objectives of the EU Habitats Directive[5], on which the Natura 2000 Network is based, the measures to be identified in the PAFs are mainly aimed at ensuring the maintenance or restoration, in a favourable conservation status, of natural habitats and species of Union importance, while taking into account economic, social and cultural needs as well as regional and local particularities. The legal basis of the PAF is Article 8 (1) of the Habitats Directive[6], under which Member States are required to submit to the Commission, where appropriate, their estimates of EU co-financing that they consider necessary in order to fulfill the following obligations in relation to Natura 2000:

- establish the necessary conservation measures which, if necessary, involve appropriate management plans specific or integrated with other development plans;
- establish appropriate regulatory, administrative or contractual measures that are in accordance with the ecological requirements of the natural habitat types.

[5] Council Directive 92/43 / EEC of 21 May 1992 on the conservation of natural and semi-natural habitats and of wild flora and fauna, http://eur-lex.europa.eu/legal-content/IT/TXT/ ? uri = CELEX: 01992L0043-20130701.

[6] Article 8 (1): Member States, in parallel with their proposals for sites that may be designated as special areas of conservation, where priority natural habitat types and / or priority species are found, where appropriate, send the estimates to the Commission of the Community co-financing which they deem necessary in order to fulfill the obligations referred to in Article 6 (1).

In special report no. 1/2017 on Natura 2000[7], the European Court of Auditors concluded that the first completed PAFs (for the 2014-2020 multiannual financial framework (MFF)) did not provide a reliable picture of the actual costs of the Natura 2000 network. therefore the need to update the format of the PAFs and provide further guidance to improve the quality of information submitted by Member States. The recent EU Action Plan for Nature, Citizens and the Economy is committed to this process, with the aim of ensuring that Member States provide more reliable and harmonized estimates of their respective financial needs for Natura 2000. In the conclusions on this action plan, the Council of the European Union recognizes the need to further improve multiannual financial planning for investments in nature and agrees that there is a need to update and improve the PAFs. The importance of better forecasting the financing needs of Natura 2000 in view of the next multiannual financial framework of the EU is also recognized in a resolution of the European Parliament. Green infrastructures in Calabria are characterized by a network of natural and semi-natural areas, represented by the National and Regional Parks (Aspromonte National Park, Sila National Park, Pollino National Park and Serre Regional Park), the Regional Reserves (Lake of Tarsia and Foce del Crati and the Valli Cupe). These are large strategic areas, which play a central role in the conservation of biodiversity, in fact they represent the core areas of the regional ecological network being implemented. Currently they comprise an area of 250,000 ha, whose management is aimed at acquiring a complex series of ecosystem services.

6. Pilot projects for the enhancement of natural resources

Environmental protection as a resource for development can take various forms, depending on the characteristics of the local context. For each of the selected areas, a specific vocation was identified with reference to the enhancement of local environmental resources. This made it possible to investigate three possible paths of sustainable development, with different characteristics depending on the territorial context of reference. Extensive use was made of the analysis of case studies, experiences of integrated local development based on the enhancement of natural resources, carried out in other territorial contexts. Territorial contexts were clearly chosen that presented sufficient similarities with the Calabrian areas of reference, so as to be able to draw policy indications for the design and launch of pilot experiences in Calabria. In this way the three areas analysed could become as many laboratories for the experimentation of different sustainable development paths. The environmental enhancement paths that were analysed were:

- the requalification of the accommodation offer in a tourist resort and the application of environmental quality certification systems as territorial marketing tools and as a competitive advantage on the tourism market; the Calabrian context in which to promote a pilot experience of this type was identified in the Tropea tourism system;
- the creation of entrepreneurship and employment in innovative sectors related to the environment, in relation to the presence of a protected area; this issue was addressed in relation to the territorial context, represented by the wetland of Lake Tarsia and the mouth of the Crati;
- the use of volunteering in projects for the recovery and protection of the environmental and historical-artistic heritage; this type of initiative has been combined with the hilly area south-east of Reggio Calabria, where experiences of this type already exist and which could therefore become an interesting laboratory from which to export this tool for the enhancement and protection of heritage to other areas of the local region.

An objective of this work can be represented by the institution of the Calabria Biodiversity Observatory, based on a Web Gis system, which gives the user the possibility to interactively explore the biosphere of the Calabria Region, and its contents (habitats and ecosystems, plants, animals and other forms of life). It is an instrument of knowledge, that the different institutional levels (Parks, Universities, Local Authorities, Economic and Social Partnership) could use, to orient the endogenous development and in particular the ecotourism, along the paths of the Calabrian Ecological Network.

[7] Special Report No. 1/2017: more needs to be done to fully realize the potential of the Natura 2000 network, https://www.eca.europa.eu/it/Pages/Docitem.asp?did=40768.

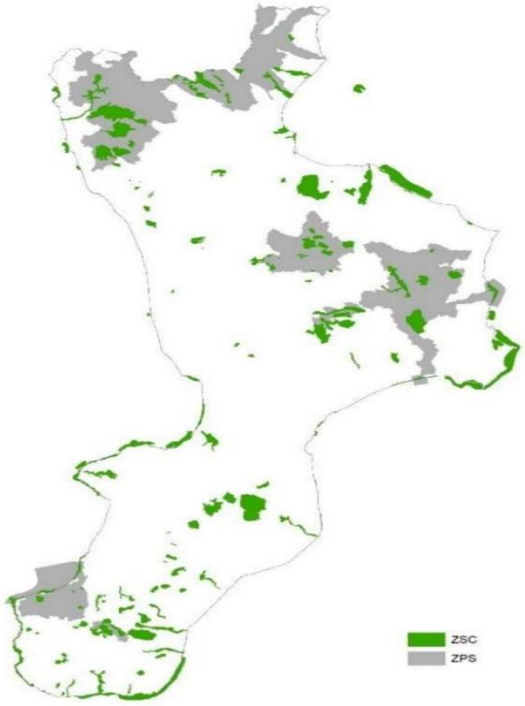

Fig. 1: Rete ecologica regionale, siti rete natura 2000

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In the post-pandemic phase: do we need urban planning?

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Abstract

Public institutions and Scientific authorities are working on a world scale on the several hypothesis and prediction for the end of the pandemic. According to Richard Florida, each crisis is followed by a reorganization of the territory and cities since peoples' lifestyle and their ability to adapt has changed. We need to create a new sense of belonging with shared values and this requires quite a long time as well as building high quality public spaces. Digitalization will have a pivotal role: from applications monitoring the risk of contagion to the new ways cities are organized. In such scenario, the question is: do we need urban planning in the post-pandemic phase? Urban planning has always been about managing how cities and territories work both on the medium and long term. As of today, urban planning will turn out to be essential only if it's able to offer an instant answer. The new urban planning should identify those solutions able to predict and manage any future scenarios determined by such a health emergency. In the post-emergency phase, it will be so important to be able to quickly create a map of the whole national territory showing the presence or absence of the "relevant local dimension" for each city. Therefore, thinking about the strategic organization of cities and of the national territory with its several systems - bearing in mind a conscious integration and the concept of smart city - it is a real need and not just a choice.

Keywords: urban planning, pandemic, smart city

1.Scientific framework and research reasons

This research is part of a scientific disciplinary sector, based on the awareness that a new urban cycle is starting and, also, that the urban planning is faced with a double challenge: from one hand, to activate the available intellectual resources to deeply analyzing the current and future radical changes in the city, in particular the which ones related to the pandemic, on the other hand to insert the relationship between urban planning and public policies in a connected long-term framework. This paper intends to provide a working hypothesis and a contribution of ideas. The study of the problems related to the current government of cities has now become such a delicate and important phenomenon: for this reason the opening century of the third millennium has been called “century of cities”. Complexity impacts the urban phenomenon, as nature, architecture and human factor interact each others in cities. We tried to apply the concept of complexity, formulated in social sciences, to Urban Systems. City, as a complex system, has undergone continuous evolutions, starting from the archaic period to the post-industrial one. Some arguments on *unplanned urban fabrics* in the analysed time-frame, lead us to say that even in absence of planning, cities have managed to adopt an ordered morphology. However, due to the fast urbanization processes, with an exponentially growing anthropic pressure, an osmosis between planning and forms of self-organization from below should be necessary. City is therefore in a continuous evolution due to its own endogenous capacity of self-organization. The multiple interpretations of the governance of urban space, cities’ use and its changes over time involve territory, city itself, all the individuals in the role of inhabitants. Knowledge, as a strategic element, shapes the definition of urban phenomena. In such scenario, the citizens’ involvement, for a direct and conscious participation in the problems related to public government and urban planning, makes it possible to promote the political strategies in city. In this context, security is one of the fundamental parameters for smart cities, a decisive area for verifying the transformation of public security. At this stage, in some cases, we are witnessing the passage of power from States to cities. In 2050, 66% of the world's population will live in cities: it means that cities will probably replace State in various situations, also developing international relations between them and becoming the preeminent political subject. Many different problems emerge, examining some indicators, such as social cohesion and power conflicts: from immigration to youth unemployment, from people impoverishment to tensions with the Roma communities, from transport to waste, from poorly designed Public Works to intellectual emigration. All these items intersect with crime and corruption. The most aware (intelligent and sustainable) cities could allow an optimal management of resources from the safety point of view, coordinating both public institutions (from police to judiciary and other local authorities) and private entities (including planning and management of tangible and intangible infrastructures). Sectors with high risk of criminal infiltration, such as mobility, logistics, waste disposal, energy, would play a key role. At the same time, there will be obvious privacy problems for every citizen, as we will be all connected to the network, and therefore potentially under surveillance. Cities progress over centuries has never been linear. Motionless periods were followed by moments of huge changes, as in this historical phase, due to the great technological transformations underway in the world of networks and the pandemic emergency. In this perspective, we intend to explore the component of innovations related to the artificial intelligence, as well as human intelligence. Cities are not just places for living. They are also powerful creative devices to activate the different present and explore the possible future if they allow a community life, able to build fruitful relationships, to generate fertile synapses, to produce new economies and to accelerate innovation. Instead, when cities are fragmented places of inequalities, spaces of unresolved conflict and generators of marginality, they lose their co-evolutionary function with humanity. The challenge of a responsible, innovative, generative and circular urban planning is to design cities that will be dynamic and non-stationary, circular and non-dissipative, generating values and quality and non-erosive: consuming less soil, decreasing greenhouse gas emissions, not eroding natural and cultural resources, pursuing more sensitive strategies, that should be guided and implemented by the community. In such scenario, city, as a place for enhancing collective intelligence of its inhabitants, creates a paradigm shift able to produce a new vision of its mission and its capability to generate an enabling ecosystem based on an hardware, provided by the new quality of spaces and infrastructures, and a software, constantly updated by active citizens and equipped with a new operating system consisting of urban planning and advanced urban policies, in response to the changing demands of contemporaneity. In this context, it is really interesting to deepen a project of National Research Council, arising from the needs to integrate and innovate urban planning disciplines with new digital methodologies (AI, Machine learning, IOT, Sensors). The project goal is supporting various urban development processes, including knowledge of state of art, natural and social environment, virtuous management of urban and environmental transformation and regeneration processes, the protection and care of the urban areas, nature and culture of territory and landscape. This highly innovative approach is based on the concept of "Digital Twin", applied to city and its sustainable development. The application of "Digital Twins" to an entire urban community consists in the creation of integrated digital systems and

predictive analytics techniques, able to replicate a physical system in a virtual one, following and simulating its development and operational life, learning and predicting collective behaviour of urban agglomerations, and, most of all, articulating and combining all the components together. It means an Urban Intelligence capable of imagining wider horizons of knowledge and prediction, useful for urban planning and management, capable of constructing more suitable scenarios for restoring the complexity of urban life. In summary, this research work, starting from the need of re-thinking the urban planning role in the post-pandemic scenario, aims to propose food for thought about urban intelligence, on the city of tomorrow, with the scientific goal of identifying different and multiple elements of knowledge, as well as predictive analysis tools.

2. A City School: the Urban Intelligence Observatory

As exposed in the previous section, the study of the problems related to the current government and management of cities has now become a really important phenomenon: in fact, our century has been called “century of cities”. Anyway, city is always in continuous evolution, thanks to its own endogenous capacity for self-organization, as explained in physical sciences according to studies and theories formulated by the Nobel Prize winner Ilya Prigogine. The working hypothesis, with the aim of establishing an Observatory called "Urban Intelligence", has the ambition to address new emerging problems, through a multidisciplinary approach (sociology, philosophy, anthropology, economic and urban planning). Culture should be the strategic element, impacting the definition of urban phenomena. Citizens' involvement is essential to guarantee a direct and conscious participation in public government and urban planning problems, also in order to promote the urban political strategies. The establishment of an Observatory called "Urban Intelligence" is along the right lines of creating a new concept of City Schools that, like Business Schools for post-Tayloristic companies in crisis in the last century, could be train the new urban managers, capable of successfully tackling the emerging problems in the complex city contexts. The Urban Intelligence Observatory aims to develop the hypotheses of an integrated work between disciplines, universities, local authorities and institutions, in order to create safe, intelligent and, of course, sustainable contemporary cities. The Observatory stands as an opportunity of convergence of all different disciplines and scientific skills interested in city. This multidisciplinary approach arises from the evidence that our existence is largely spent in cities, often dominated by complex situations, like decay, sometimes lack of urban safety, both in physical infrastructures and in social contexts.

3.Beyond the pandemic

As known, the UN 2030 Agenda has included among its objectives the reorganization of city in terms of sustainable development (Objective 11, Sustainable Cities and Communities). Furthermore, sustainability of new urban development models is at the heart of the Green New Deal, by the European Commission led by Ursula Von der Leyen. Finally, the urgency to achieve these goals has increased since the current socio-health emergency from Covid-19 and the reorganization of human settlements in a post-pandemic key is one of the fundamental themes of the new programs to re-launch economy for a good strategic use of the Recovery Fund. Without any doubt, the ancient city was better equipped to face epidemics, not only due to the structural presence of lazarets and sanatoriums, but also due to the forma urbis itself, which provided for human-sized distances and better confined places of relationship, like the neighborhoods. The huge expansion of the modern city and the connected polarization of services are the unstoppable effect of the new dynamics development connected to the industrialization process and the related economic boom, but the city shape is due to the distorted application of theories and doctrines of the Modern Movement (CIAM, 1928-1959; Athens Charter, 1933). Today, in the contemporary and post-modern city, the lifestyle, the social relations and the urban structure are completely changed. The metropolisation of urban settlements is no longer just a phenomenon linked to its size, but rather an inevitable trend related to the disintegration of facilities, their expulsion from the urban structure for a better connected to mobility networks. Not only the city, but also its users are changed: they are no longer citizens but city users, newcomers, travelers, globetrotters, any other social figures produced by the new functional paradigm of the globalized settlement. In the 90s, starting from the items like cybersecurity and growing power of computer networks, a new character was born: the hacker. The concept of hacker initially borned in computer and tech field, to indicate "an expert in computer programming and management; an individual who illegally accesses information on a computer system and sometimes manipulates it" (Merrian-Webster, 2015). Hacker attacks have grown with the development of telecommunications. The spread of digital technologies, during the twenty-first century, has meant that the number of hacked systems has dramatically grown. The city, with its squares, and the various places of

participation, becomes an amplifier, as a specific social, political and religious identity is attributed to the civic space. So, the city is a platform and an amplifier to be hacked. Carlo Ratti also states that << hacking the city in places of cultural value, such as squares, is an act that draws on the tradition of appropriating physical space >> (Ratti, 2017). Similar events and actions, such as the National Mall in Washington (DC), a space of great visibility and a national and international sounding board, given that among the various events, every four years is the scene of the inauguration ceremony of the American President, are proof of the value of Urban Hacking, as a language of social affirmation. Today, cities are increasingly pervaded by a digital component connected to physical space. The convergence of digital and physical lends itself to hosting and amplifying the different features of hacking. Last but not least, the cyberterrorism, which now represents a serious threat, due to the digitization of physical structures. Urban-scale systems such as underground and distributed pipelines are vulnerable to terrorist attacks, becoming a potentially a target for hackers, regardless of urban dimensions. But also, hacking can perform an important positive function, both for social and security reasons. For example, given a platform, a kind of urban equivalent of Android OS, anyone would be able to create apps or something similar on an urban scale. Therefore, the promotion and the sharing of good practices, both at cognitive and technological level, increase the urban communities commitment to participate in the development mechanisms. It would create a complex network of transparent systems in a continuous and shared information flow, as one of fundamental human rights, that is what the philosopher Henri Lefebvre defined << le droit a la ville >>, the right to the city (Sassen, 2013). Open Data and Open Platforms, represented by accessible spaces in city, will be the key to sharing ideas, knowledge and best practices with collaborative actors and stakeholders. An urban life that, through a convergence of physical and digital space, will be able to generate a new citizenship. The city of future was born from an intersection between digital and physical worlds. These considerations about cities of future, in the historical context of pandemic, lead us to rethink territories and cities, figuring out a civilization of care. History, in fact, sometimes has unexpected crossroads that, even if apparently are just contingencies, actually are the result of long-lasting processes which, beyond the intentionality of actions which created them, suddenly become real, marking a watershed in the world history. Perhaps it is too early to say that for sure, but as of today we can suppose that COVID19 epidemic and its consequences could be one of these events, one of the history's watersheds. Pandemic has impacting our life in a way we cannot imagined before. We will come back to our life, we will retake our space but when we do, we cannot imagine to simply return to our business as usual. Building a right future response is absolutely important. Many researchers are studying about post-pandemic cities at long but also short terms, restarting life as soon as possible, for example applying plan based on detailed tracking of the current pandemic and historical accounts of previous ones, presenting some key measures to prepare our cities, economy, and workers for sanitary emergency crisis and beyond, considering infrastructures, smart working, industrial clusters, key institutions, less-advantaged communities and so on (Florida, 2010). Our mayors, governors, and community leaders must do whatever is necessary to get their cities back up and running as soon as they safely can. After, we will need plans in place to prepare for future pandemics, and any social or economic lockdowns they necessitate. Unsustainable development model, whose damages to living environment cannot be underestimated or ignored anymore, is leading many authoritative observers to study and reflect about the consequences of the pandemic and the fragilities that it has highlighted. Overcoming of the boundaries, not only the functional ones, between anthropization and natural spaces, planetary urbanization processes, unsustainable mobility of goods and people, result of extractive economies and processes of destruction of regional know-how and productive cultures, consequences on greenhouse gas emissions and human health, unequal distribution of resources and social imbalances are key factors not only about this crisis but also about its consequences weight. Of course, this scenario lead us to questions not only about the domain of physical planning. The debate, in fact, involves the ways of conceiving and managing cities and territories but also their relations with development models and economies, with social practices, with forms and requirements of a possible wise proximity to life, able to take care of ecosystems, places and people. It includes governance models at different scales, especially in terms of demand for return and regional and local empowerment. As of today, it is certainly early for hypotheses and structured arguments that require adequate observation times, but it is for sure a propitious moment to request necessary, open and transversal reflections, both on a thematic and disciplinary level, in a moment in which the urgency makes everyone more sensitive, free and creative in grasping the dramatic contradictions but also the huge potential for shaping the future.

4.Hypothesis about new urban planning

The future development of smarter and safer cities could depend on the study and analysis of correlations between physical, digital and social space. It could also depend on our ability to promote adaptation to the many different changes that are taking place (climatic, economic, social) and, above all, to the digital changes. The research about roots, in order to design regeneration projects, represents a research topic but also an hope, in this turbulent phase of global transformation (De Luca, 2019). Urban planning is a field full of ideas in innovation, both of merit and of method, which require moments of disciplinary experimentation for structuring at the various administrative levels. The concept of resilience is now accepted and integrated in urban science, as a challenge for public policies, seeking the underlying belonging in the territories, in the constituent elements of the existing city, focusing on circular economy, managing urban transformations in different contexts, with actors who are becoming more and more sensitive to a conscious resources use. Before looking for these solutions, it is important to consider the planning regulations, present in Italy since 1942. Among many others necessary reforms in Italy, in fact, there is also the which one related to urban planning, territory government and soil transformations. There are sixty-six years of waiting, since the terms of the ninth transitional provision of the Italian Constitutional Charter expired. Not even the modification of Title V of the Constitution, in 2001, which elevated the Urban Planning to Territory Government, was enough to generate the conditions for a global and significant rethinking. This subject is clearly fundamental for any policy of protection, enhancement and development of the national and local territory. In this contest, it would be convenient that a different territorial design has as its objective an innovative institutional architecture. On the other hand, the inclusion of urban planning subjects in the Constitutional Charter, among the administrative legislative tasks of the Regions and ordinary government activity for local authorities, is not very clear. The Subcommittee on the Constitutional Organization of the State, which was supposed to discuss and deliberate on this issue, never studied it in depth (Pignatelli, 2012). There were only two interventions, which introduced two serious errors: << as it is clear, since the law of 1942 exists, it is not true that the regulatory plans were approved by law. Secondly, it is not true that the competence for urban planning almost exclusively concerns the interests of local authorities, because the territorial plan was already foreseen in the 1942 law, which transcends the purely local plan, and in 1947, when these were discussed arguments, the planners were already convinced that urban planning problems have not simply a local dimension, but a regional or national dimension >> (Spantigati, 1969). Actually, we still have not clarify this initial misunderstanding. This is also the reason of this huge delay in the renovation of the urban planning regulations. The territory is the main resource in the hands of the local territorial entities, which together with lean, transparent and fast technical tools, can create a good governance for the entire territory. The territory governance is the main act of political direction which, starting from planning, embraces the program, the soil defense, the protection of landscape and historical heritage, the protection of environment, as well as the guidance and control of the physical transformations of the entire national space (Gaeta, Janin Rivolin, Mazza 2013). Re-launching the request of a new national law, in a global rethinking of regional and sectoral regulations, is now an urgence. This urgence is also related to the new economic geography, that is no longer in line with the which one of the mid-twentieth century, but should be aligned with the technological and IT revolution in progress, that makes the classic tools, developed in the twentieth century, already too obsolete (Gaeta et alii, 2013). The classic urban planning discipline has become incomprehensible to most citizens, also in its implementation, so much so that the time needed to draw up urban planning tools is measured in years, while the economy and society run and they require quick answers: rethinking urban planning is absolutely necessary. Therefore, a pragmatic debate is needed, revolving around a process of adapting definition of public policies with a need of country modernization, re-imagining the territory, its space and its government tools, as requested by the active social components: businesses, families and institutions (Inu, 2019). Our society is facing to new challenges, involving towards an increasing human isolation. We need to understand that it is really important to create a relationship between people, city and nature. The new urban planning has to take again the ownership of its own identity, in particular considering eco-sustainability and natural spaces, in order to create self-contained places, pollution free, with a natural microclimate, in which each individual can perceive comfort feelings and psycho-physical well-being. This kind of approach aims the concept of autonomous green spaces, connected by large ecological corridors. Only in this way, any place at any scale (apartment, building, neighborhood, city, territory) should be able to conceive the new anti-pandemic spaces.



Fig. 1: Green building

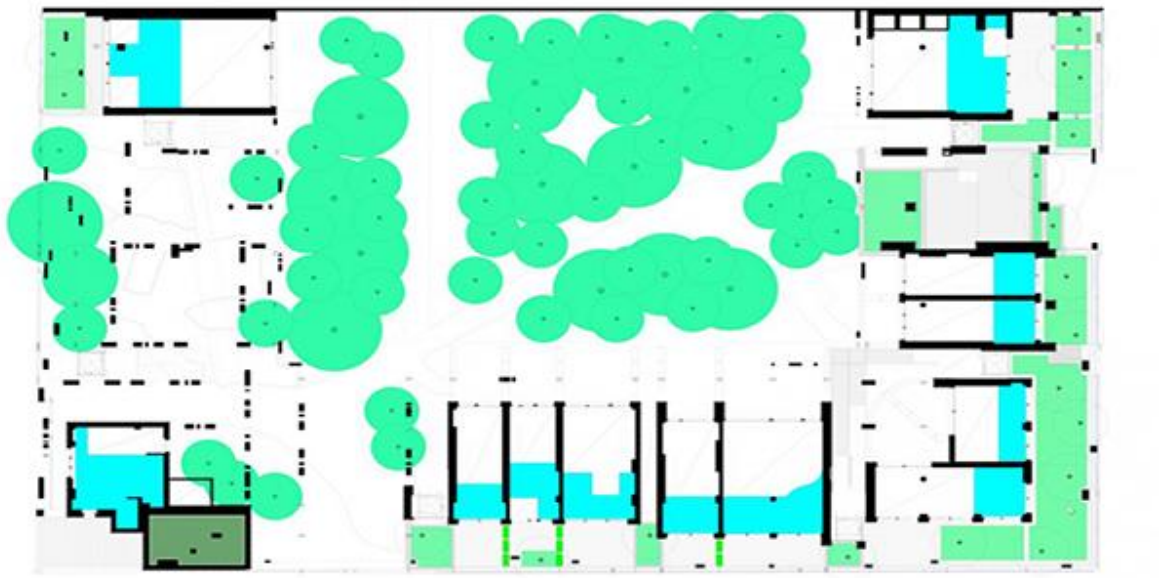

Fig. 2: Green courtyard building

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WORLD HERITAGE and DESIGN for HEALTH
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The Neapolitan Riggiola as design for health

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Abstract
The English writer Jessie White Mario, Italian patriot and Pasquale Villari's correspondent for the description of social conditions in Europe, in her investigation into Misery in Naples, comparing the social condition of the southern city with that of London, recalls how the former capital suffered very degraded conditions. In this regard she also noted how a well-known English guide, made in several editions for the Italian cities, remembered, in that of Rome, that the sick from epidemics generally came from Naples. As if to remove that cliché contained in the volume published by her compatriot John Murray, she reported: «Once Naples was held one of the healthiest stays in Europe. Today foreigners avoid it as an infected place, and in the most famous Guide to Rome - that of Murray - we read that the climate of Rome is slandered, that most of the so-called Roman fevers are imported by travelers from Naples». It is singular to note that it will be up to another guide, that of the city of Naples of Carlo Tito Dalbono to respond to English insinuations. The healthiness of the places of the Neapolitan residence will be told through the illustration of the production of riggiole, and, supported by the technical description of the art of masonry, for which there are no other workers, in other places able to stand up to this confront.

Keywords: Riggiola, Design d'Argot, Conservation, Tradizional Know-how

1. The Riggiola. Design and building know-how

Among the historical materials of the building tradition of southern Italy, majolica terracotta productions stand out.
The Neapolitan riggiola is a building material used for the covering of floors and portion of wall. The Neapolitan object known as "riggiola" is a particular product of the local building tradition, historically used for flooring and cladding.
These 'laterizi' were also usually used for cladding the extrados of domes, as well as the upper parts of bell towers.
Thanks to this last use, the riggiola, tiles became important component of the historic Neapolitan urban landscape, also because, gives their coating is made by bright enamel, they allowed the refraction of sunlight. This particular condition actually also allows to record atmospheric changes of the environment, thus changing even the light condition of that landscape, according to the presence of dark clouds or of bad weather, which tend to amplify the light conditions by the brilliance of the majolica surface of the tiles wet by the rainfall. It is also used into monumental building, for the lining of the domes or the terminal part at the top of the bell towers.
The material was born from and processed through the transformation of terracotta which was, indeed, one of the main historic building materials accompanying the evolution of human life over time, at least in the context of the Western Mediterranean culture.
The Neapolitan riggiola is, therefore, a building material used for the covering of floors and portions of walls also for the great feedback it offers in order to guarantee excellent hygienic and sanitary conditions.



Fig. 1: Riggiole Napoletane. Private collection of the Author

1.2 Birth of a product

The riggiola tile i sten an object, that was born, conceived, and improved over time thanks to the testing and the comparisin of this production with the fact of life. Somehow, the Neapolitan riggiola can be understood as one of the primordial elements of the moder-age design in the obvious logic of a design borrowed from experiences and occasioned by the constant tension towards the ‘sustenaible improvement’ of the product itself.

The main component of the cited manufactured article is the clay, worked in its plastic state, threfore wet, and able to bue shaped according to different madels, usually, shaped as a box,thus defining by raw earth the physical figure of each tile precisely.

Beacause of the tecnical improvements of the manifacturing proces usede by the historic aiolicas companies, this productive system increasingly developed over time, even by the pessure impressed to the cited plastic mixture, which aimed at improving the purity of the comprounds by highlighting the presence into them of incoherent materials, and of air pockets. In particular, this process was also able to guarantee the making of functional, and homogeneous dimensioned thicknesses of the tiles, due to their subsequent, firing.

The selection of the clays and the composition of the mixtures took place by sieving muds with specific sieves, and by adding water to them in order to hydrate their entrepreneur’s productive expectations.

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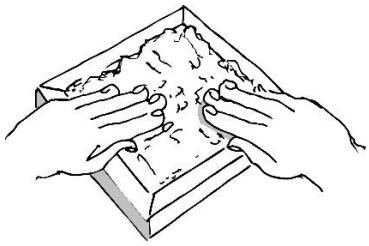
The selection of the clays and the composition of the mixtures took place by sieving muds with specific sieves, and by adding water to them in order to hydrate their driest parts, thus ensuring their better workability.

These measures were actually functional both, to the subsequent cooking and to the ergonomic use of the cited resource which, using a minimum quantity, thus satisfied the entrepreneur's productive expectations.

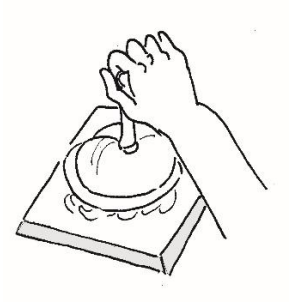
Also the perfect 'tone' of consistency of the raw earth was a fundamental requisite for the correct drying of the riggiola tiles that, by cementing the parts of the material, allowed the opportunity to place a greater quantity of products inside the cooking chamber. There the tiles were set 'like knives', i.e. they were placed using one of their smaller faces as a base, so that they would be homogeneously 'surrounded' by heat. Drying the raw clay slowly and evenly, this process also avoided the creation of cracks or 'hairs' inside the tiles, while they were fired.



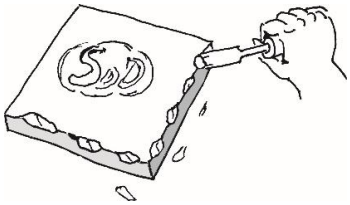
Fig. 3: Ancient Neapolitan Riggiole



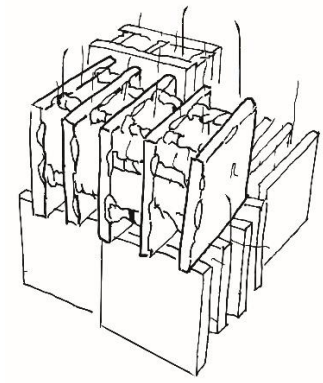
1. Spreading the clay into the mold



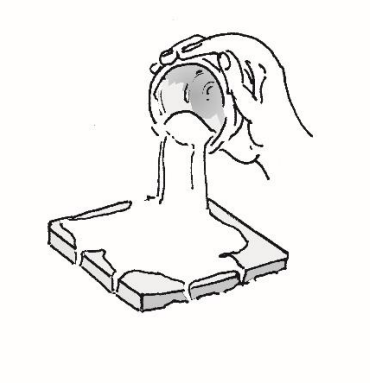
2. Affixing of the Company stamp



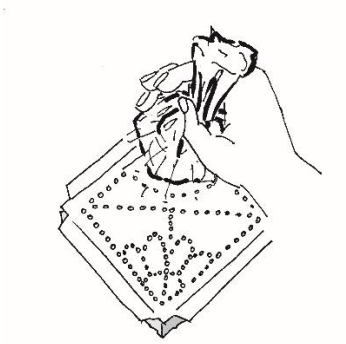
3. Preparation for cooking in the oven



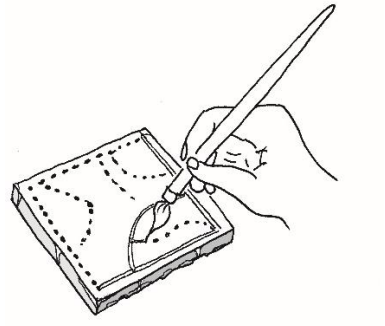
4. Baking in the oven



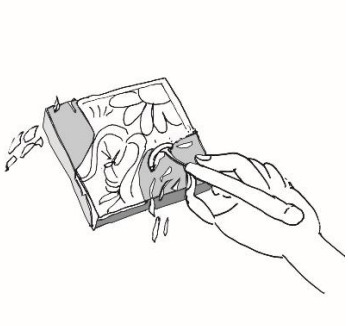
5. ‘Petenatura’



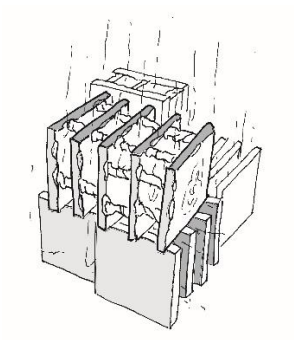
6. 'a spolvero' transfer



7. Tracing with enamel



8. Removal enamel (riggiola petenata-spetenata)



9. Second firing

Fig. 4: Sequence of steps for the production of the riggiola (drawings by the Author)



Fig. 5: Naples. Monastery of Santa Chiara. A sitting of the Cloister of the Majolica

2. The Riggiola. Design and building know-how

The Neapolitan art of making square slabs with raw clay that, subjected to firing, can then have one of the two surfaces treated with enamel and therefore majolica with brilliant colors, intended for the floors and also for some portions of the walls, lambris, is to be considered as one of the major contributions that traditional technical culture offers to the construction company. In other respects, it condenses historical know-how and therefore also constitutes a material tool to be able to preserve the methods of execution of the works which, because they are no longer practiced, constitute experiences whose memory must be preserved. Similarly, in the technical culture of construction companies, the knowledge concerning the ancient ways of preparing the mixtures and the technical tools for making stuccos and other finishes of 'architectural impagination' must be preserved.

2.1 Birth of a product

The terracotta product is remembered by the technical literature of the territory as a Neapolitan peculiarity so much so that a city guide, despite being written mainly for tourism purposes, did not fail to

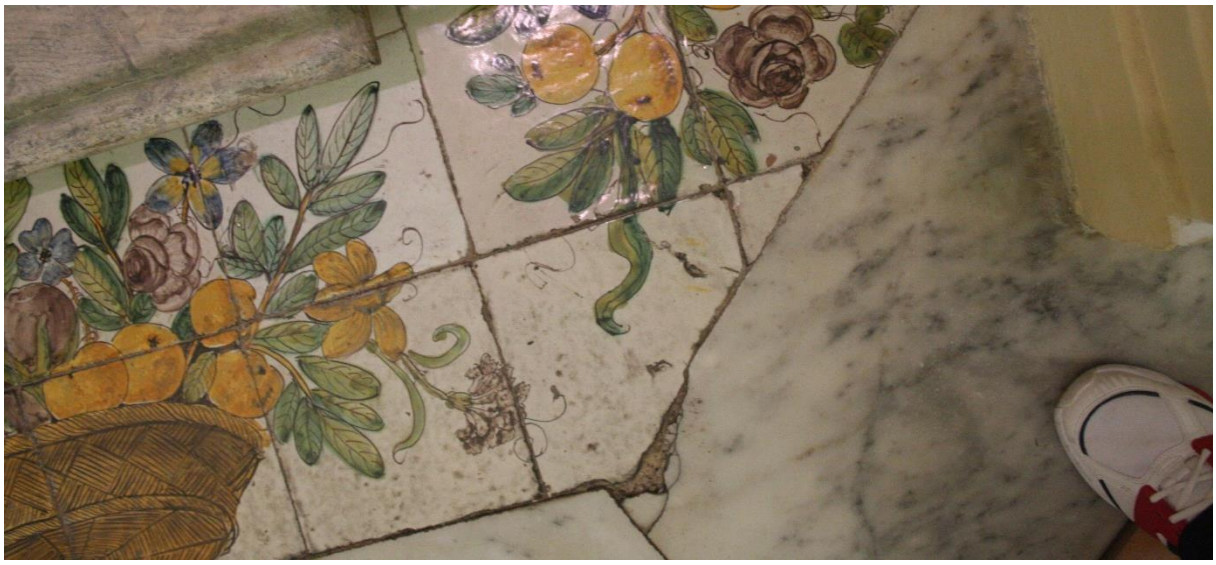


Fig. 6: Anacapri. Church of San Michele Arcangelo. Pavement of a minor chapel



Fig. 7: Ravello, Villa Rufolo, Flooring in Neapolitan riggiole (1856)

report the Neapolitan industry is explained in the terra cotte majolica and faience: "Of this branch of industry and of all the road that leads to the bridge, many things could be observed, but if we need to summarize, for the sake of brevity of our description, we will notice that many clay works are perhaps the part that provides the most usefulness and a little glory is the part of making the ground unsullied. The brick factories, with matt firing and glossy firing, with various designs, are almost a Neapolitan specialty, and when in other cities of Italy, starting with Rome, the floors of the houses were badly seen due to inequality and disconnection, the our Naples, even in small houses, had good floors. The study of archeology reveals to us that the Carthaginians, in ancient times, were very zealous in wanting to paved the streets and unstuffed the soils, and little Pompeja shows us even today the luxury of mosaic floors. We learned from it. Ancient Rome, it was said, followed Carthage in such a form of civilization. As the bricks of good furnace construction come from Gaeta to Naples and elsewhere, the Neapolitan bricks fill large and small ships every week and go away. The figuline of Giustiniani, Colonnese, Majurino, which can be seen on Via della Marinella, before the bridge, form an emporium of everything useful for domestic cleanliness. Tubs, pipes, pipes, toilets, balconies, columns, decorative statues, vases, are the dowry of these warehouses.

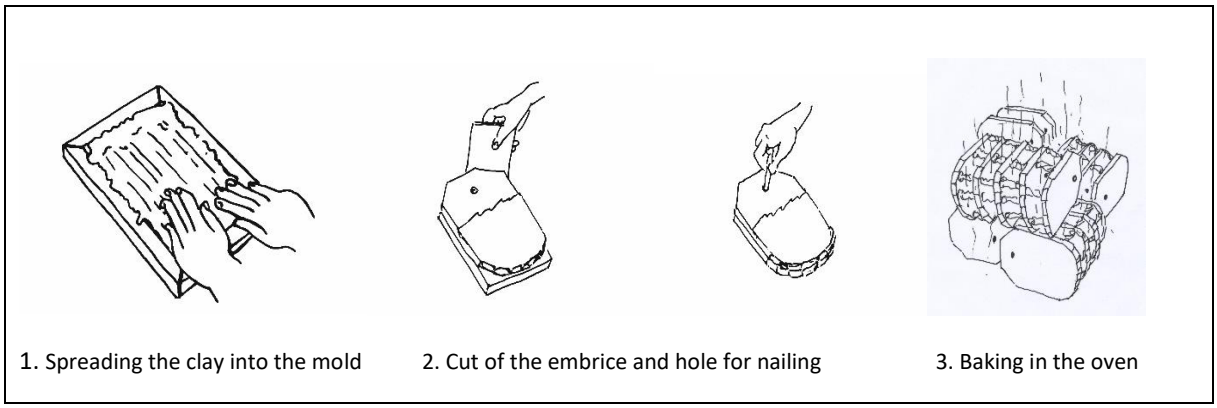


Fig. 8: Sequence of steps for the production of the riggiola for revestement of domes (drawings by the Author)

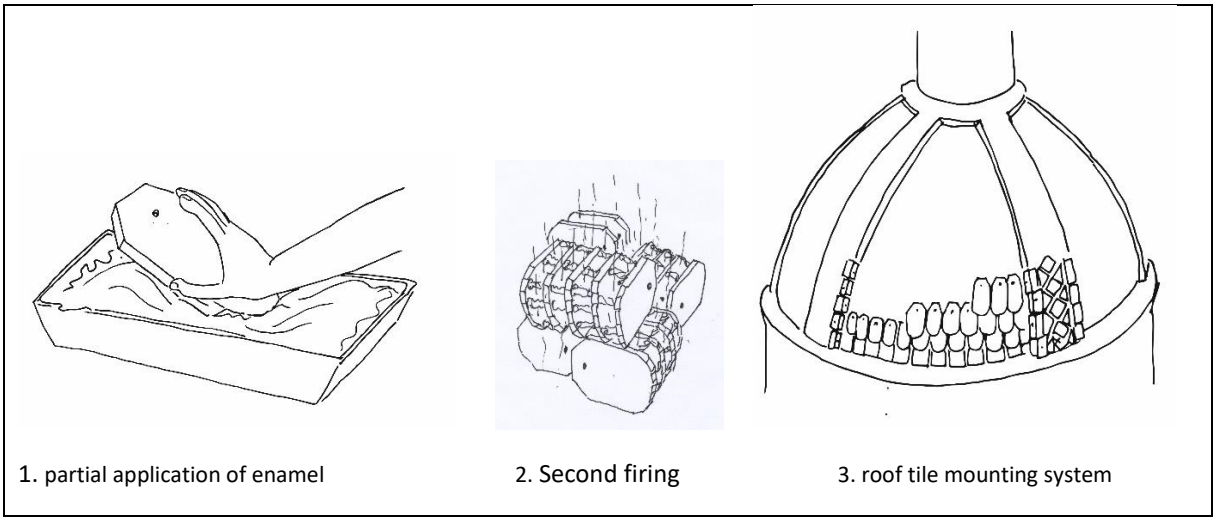


Fig. 9: Sequence of steps for the production of the riggiola for revestement of domes (drawings by the Author)

But to see how bricks are our specialty, the stranger would have to witness the immattonation of a room, and be persuaded of the great practice of our workers and the speed in placing, so that no other worker would be able to do so quickly ".

2.2 The necessary hygien

The Neapolitan hygienist Marino Turchi wrote: "Everywhere, in civilized Europe, there is a concern to solve in the most convenient way the great problem of building healthy, sufficient and cheap houses for the poor worker and his family. Gentlemen, the dwellings of these unhappy classes in our city are no less abominable. My nature shuns the habit of changing the part of historian into that of novelist: I observed before writing, and then I wrote what I saw. I walked the most obscene and obscure streets, visited the abodes of the poor and the worker, and I would like to have copy and virtue of words that would be enough to portray the horror and disgust that comes from that sight. I entered those warehouses, which we would better say pit of hell. There is something for everything; but in a small courtyard in Porto I reached 29, where the cholera of 1837 caused an infinite massacre! And then it was that those tombs were whitened by superior order! " (Turchi, *Due discorsi*… pp. 6-7)

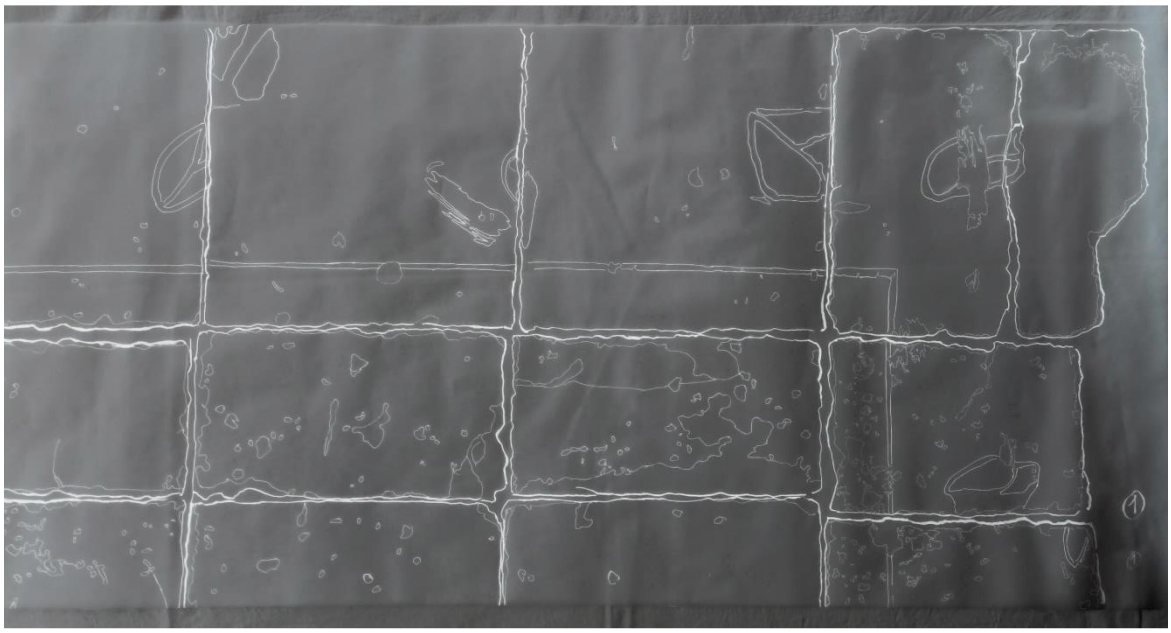


Fig. 10: Giugliano in Campania, Flooring in Neapolitan riggiole

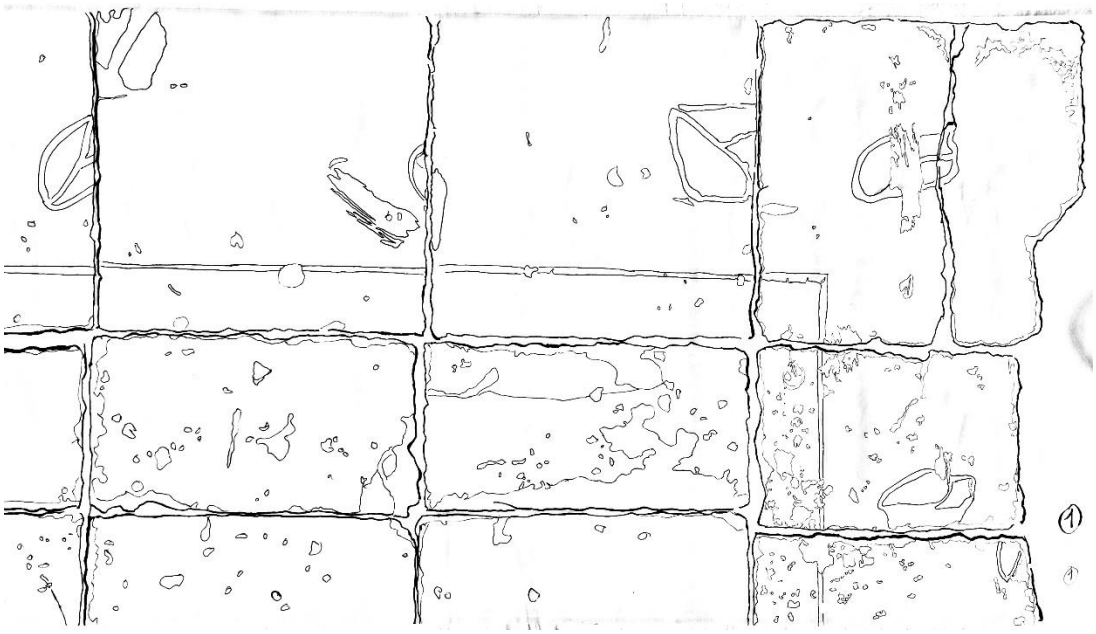


Fig. 11: Giugliano in Campania, Flooring in Neapolitan riggiole

«Lastly, a special mention must be made of the modification made by the Commission in the articles relating to the use of newly built houses and in the rules which the authority must comply with by granting the permit for habitability. It is known that in the course of this century the provisions on the subject were varied several times, also depending on the various political upheavals; however, all the ordinances issued in this regard, including also the regulation for the implementation of the general health law of 1865, always required a certain period of time to elapse from the completion of the walls and the completion of the plaster and floors before granting the license to live in the premises.



Fig. 12: Cimitile. Church of San Francesco Di Paola. Pavement

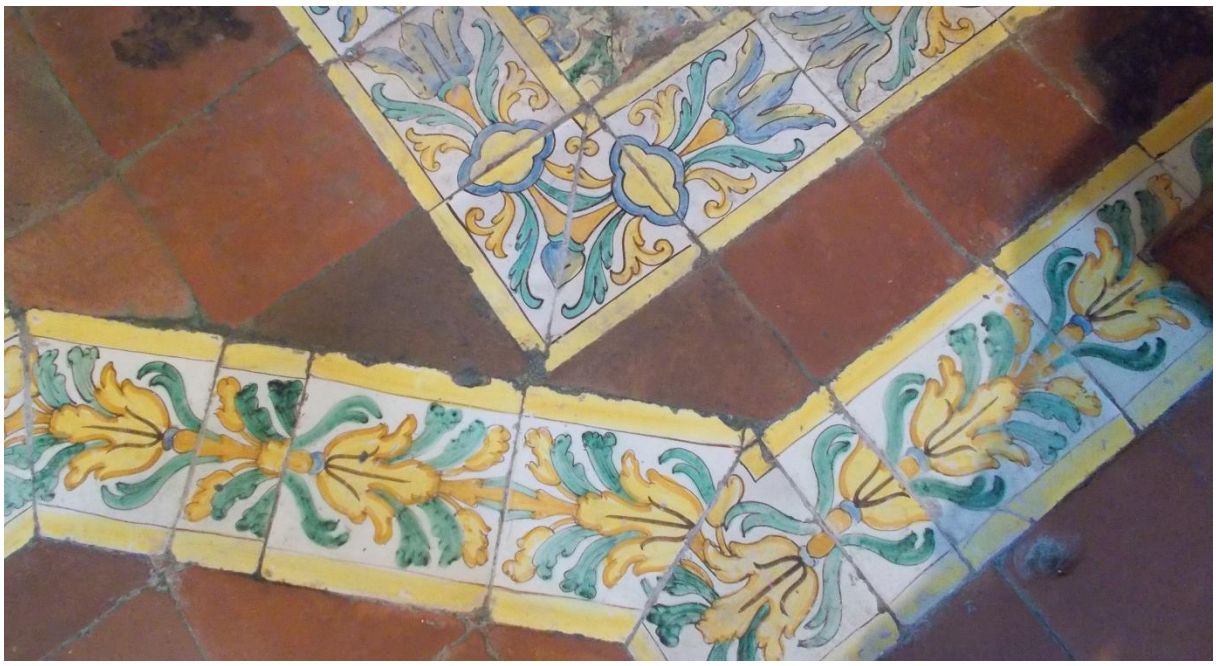


Fig. 13: Cimitile. Church of San Francesco Di Paola. Pavement

This compulsory period, in the aforementioned ordinances, varies from twelve to eighteen months for walls and from three to six months for plaster and floors» (*Progetto di Regolamento Edilizio*, p. 569). The hygiene of the house is strongly recommended precisely because the ancient floors, made with boulders of beaten conglomerates, absorbed all sorts of garbage and the constant absence of running water in the houses did not allow the cleaning and hygiene action determined by the washing of the surfaces.
The Neapolitan riggiola with its waterproof surface allowed the management of an apartment with greater simplicity in terms of cleaning and hygiene of the rooms.

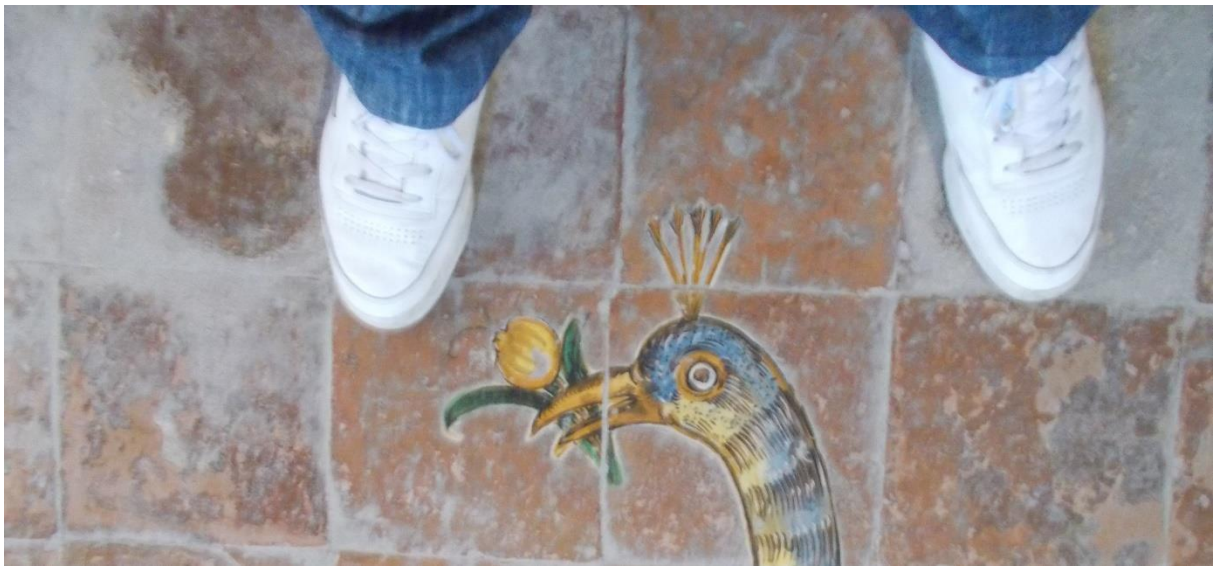


Fig. 14: Cimitile. Church of San Francesco Di Paola. Pavement

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Mapping green spaces and slow mobility connections in the city of Turin. Analysis and design strategies in the field of proximity tourism

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Abstract
In the period of Covid-19, the current research aims at exploring the proximity to essential services in the city, but also evaluating the spatial quality of slow mobility connections, in relation to daily movements, such as home – school, university - parks, or school - museum for leisure. Particularly, the actual pandemic situation forces us to reconsider the importance of the open spaces in our cities (i.e. parks, gardens, agricultural fringe areas) but also sports facilities and cultural polarities, as final destinations for proximity tourism and recreational activities. A better quality of slow connections can be a key factor in the field of urban mobility, but it can also influence environmental, social and safety aspects in a positive way. The research considers the city of Turin as a case study for the analysis, especially, the relationships between schools/universities and parks, museums and sports facilities. The research exploits the big amount of open-access geospatial data and the potential of GIS tools for mapping and spatial analysis, in order to analyze the availability of green spaces in the city and, at the same time, find out the slow mobility connections (shortest and fastest routes) between universities and parks. By analyzing the existing urban fabric, the research points out some indicators that can support urban design strategies for promoting more sustainable tourism. A series of thematic maps, at the urban and neighbourhood level, have been drawn to visualize the main outcomes of the research.

Keywords: proximity tourism, mapping, green spaces, GIS, urban analysis, slow mobility

1. Introduction
The actual pandemic situation has opened many reflections on the post-covid future of our cities, which are affecting many research fields: urban planning, economics, tourism, sociology, mobility etc. The covid-19 has led to a sharp reduction in our travelling outside the cities and it has forced us to use the proximity places for many different purposes (job, education, leisure etc.). Some urban-planning strategies, that have accelerated in the last year, seem to point towards a new model of the city: "15-minute city", which allows everyone living in a city to access to essential urban services within a 15-minute walk or bike (e.g. Hidalgo, the mayor of Paris, and other politicians around the world have announced the idea to change the city in a 15-minute city, where all residents can reach on foot or by bicycle all the services they need) [1]. Some of the most relevant benchmarks that can lead the re-thinking of the actual city model are related to the spatial distribution of essential public amenities, the availability of green spaces, the proximity to schools, universities, health institutions, stops of public transports, that are evaluated at neighborhood scale. Even in the field of tourism new strategies need to be re-defined. The post-crisis tourists will probably choose to travel to destinations closer to their place of residence for many reasons: less risky destinations, reduction of purchasing power, but also for a greater social and environmental awareness. [2]. In this perspective, new territorial strategies need to be re-defined, at the urban, metropolitan and regional scale, that can encourage new forms of proximity tourism, encouraging more sustainable tourism and enhancing the resources that are nearby our homes [3]. The current pandemic led us to make deeper analysis to evaluate the availability of green spaces in our cities, to re-consider the spatial distribution of services and places of interest, that, in the field of proximity tourism, can become the final destination of a half-day trip for citizens. Even the space *in-between* the origin and the final destination should be considered as a key factor, in order to improve the quality of the mobility experience through the city. The measurement of quality of walking experience

through a city is influenced by many factors such as: amenities, urban furniture, visual qualities of its built environment [4]. All our daily movements in the city: home-work, home-school, railway station-university, school-parks, school-museum, can be deeper investigated, in order to promote more walkable and bikeable streets. In some Italian cities, such as Turin and Milan, where many actions in terms of slow mobility have been undertaken in the last years, the pandemic has also sped up the realization of “light” bike lanes in order to encourage inhabitants in sustainable urban mobility, but also to avoid congestion of crowded cars and public transport. Another crucial point that the pandemic has revealed to us is related to the availability of public near-residential green spaces. In the city of Berlin, for instance, there are some rules at the city level that establish a minimum size of near-residential open space (0,5 ha), that should be reached in a short time (approx. 5-10 min. by foot), no further than 500 m [5]. The proximity of green spaces has a great value for many sections of the population, such as children and elders, but it can also play an important role in relation to the new needs of citizens, forced to smart working, such as employed workers and students that, during the workday, could be encouraged to go to nearby green spaces for leisure, even just for a short stay outdoor. In this framework, the current research, centred on the city of Turin, aims at investigating some places of the city, such as green spaces, sports facilities and museums, that, in the field of proximity tourism, could become the final destinations for inhabitants, students that come from universities and schools.

2. Turin case study: mapping green spaces, sports facilities and museums

The city of Turin has been selected as a case study for analyzing the relationships, in terms of accessibility, between schools/universities and green spaces, museums and sports facilities.

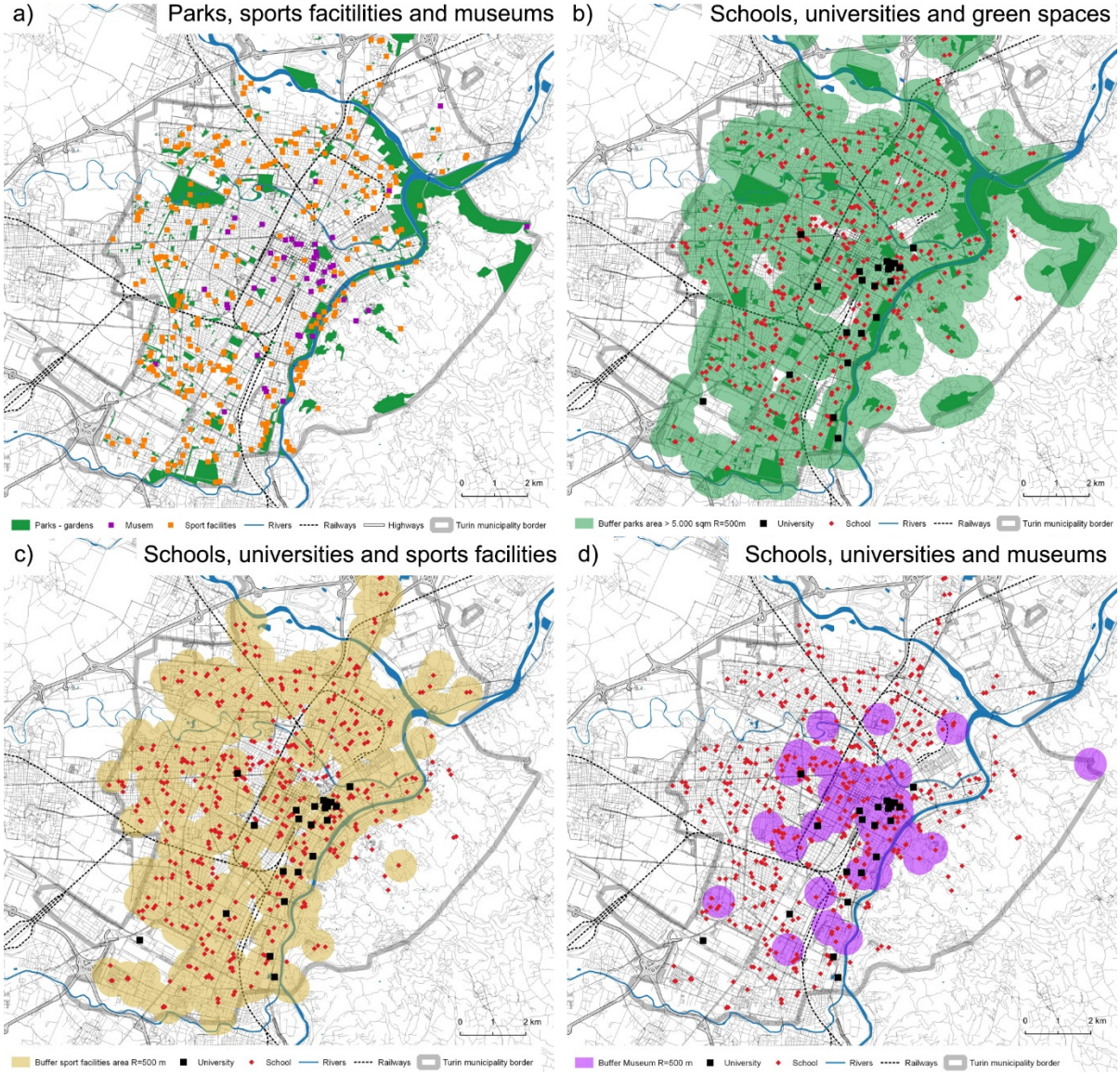

Fig. 1: a) Spatial distribution of parks/gardens, museums and sports facilities in the city of Turin. b) Proximity of schools and universities to green spaces larger than 5.000 sqm, within 500 m (buffer from the borders of the green areas). c) Proximity of schools and universities to sports facilities (buffer 500 m). d) Proximity of schools and universities to museums (buffer 500 m).

In this section, it will be analyzed, at the urban scale, the spatial distribution of these three typologies of places, that, can be enhanced thanks to the role they can assume in proximity tourism. The Green Infrastructure Strategic Plan, recently published by the Municipality of Turin, supply interesting data about the spatial distribution of the greenery in the city of Turin [6]. The green infrastructure of Turin, considering parks, gardens and river banks, has a long tradition in the city. The city is crossed by four main rivers: Po, Sangone, Dora Riparia and Stura. The plain is cut by the rivers, coming down from the western Alps, that are important ecological corridors and great resources for recreational activities. Even the hill, with its woods, on the east of the city, is a big green heart for the city. In the city of Turin, the first idea related to the fruition of green spaces for recreational activities can be dated back to the period between the ending of XVI and the beginning of XVIII century, when the nobles and the local middle class created around the city and in the hill a crown of villas and places for holidays and hunting activities. At the beginning of XIX the royal gardens, localized in the historical city centre, were in the only green space in Turin. During the French domination a series of green boulevards were created outside the walls and during the XIX century started the works for the Valentino park, the Sambuy garden, the Cavour gardens. The main parks and gardens that today are accessible, belong to the XX century and to the recent history of the city. Nowadays the green spaces, publicly accessible, are 18.200.000 sqm (14% of the Municipality surface), which corresponds to 20 sqm/inhabitant, above the European average (18,2 sqm/inhabitant), more than double the recommended minimum threshold by the World Health Organization (9 sqm) [6]. In the current research the analysis, at the city scale, has been performed with the main aim of investigating the proximity of schools and university, to green spaces, sports facilities and museums, within the municipality of Turin. The big amount of open-access geospatial data, available through the municipality geoportal and open street map datasets, allow mapping the data by using GIS techniques [7].
In the fig.1a, it has been shown the spatial distribution of green spaces (parks, gardens, riverbanks) available for recreational activities, with the overlapping of the museums and sports facilities, that can be considered, especially in the period of Covid-19, as a system of places, reachable by students of different ages with low efforts, on foot or by bicycle, according to the idea of proximity tourism. In the fig. 1b, it has been analyzed the proximity of schools and universities to green areas. This analysis, at the city level, has been performed by applying a buffer of 500 m from the borders of green spaces that are larger than 5.000 sqm. The map shows a high coverage of green spaces in the city. 97% of the universities, located in Turin, can access a green area larger than 5.000 sqm within 500 m. 96% of the schools can access a green area larger than 5.000 within 500 m. In fig.1c, it has been analyzed the proximity of schools and universities to sports facilities (swimming pools, gym, football pitches, tennis courts, climbing gym, boating centres etc.). The analysis, at the city level, has been performed by applying a buffer of 500 m from each sports facility. 97% of the universities can access sports facilities within 500 m. 90% of the schools can access sports facilities within 500 m. In the fig. 1d, it has been analyzed the proximity of schools and universities to museums. The analysis, at the city level, has been performed by applying a buffer of 500 m from each museum. 81% of the universities can access a museum within 500 m. Only 33% of the schools can access a museum within 500 m. In fact, museums are more polarized in the central part of the city than in the peripheral areas. Nevertheless, some exceptions are located in outskirt can be considered interesting opportunities for those districts in the field of proximity tourism. Furthermore, it has been performed also the analysis in order to investigate the proximity of schools and universities to the three typologies of places (green spaces larger than 5.000 sqm, sports facilities and museums). The results of the last analysis show that 81% of the universities can access all three types of places because the locations of most universities are polarized in the central part of the city. Only the universities that are farther from the city centre (e.g. the faculty of medicine, the University campus along the river Dora, the faculty of economics and most of all the Polytechnic Citadel of Design and Sustainable Mobility located nearby the Fiat Chrysler Automobiles factory in Mirafiori), cannot access to three typologies of places that have been taken into consideration. The analysis of three typologies of places has been also applied to the schools. Only 27% of the schools can access, within 500 m, parks, sports facilities and museums. While most of the universities are located in the central part of the city and can more easily access the museums, the schools are spread over the whole municipality area and they cannot access the museums in the same way.

3. Slow mobility connections between university and parks

This section is focused on the slow mobility connections, between university and parks. The availability and the proximity of places of interests, cannot be the only factor to analyze, in relation to leisure. It is also important to consider the quality of the mobility experience, moving through the city, between the origin and the destination. Several factors can influence the pleasantness of the experience through the city: the availability of a safety infrastructure (e.g. sidewalks, cycle paths), the attractiveness of the route (presence of trees, low traffic and pollution, shading, quietness of the urban environment, valuable elements of the landscape such as waterways, historic buildings), the directness of the route, without

wanderings, the comfort of the route (pavement typology, shadings, slope etc.), the level of integration of the route in the transport network (number of intersections with other routes, interchange with other means of transport).

3.1 Methodology

In the current research, the cycle connections between the Faculty of Engineering of Politecnico di Torino, localized in Corso Duca degli Abruzzi and the surrounding green spaces, have been analyzed. The analysis has been performed by defining an isochrone of 10 minutes by cycling regular. The isochrone allows determining the playground of the analysis in term of space to investigate. From the map shown in fig. 2a it is visible the existing cycle network and the green spaces that are localized in the surroundings of the Politecnico. The analysis has been carried out, by considering the size of the green areas, but also the time to reach each area. An isochrone of 10 minutes cycling, without considering any time for stops and crossings, means covering more or less the distance of 3,0 km in the city (speed average 12 km/h). The second parameter that has been considered, corresponds to the size of the green area. It has been set the threshold for the green spaces to 25.000 sqm, that is the area of a medium-sized urban park. This threshold allows considering as the final destination only the most significant green spaces, by neglecting the smaller ones, that are not so relevant to justify the movements by bike. The analysis has been performed both for the fastest route (considering the minor time as possible) and for the shortest route (considering the minor distance). The analysis has been performed by using GIS tools and the open route service plug-in [8], available in the GIS platform.

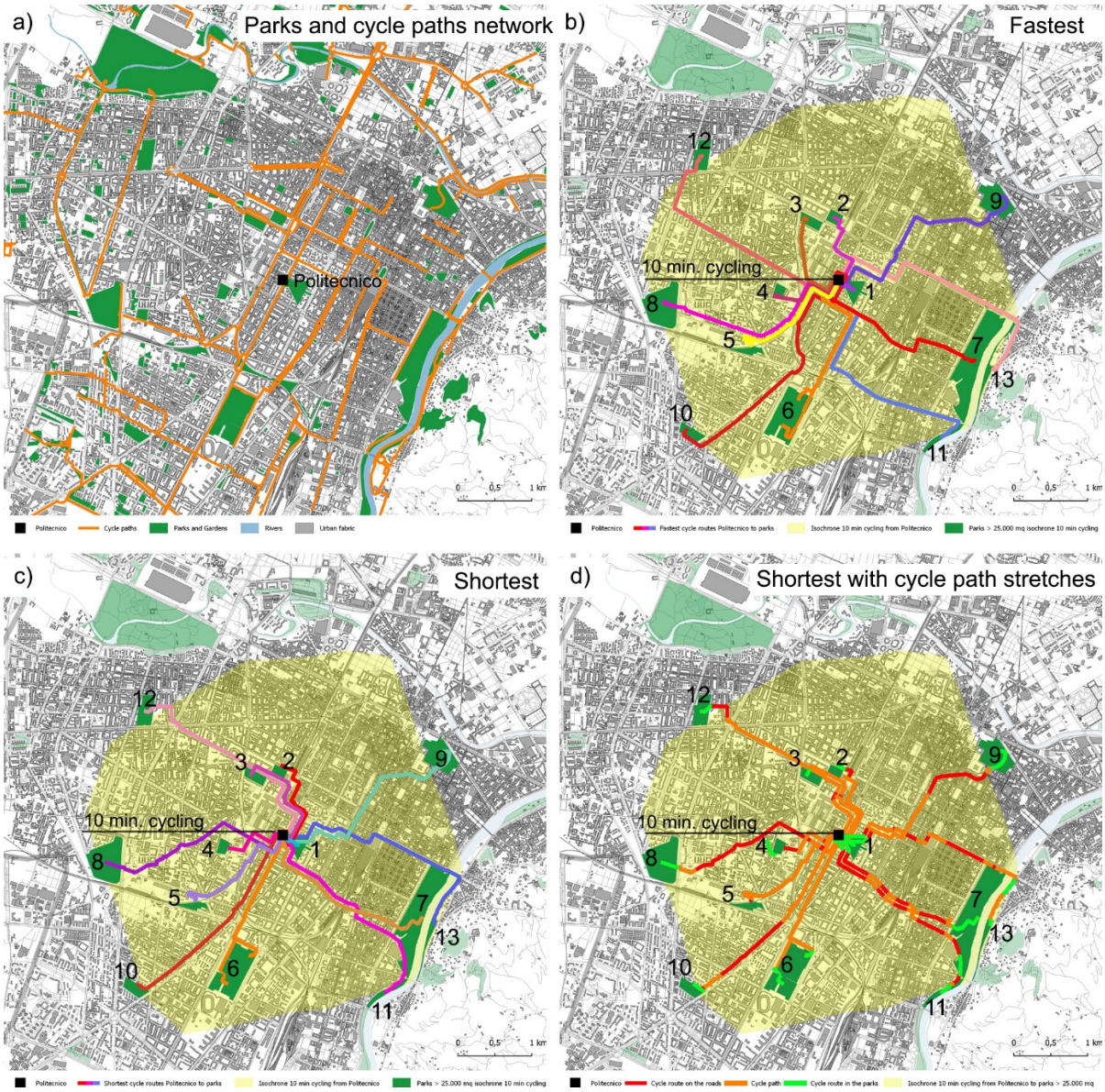

Fig. 2: a) The location of the Politecnico di Torino, with the existing cycle paths network and the surrounding green spaces. b) the fastest routes that connect the Politecnico and the surrounding green area. c) the shortest routes that connect the Politecnico and the surrounding green area. d) the shortest routes with the cycle path stretches.

3.2 Outcomes

The proximity green areas, that are reachable within 10 minutes of cycling from the Politecnico, are 13 and they are listed in the table below (fig.3). The fastest routes, shown in fig.2b, are drawn along the network of main straight boulevards of the city of Turin (e.g. Corso Peschiera, Corso Galileo Ferraris, Corso Orbassano, Corso Ferrucci, Corso Dante Alighieri), that have been designed for the fast mobility by car and where there are no cycle paths. The shortest routes, shown in fig. 2c, on the contrary, seem to be more coherent to the slow mobility needs and follow the network of the existing cycle paths. The map, shown in fig.2d, shows the overlapping of the cycle paths stretches along the shortest routes, which makes evident the portion of the cycle paths along the whole routes. From the map in fig. 2d and the table in fig.3, it is also evident which are the green areas reachable from the Politecnico through a higher percentage of cycle path stretches. Without considering the pedestrian area of Piazzale Duca d'Aosta, in front of the main entrance of the Politecnico, which cannot properly be defined as a park, the other relevant parks that are well connected by cycle paths are the Parco Cavalieri di Vittorio Veneto (95% cycle path), the Parco Artiglieri d'Italia with its sports facilities area of the Cit Turin (93% cycle path), the Giardino Grosa between the Porta Susa high-speed railway station and the Palace of Justice (91% cycle path), the Parco della Tesoriera, localized along the Corso Francia, with its baroque villa and the monumental plane tree (82% cycle path). On the other side, the analysis makes evident that the cycle connections of the Politecnico with the eastern parks of the city (Valentino park, the green spaces along the riverbanks of the Po) are still weak. This is certainly due to the barrier of the railway, that crosses the city untill reaching Porta Nuova railway station, that does not facilitate the connections in the east-west direction. Even the cycle connection to Giardini Reali, in the historical city center, is partially available by a cycle path, but it fragments itself in the historic urban fabric. In the synoptic table below (fig.3), the lengths of the slow routes have been also related to the size of the parks, and to the number of trees that are perceivable along the routes. This synthetic representation allows comparing simultaneously the proximity green spaces, by visualizing different indicators, that can be helpful to users in the route choice. By analyzing the percentage of the cycle path along the route, the number of trees per kilometre and the size of the park, it is evident that the Parco Cavalieri Vittorio Veneto seems to be the most reachable green destination for students that, from Politecnico, want to use the park for recreational activity.

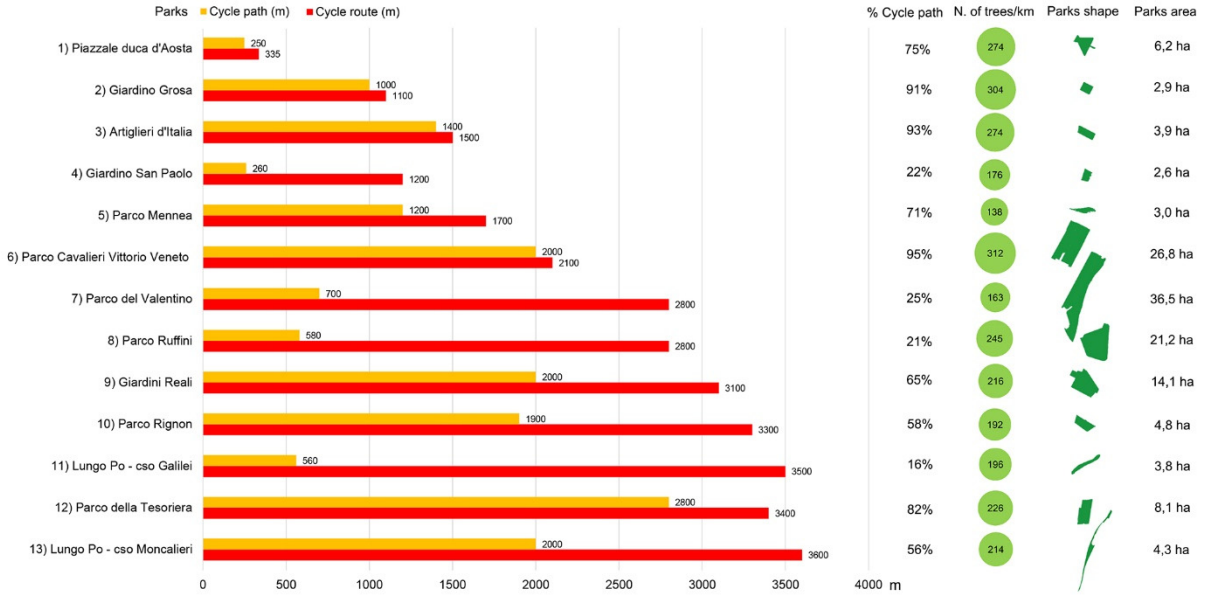

Fig. 3: Synoptic table. Comparison between the slow routes connecting the Politecnico di Torino to the surrounding green spaces, by applying the isochrone of 10 minutes cycling regular. On the right the percentage of cycle path along the route, the number of trees per kilometre, the real shape of the parks linked to the size;

4. Conclusions

The research has analyzed, in the city of Turin, the proximity of schools and universities to green spaces, sports facilities and museums, that can be considered as the final destination for proximity tourism, in relation to the current movement limitations due to the pandemic. This kind of destinations can be effectively considered as resources for proximity tourism. A half-day visit to a museum nearby the school or our home can be a successful experience in this period, as well as the enhancement of the slow mobility connections towards green spaces in the city can become part of an urban agenda for the post-

pandemic future. In terms of methodology, further developments of this research can be addressed by increasing the number of indicators for a deeper evaluation of the quality of the slow connections (e.g. valuable elements of the landscape, landmarks, historic buildings, the complexity of the facades, the width of the sidewalks, pavement typology etc.). Image segmentation models can be applied to this issue, in order to detect automatically the most valuable elements of the urban landscape.

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The regeneration of peripheral spaces. The case of Borgo La Martella in Matera

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Abstract

By 2030, almost 60% of the world's population will live in urban areas and this fact, which in itself contains many other facets, shows that urbanization underway is one of the transformative trends of our century. The regeneration of the suburbs is an urban "challenge", but above all a social and environmental one. The theme of suburbs and their living becomes central again because they often represent the “city within the city” and travel at different speeds from consolidated urban centers, often representing places where numerous resources are wasted or not adequately exploited.Regenerating these spaces means re-establishing a social and environmental balance, giving value to those “urban voids” waiting to be at the service of the community and which unfortunately are associated with degradation and discrimination. An integrated and no longer sectoral vision of the qualities of spaces burst forcefully into the current scientific debate. Regenerating these places can be, as they have been in some cases in the past, an opportunity to offer the city new spaces for relationships, involving the citizen more and more and proposing a policy of positive reuse and transformation rather than land consumption. and uncontrolled urbanization. The working group will bring to attention the case study on the "Borgo la Martella" of Matera with the "aim of grasping the positive values of peasant civilization and inserting them into a reformist process of development".

Keywords: inclusiveness, integration, regeneration.

1. Matera. Towards an integrated and sustainable city

by Domenico Passarelli

The city and the man-made territory, in industrialized countries, represent the result of an economic model that in the last 100 years has had an immeasurable growth in the consumption of energy, materials, non-renewable resources and land but also waste, producing environmental pollution of all kinds. It will be necessary in every field to reverse the course, bringing every action back into its own territories within the culture of sustainability. The city, therefore, needs to be rethought and redesigned according to a new scientific and cultural approach. It is widely believed that contemporary urban planning must face problems and different needs from the past in order to give immediate responses to the changes taking place: social, economic, disintegration and widespread poverty by placing the common welfare on the profit of the individual as a priority in the name of future generations. Today we need a new awareness, a new responsibility, a new urban culture. A new way of planning the territory in defense of the common welfare, which first of all means preserving the historical and cultural heritage, guaranteeing the equitable distribution of human rights and evaluating the consequences of transformation interventions on the territory. Hence the need to elaborate an idea of the contemporary, of how we want to re-build, re-generate the cities of the future and protect the landscapes and how a new design culture can become the road and the engine of this vision. In a contemporary world, objective indicators of well-being are no longer sufficient to express people's well-being, which increasingly depends on non-monetary elements: living in a healthy environment, ensuring proper movement, living healthy and so on. In compliance with these objectives it is necessary to satisfy the qualitative development of a Community which is essentially an improvement in the quality of life, protection of the ecological balance for all the "subjects" of the ecosystem and, search for the satisfaction of specifically "post-materialistic" needs or of a spiritual order. The above leads to particular attention to the general criteria with which we can evaluate "quality": we move from a neoclassical approach in which the value of an asset was determined by its market value (total economic value) to the notion of the quality of life and at the level of satisfaction of needs (Complex Social Value) in which a plurality of conditions are satisfied. An asset intrinsically possesses a value that cannot be traced back only to the economic sphere.

2. Agenda 2030. Sustainable Cities and Communities

by Ferdinando Verardi

The eleventh goal of the 2030 Agenda aims to make cities and communities sustainable. Although it highlights the situation of cities that now welcome about 60% of the world population, this goal is broadened to extend access to essential services to all, a sustainable and resilient home in a green environment, the safeguarding of cultural heritage. , protection from disasters. Understanding how the city is or how it must be organized, to respond to which social needs, with respect to which set of values and meanings, constitutes one of the main objectives of public policies and support research. The future of studies on the quality of urban life is therefore strongly linked to the possibility of combining the principles highlighted above from a methodological point of view. Just as degradation generates degradation, favoring attitudes of neglect or worse vandalism in people, so the presence of well-kept and decent environments not only contributes to improving the quality of life, but also generates behavior of responsibility and collective care. National and international environmental policies, and especially the European Landscape Convention, increasingly recognize the strategic importance of urban and peri-urban spaces, capable of generating jobs, attracting investments and increasing the quality of life of European citizens. It should be remembered that regeneration represents, first and foremost, an opportunity to solve problems such as the identity of a neighbourhood and the lack of public spaces whose objectives are attributable to: the safety, maintenance and regeneration of the building heritage public and private; the drastic reduction of land consumption and waste of buildings, energy and water; the revaluation of public spaces, urban green areas, neighbourhood services, the rationalization of urban mobility and the waste cycle. Urban regeneration, therefore, as a new intervention strategy on the existing city that concerns not only interventions on individual buildings, but parts of the city, on degraded or underused "urban fabrics".

3. Urban planning changes, the Company changes

by Ivana Carbone

<<It is precisely in the cities, in fact, more than elsewhere, that the differences of society are diluted and amalgamated and the diversities coexist until they become values[1]>>. And the evolution of the city is inevitably a reflection of society and an expression of its changes over time. Some important questions emerge that intend to deepen both the relationship between urban space and user, and the role of technology in the "passage" between the contemporary and historical city, such as: can the city still be understood as a mirror of humanity? How much technology favours the nature of places and how much is the urban balance bending to market rules and the emerging virtual needs of the community, rather than solving their real and priority ones? The evolution of the city then could not fail to be configured as an entity open to communication, capable of creating connections and sharing, constituting, in fact, a "system". Recent US studies on the happy habitat highlight how social connections actually increase the appreciation of an urban space, underlining a preference for places crowded or populated with gazes, because they are perceived as safer. Other researches highlight how the psychologically reassuring characteristics, despite being able to promote well-being and generate in the user a sense of security that leads to rediscovery, remain linked to exquisitely contextual aspects, intrinsic to the physical consistency and identity of the city. The enhancement of the "materiality" of the contemporary city is in tune with the results of Richard Florida's[2] theory that, in *Who's Your City ?,* puts a physical place in relationship with the personality of its inhabitants. In fact, the creative economy is making *"where to live"* the decisive choice, strictly influenced by lifestyle, together with the offer of services and infrastructures, and aesthetics. According to Jan Gehl, for example, urban architects should take care of people first[3]. The latter, directing his research and his work in the direction of the attractive city on a human scale, promotes a positive relationship between the inhabitants and the urban context, starting from the belief that the structure of the city has an impact on the life of those who live there. The working method starts from a collection of data, where empirical experience most of the time gives surprising results. Urban planning should therefore always start from the needs of man. The real user of the space, the inhabitant with his "anthropological roots" and attitudes, could find a central role in the design choices[4], especially in the light of a European culture that should possess the << gift of understanding the complexity of things[5] >>, with a history full of stratifications and beauty.

4. Matera and the Borgo “La Martella”. Perspectives for sustainable development

by Luigi Acito, Ferruccio Lione

It is history that Matera in the fifties of the twentieth century becomes the center of elaboration of proposals in the field of urban planning, architecture and agricultural economy, which go beyond the boundaries of the local situation and invest, with all possible contradictions, the most general question of the southern peasant world and the prospects of redemption from underdevelopment. The attempt to shape a new "modern" city was not only a utopia but, in part, a prototype of a "city of the fifties" as was Olivetti's Ivrea. The city, pointed out by Togliatti (1948) and De Gasperi (1950) as "national shame", opens up to contributions from scholars and external specialists gathered in Matera by that "great inspirer" who is the engineer from Ivrea and assisted by referents inaugurating a season of great ideal tension and interdisciplinary work that will mark the development and modern history of the city. The presence in Matera and in the province of personalities such as Ettore Stella and Rocco Scotellaro and of external scholars such as Frederick Friedmann[6] and Nallo Mazzocchi-Alemanni[7],

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[6] FRIEDRICH GEORGE FRIEDMANN (1912-2008), born in Augsburg, of Jewish origin, took refuge in the United States during the Nazi period. After the war, he obtained a scholarship for Italy under the Marshall Plan. It is Carlo Levi, whom Friedmann had met through reading "Christ", who directed him to Basilicata and directly to Rocco Scotellaro, mayor of Tricarico.

lead Olivetti to choose this city to extend the community and planning experiences already started in the Canavese to the South. It is precisely the agricultural economics studies conducted by Mazzocchi-Alemanni that set the basic conditions for realistically thinking about the rehabilitation of the Sassi, providing for the displacement of its inhabitants in the Matera countryside, in new residential villages, unlike what is indicated by the Reformation Authority which strongly supports scattered settlements. In May 1950 Olivetti was in Matera together with J.D.Zellerbach, delegate of the United Nations and High Commissioner for refugees, to start the construction program of 200 housing for the homeless, financed by the ERP (European Recovery Program) and managed by the American mission ECA (Economic Cooperation Administration) as part of the Marshal Plan. Olivetti met Stella, the "modern" architect of Matera, and announced to him the assignment of the design of the two hundred apartments, to be built outside the city and in a short time to fully and quickly implement the Sassi decongestion program . In a short time Stella set up the urban plan of the new village according to the community intentions advocated by Olivetti, but the premature death of the young architect, which took place on 10 February 1951, interrupts the work of defining the project. From this moment on, the urban and architectural history of La Martella took another path. In fact, the urgency to start building the houses requires a diversion of the design assignment of the new village to two Roman urban planners who are already working in the Lucanian area: Federico Gorio and Ludovico Quaroni. Built a few kilometers from Matera, the village condenses in its articulated urban structure and in the reinterpretation of the "neighbourhood unit" the ideal of a new urban and social structure that is to be similar to that of the Sassi: a peasant village within a structure urban planning with a popular but in some innovative way, which exploits the concept and the Anglo-Saxon theories of the Neighbourhood Unit. In the heart of a rural reality in southern Italy, an attempt is being made to apply, according to Olivetti's wish, a North American model derived from the experiences of the Tennessee Valley Authority. The resulting urban layout focuses on the collective services with the dominant church and the civic center, and the houses arranged along winding streets which, following the orography of the place, determine a rich articulation of the neighbourhood-spaces. Among the rows of houses, large free spaces constitute the system of gardens connected directly to the houses to be assigned to individual families. The housing units, contained in rectangular cells, in their arrangement alternately along the long side of the rectangle or the short side, determine a rich articulation of the elevations and external spaces. The yard in front of the house is both a private space and a space for relationships. The Church is the most important collective building from a symbolic and representative point of view. It has a single hall, with no apse or bell tower. It is the rural landscape and the simplicity of peasant life that suggest the composition of an architecture and a human interior space, elementary and essential, which has the property of speaking directly, of immediately arousing sensations and feelings.

5. Return to “La Martella”

by Luigi Acito, Ferruccio Lione

Today, renovation and conservative restoration works are being carried out in the civic centre of La Martella, financed by the *“Urban development contract of the National Plan for the Cities. A "return to La Martella"* of the urban community of Matera, 60 years after the *memorable 1952*, this time on the basis of a *recognition of value* that is inscribed in the more general process of redemption and enhancement of the historical-cultural quality of the city, today the European capital of culture. We return to La Martella therefore, with a very different soul from that which has characterized the use of the structures of the Borgo, and its "civic center", in recent decades: an often improper use, if not a non-use (abandonment), the result of the overt "failure" of the Olivetti utopia of the *"Community*" that should have animated those structures. This new approach to revitalizing the Borgo aims above all to recognize its value as a *significant historical testimony* of the rich and Beyond the historical significance of the urban-cultural and social process that led to the construction of Borgo La Martella to welcome the farmers of the Sassi di Matera, the buildings of the Borgo must be recognized with a high architectural, technical and aesthetic value, as well as documentary, to be safeguarded. through an operation of "restoration" and reuse compatible with their survival. There is more: *Borgo La Martella is still happily inhabited*, and its inhabitants are clamoring for the use of collective architecture, which in this case are the square, the cinema, the theater, the library, that is the " *collective themes* ”of an agora today subject to phenomena of decay and obsolescence. The project envisages, among other things, the recovery of the original library, of the open-air cinema, a precious testimony of a type of space for film projections, now obsolete, but very widespread in the 40s of the last century for the

[7] NALLO MAZZOCCHI ALEMANNI, agricultural economist receives from the Consorzio di Bonifica di Bradano and Metaponto the task of studying a general plan of interventions for Matera, included in the context of a healthy agrarian reform for the whole South

"all 'open' of the seventh art: a typology that could be re-proposed today by making its originality a distinctive factor among the summer film arenas. The revitalization project of the civic and community center of La Martella can be completed only when all the publicly owned buildings including the village theater return to full availability and use that the Quaroni group assigned them: only then can we say that we are, knowingly and definitively, "back to La Martella". And this is certainly the primary objective of the project that the municipal administration is carrying out with the aim of *"restoring architectural and urban quality to the vital center of Borgo La Martella, and with it, to the entire urban reality of La Martella, over the years profoundly changed compared to the conditions that had guided the original choices of the Olivetti group ".* A complex operation of "urban regeneration" that will be able to culturally revive the Borgo de La Martella, today << withered flower of Italian urban planning[8] >>, and project it into a much broader dimension of enhancement of its identity, in the bed of the initiatives worthy of the European Capital of Culture 2019.ried production of *"modern architecture"* that characterized Italy before and after the Second World War.



Fig. 1: "Borgo La Martella", design by L. Quaroni

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Reform of healthcare organizational models in Italy: study and evaluation of development processes. The strategic role of distance learning.

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Abstract
The distance learning sector that has been growing strongly for several years in 2020 has had an exponential growth becoming a practice acquired in all Italian universities. During the pandemic, something unimaginable until a few months ago was possible: to carry out a mass experimentation of distance learning both in schools and universities. This experimentation seems to have opened the doors to a new modality, known as blended learning, which will surely characterize the near future. The objective of this work is the deepening of the opportunities offered by the new telematic tools and distance learning to fill up the existing training gaps and obstacles to achieve full interdisciplinarity, as well as to enrich the knowledge and operational background of those professionals

Keywords: distance learning, territorial promotion, health organization systems

1.Introduction

The opportunity for an overall rethinking of the organization of the health and social health services network following the Covid-19 pandemic, as stated by the main national and international observers and as initially included in the "Relaunch Decree" but then in all subsequent regulatory documents , is a unique opportunity to bring together many reflections that have emerged in recent years. Until today this is missing and much needed in this pandemic phase. With a view to promoting the area, in particular, some lines of development have been identified that we must consider essential to accompany a process that can be considered truly modern:

1. Development and enhancement of new technologies such as telemedicine, digitalization of care pathways, interoperability of information systems;
2. Renewal of the financing systems for social assistance paths, today highlighted as a mere sum of services and instead identifying unitary schemes for taking charge, in order to favour the integration of services and continuity of assistance;
3. To enhance together with medical knowledge also those of patients, OSS caregivers and all the figures involved in the assistance process in the area;
4. Involvement of all health professions in the care process and displacement of traditional "hospital" professions on the territory and aggregation of the same in analogy with what has already happened for general practitioners.

In this perspective, the choices of governance and planning tools, made by the various Regions to guarantee the necessary structural and / or functional integration processes, starting from the stratification of demand and the identification of the target sub-populations, as a condition of address of the taking charge. At the same time, more and more personalized care profiles are taking shape, through the adoption of Individual Care Plans (PAI) and Personalized Care Plans (PAP), especially for the benefit of patients in conditions of higher health and social care complexity. The creation of multi-professional teams and the expansion of the traditional concept of the Casa della Salute, involves a qualitative leap in the individual professions, today excessively focused on the hospital dimension or scarcely accustomed to working as a team, requires a profound rethinking of university and professional career paths and continuous training. The objective of this work is the deepening of the opportunities offered by the new telematic tools and distance learning to bridge the existing training gaps and obstacles to achieve full interdisciplinarity, as well as to enrich the knowledge and operational background of those professionals who were the most involved in the past through the hospital paths and today transferred to the territory. As the context changes, it is in fact necessary to have an adaptability of professionals called not only to know the new areas of their profession, but the basic elements of the professions with which they will have to interact and confront. The experience gained in this pandemic phase helps in this too. The introduction of distance learning, up to now an almost exclusive field of telematic universities, and largely excluded for the health professions, has led to a breakthrough both in the way of teachers and students.

2. Background and analysis of the reference literature

An element of correlation is given by the development of the educational process of the elements of higher education, as laboratories of knowledge (lifelong learning). Briefly, in recalling the genesis of the university system in Europe, the latter were born in the early Middle Ages and, among the oldest in the world, there are several Italian universities: Bologna, founded in 1088, Padua, in 1222, and Naples, established in 1224 by the will of the Holy Roman Emperor, Frederick II of Swabia. In the same period, many other universities were established, such as Oxford, Paris and Prague, and this probably contributed to making Europe, as a whole, the cradle of Western culture. Over the centuries, despite their long evolution, universities have substantially retained their functions: on the one hand that of disseminating advanced knowledge and on the other that of serving as a place for study, comparison and experimentation for the search for new knowledge. In recent decades, however, a “third mission”, wider and more complex to define, has been added to the two "traditional missions", which includes a series of activities. The basic idea goes back to Clark Kerr, professor of industrial relations at Berkeley and dean of the University of California who, in 1963, used the term "Multiversity". According to Kerr, the University should have mixed with society, come into contact with the territory, generate new forms of engagement (Sigurdson, 2013). In The Uses of the University (2001), Kerr traces the most important stages of this process. Today Kerr's intuitions seem to have finally found the right dimension, as evidenced by the presence of several studies that have focused on the relationships between universities, the business fabric, the government and the territory as a whole. In fact, some research papers analyze the role of the University as a pivot to orchestrate the

activities of entire regional innovation ecosystems (Thomas, Faccin and Asheim, 2020), other contributions have looked at the process of co-creation of value and resulting sustainability from these reports (Trencher et al, 2017), still others have focused attention on the success factors of science and technology parks (PSTs), built around the Triple Helix Model, of which universities represent a fundamental component (Guadix et al. , 2016; Leydesdor and Meyer, 2006). First, the technology has allowed researchers to increase their efficiency and productivity, drastically reducing the time and costs of communicating and retrieving data and information. Moreover, unlike what happened until a few decades ago, today researchers of any discipline can participate more easily in international working groups and collaborate with other universities and research centers, even geographically distant. Secondly, innovation has allowed some universities to make very profound changes also in terms of the provision of training services. Harvard and Stanford have long offered online study courses, and telematics universities in Europe have also grown significantly over the past decade. Of course, moving the provision of training courses to e-learning mode is a complex process that encounters numerous barriers: financial (due to the huge investments required), technological (to offer students high quality services), legal-institutional (all in order to obtain the necessary authorizations from the Ministry and the competent authorities) and psychological (to "convince" students, businesses and the market of the value of the training offer). On the other hand, the introduction of study paths delivered electronically, whose legal value is equivalent to that of qualifications obtained at traditional universities, also produces positive effects. These benefits concern both students, who enjoy greater flexibility, reduction of bureaucracy and costs of accommodation and transport, and the market as a whole: increase in the variety of the offer (students can choose between traditional and online training), effects redistributive and underutilized capacity saturation (students-workers, disabled, or who live far away from traditional universities, and who probably would not have been able to study, now have a chance to do so).

3. Distance learning and the health professions: reflections in the light of the pandemic.

The distance learning sector, which has been growing strongly for several years in 2020, has experienced exponential growth becoming a practice acquired in all Italian universities. During the pandemic it was possible, it was able to show a strong resilience, while most of the traditional universities found themselves unprepared to transfer the training offer on technological platforms. The current pandemic has allowed something unimaginable until a few months ago: to carry out a mass experimentation of distance learning both in schools and universities. This experimentation seems to have opened the doors to a new modality, known as blended learning, which will surely characterize the near future. The application of online teaching methods to the whole subject of vocational training is also interesting. Even if before the pandemic phase these were widely used in the last two years, they have become the exclusive mode with repercussions on costs and learning times of absolute interest. Continuing Education in Medicine (E.C.M.) is provided for all health professions. In fact, ECM credits represent in numerical form the system with which the health professions must provide for their own need for updating from a clinical, organizational or public health point of view. This training method is essential for renewing, updating or increasing one's wealth of theoretical and practical skills, having value for the whole national territory even in the course of regional accreditation of the provider (Universities, Scientific Institutes of the National Health System, Orders and colleges of professions health, etc.). In this case, distance learning is provided both in individual and group terms, through three types. The "virtual class", which is centered on the teacher who uses the traditional frontal teaching method, even if the lesson is transmitted at a distance and to multiple audiences not only simultaneously but also at different times. "Collaborative learning online", which is centered on the group of peers, who share knowledge, experience and skills online. Finally, "self-learning integrated by support systems (paper, telematic, information, etc.) which is centered on the student who uses appropriately prepared durable materials, following his own temporally individualized path, with or without guidance and support. of a tutor. From this point of view, the telematic universities seem ready for the final sprint. In this environmental and temporal context, a necessary and sufficient condition for the elaboration of a theoretical model of reference for the training of the health professions, is represented by the presence of a multi-professional and multi-disciplinary catchment area. Given the short times dictated by the emergency, for Distance Learning (FAD) the choice of the "Problem-Based Learning" method (PBL, learning for problems), an active method suitable for training in the health sector, is aimed at defining pursuit of specific and individualizable learning objectives. The physical distancing imposed by the COVID-19 epidemic has prompted health institutions to make a rapid and important cultural change, moving from the organization of classroom training events to the organization of "virtual" training events. ". The use of audio-visual technologies for remote meetings,

especially teleconferencing, has become necessary for scientific dissemination, in its various forms. The health institutions also responded quickly, strengthening the already existing communication technologies, making scientific platforms available to all staff and strengthening the networks of researchers through the creation of working groups (WG) dedicated to COVID-19. belonging to the most important Italian institutions and to the WHO. In the absence of previous experiences in epidemic emergencies, this progressive evolution of training and communication models can be achieved thanks to subsequent experiments "in the field" and a series of procedural adaptations implemented progressively, following the "learning by doing" model. The work carried out by the WGs (Working Groups), albeit remotely, has ensured the realization of a series of Reports of the Istituto Superiore di Sanità COVID-19, consisting of documentation useful for self-training, series of reports published by the ISS (Istituto Superiore di Sanità) made accessible to respond to the training needs of a wide target of operators, spreading a common syllabus and a proceduralized mode of action, waiting for definitive levels to be progressively identified. In this pandemic scenario, the training system needs, in fact, to be consolidated and supervised, representing a strategic element, a determining factor, whose preparation and management cannot be subsequent to the emergence of the emergency event, but must be planned and delivered. possible a priori. The data relating to the growth of distance learning, in Telematic Universities, also demonstrate the growth of this methodology for providing distance learning services, as reported by the Global Market Insights report, which indicates a growth of 190 billion dollars from 2018. , to more than $ 300 billion in 2025, showing a compound annual growth rate (CAGR) of 7% from 2019 to 2025. According to Techanavio, elearning in Europe will reach over $ 36.25 billion between 2019 and 2023 A strong international boom, with a strong expansion due to the coronavirus pandemic. With the closure of schools and universities, there was a sudden increase in online training. The phenomenon is constantly growing at an Italian level, as well as at an international level, highlighting the current opportunity to develop digital training for companies, as well as for universities or schools. As for Italy, the increase in demand for online training developed with a + 100% in the first days with the advent of the coronavirus.

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The Home as World Heritage Between Nature and Culture, Privacy and Relationality. The House is a Small City, and the City a Large House: The House N by Sou Fujimoto

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Fig. 1: Box in a box, nesting, Ireko. One house, one city and one garden, a conceptual draft, 2008, Sou Fujimoto. Russian Matryoshkas. House N, Oita, Japan, 2006-2008, Sou Fujimoto.

Abstract
Between visibilities and invisibilities, nature and culture, privacy and relationality, indoors and outdoors, light and shadows, closeness and remoteness, is the architecture and the everyday life of Fujimoto's House N. A house that is built and reveals itself in the vision and in daily life in this in-between place. A tense architectural-existential place of empathy and estrangement, and thus of important resonance, stimulus and intimacy among people, the new sense of home and the city.

It is an architecture that is proposed as an *in-between place* in its minimal formal expression and maximum creative exaltation, there where everything is silently an *interstice*, ambivalent and borderline between continuity and discontinuity. In it, everything oscillates dialogically between pairs and dilemmas, in that permanent and tranquil interrelationship between one thing and another: between here and there, between doubt and clarity, between house, street and city; between home, intimacy and relationality. It is an architecture that exalts the non-hierarchical relationship between form-space-light-function-use and the multiple possibilities for occupancy and perception that can be promoted by space in interrelation with the body.
It is a home architecture that intends to be ambiguous in concept, in the spatiality and programme, and in the spatial relationship that it establishes with the body/user/individual, the street and the neighbourhood, evoking an idea of home (singular and collective) where simultaneity, ambiguity, interrelationship, communicability and the cooperation between house and city, privacy and relationality, are unexpectedly and intentionally adopted as a value, there where *the house is a small city, and the city a large house*, there where the home becomes world heritage: natural, cultural and human.

Keywords: Architecture, Home, Between, Nature-Culture, Privacy-Relationality

1. Introduction

From a broader perspective, it may be that the emergence of human consciousness, which implies the recognition of one's own identity and thus separation from the rest (including Nature), is what proposed, in turn, the first need for mediation. Or as Morin puts it, the sentiment of "expulsion from Nature", which emerged from the birth of consciousness, is what proposed the first need for mediation and return: the need for a "rejoining".[1] In this sense, culture, art and architecture would be an immense attempt at mediation; an attempt to replace the unity with Nature through works that attempt to give meaning not only to what it means to be Man, but also to the universe lies beyond immediate perception; constructions that attempt to give meaning to our mission in that immensity in which we have felt lost ever since we have had consciousness.
Between visibilities and invisibilities, nature and culture, privacy and relationality, in the architecture of the house and contemporary city, that in-between place is generated (interstitial, borderline and imprecise), where both men with their faces, those surfaces that gaze upon each other, and images, shapes and spatialities interrelate and are perceived, in a common space of exchange, communicability and entanglement in a permanent becoming between the real, the image and the imaginary. In this interstitial and interrelated *in-between space*, the House N, was imagined and designed, conceived and envisaged by Fujimoto as a "Future House!".

2. The interstitial house

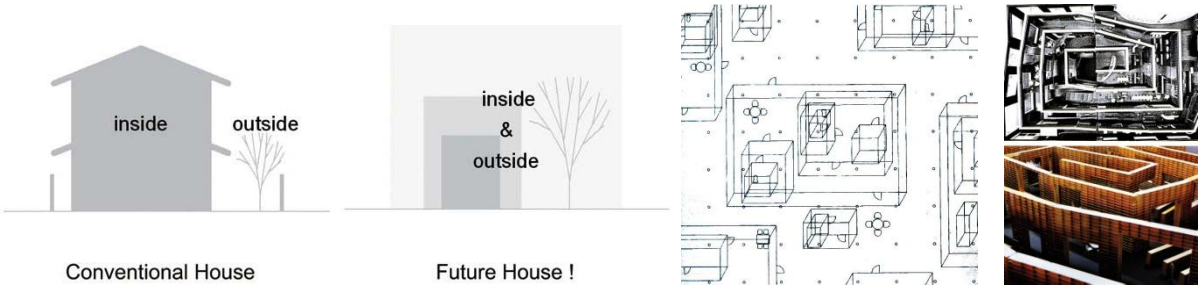

Fig. 2: Conventional House, Future House, 2006-2008. Infinite House (competition), 1995. Musashino Art University library, Tokyo, 2007-2010. Sou Fujimoto.

The House N by Sou Fujimoto opens up and literally breaks the "architectural box" to generate interstitial spaces. They are *in-between figural spaces*[i]: versatile, ambiguous, imprecise, extraordinarily predictable and unpredictable. They are spaces between instituted or pre-established concepts that are adapted and recreated; spaces between forms, functions and habitual uses that take on another meaning; spaces between indoor environments, between the inner and outer spaces; between aesthetic values, luminous values and environmental hues in white and neutral shades that are awaiting to be coloured by life; spaces between tension and tranquility, or simple between identity and difference. Spaces in which the value of the relationship and the interaction emerges, as does the importance granted to *becoming* over the state of *being*, typical of contemporary culture. This house for "two people and a dog", as Fujimoto puts it, is literally an "interstitial house".

The house is a single-storey edification whose formal “nested” structure is essentially made up of three “boxes” or “shells”, according to Fujimoto, perforated by “empty rectangles”. These boxes are of progressive dimensions, concentric to one another, as they are inside one another, with vertical walls and horizontal roofs. Even if it goes undetected at first glance, the two inner boxes are parallelepiped, while the outer box is not, solely because it fits in the lot boundaries. The largest outer box occupies the entire lot and houses the semi-indoor and semi-covered garden; the middle box defines a large part of the indoor space and the smallest and most constricted one corresponds to the centermost inner space where the lounges are located. In this house, everything is interstitial, ambivalent and interrelated: nothing is completely enclosed or open, indoor or outdoor, opaque or transparent, tranquil or dynamic. Between gradual environments, different notions of distance and perception, and the possibility of flexible use, the home is designed, built and occupied in a permanent and paradoxical communion-separation of the intimate and the social, and the serving nuclei (the kitchen and toilet) from the served nuclei (the remaining spaces: bedrooms/lounges, garden, etc.). The formal concentric and self-resembling structure of this house (the three shells) imitates that of Russian matryoshka dolls, where the interior and exterior are inverted, combined and crisscross: the indoors is also the outdoors, and the outdoors is the indoors, in an infinite repetition of inversions between “in” and “out”. The difference lies in that the House N has no single center or symmetry, nor is the proportion among the parts constant. However, the concept of repetition in difference and the fractal order is evident in both: each of the parts is “similar”, but not the “same” among themselves, varying in terms of scale or in subtle notes. Under an order of “self-similarity”, this fractalised and subtly disconcerting composition between the three perforated shells is what makes this dynamic and inverse interrelationship possible, which renders the environment heterogeneous and imprecise in terms of light, and the entire space “floating”, borderline and multivalent. As Fujimoto mentions, this inversion and merger of the interior and exterior is a legacy from historical Japanese architecture: the tradition of gardens, galleries and, as he calls them, “vibrant and in-between spaces”: “The superposition of nested boxes in the House N could be understood as a three-dimensional version of those clouds seen in the drawings on Japanese screens. The boxes are taken to their immediate surroundings, as transparent frames that relate the different events that take place amongst them. They are imprecise objects, but even so, they can be clear while maintaining their ambiguity. It is the matter of an abstract cloud. (…) This type of dwelling as a whole is a place that mixes the indoor with the outdoor, nature with the artifice and home with the city.”[2]

The entire space of the house is intentionally built on a subtle tension-calmness, which is evidenced in its environment as a sort of subtly dynamic tranquility generated by the effects of reversibility and formal, luminous paradoxes. They are the studied effects built from their geometry, either evident in their designs (floors, sections, and elevations) and photos, such as those listed below:

– The most central part of the house (the innermost box that we consider to be its main centre: eating and living area, the “lounges”) is geometrically off-centre in relation to the centre of the other two boxes.
– The entrance to the house is affected by several directional inflections, such as the inflection and later the counter-inflection of direction, from the street to the innermost area, the kitchen.
– All environments or rooms of the house have similar dimensions, especially in terms of length and width. In other words, there are no large variations amongst them, with the exception of the height, which is organised hierarchically in sequence (lower box, middle box, exterior box, in addition to the empty spaces in the roofs that are perceptively projected into infinity).
– The traffic and living areas, as well as the service and served spaces, ambivalently interpenetrate each other without any rigorous limits.
– There are neither social nor intimate areas, in other words, all areas are social and intimate at the same time, intended to generate greater ambivalence among the spatialities. In reality, no space in the house is completely intimate, reserved or stated. The space formed by the innermost box (“lounges” and the garden) is intercepted and intentionally combined with the area where the “rooms” have been placed, through the openings in the walls or the formal indefinitions amongst them, so that no area of the house is either totally concealed or exposed.
– The innermost or most secluded areas of the house are, paradoxically, those with the easiest access: a transverse path leads to the eating and living area, the kitchen and the bathroom. – Unlike traditional Japanese houses, with rooms that have hierarchically defined entrances and dimensions, the eating and living area of the House N is located in the smallest innermost box (all its dimensions are smaller, even the ceiling height).
– There seem to be no great formal distinctions between the interior and exterior walls. In them, everything is similar: openings, colour, texture and finishings. However, their thickness is different (thinner on the inside and thicker on the outside), generating in the space subtle and contradictory environmental nuances.

– The openings (windows and doors) or empty spaces in the walls have different dimensions and are arranged almost at random, although the intention has been to generate some privacy from the street. The only opening that makes a direct visual relationship possible with the people and cars on the street is that of the entrance. All others somehow deprive that street-house visibility at eye level.
– The rectangular openings in the vertical and horizontal walls generate a variable and complex luminosity throughout the day which can often become as diffuse as it is localised.

3. In-between nature and culture, privacy and relationality, indoor and outdoor, proximity and distance, revealing and concealing, continuity and discontinuity, tension and tranquility

All these spatial-formal questions that we have just mentioned, together with the coherence of the orthogonal box with vertical walls and the subsequent stability of the space (Cartesian), the complex luminosity, which is subtly differentiated, given the single white colour and the “tears”, the homogeneity of the smooth texture, the refined simplicity of the materials (the concrete, glass and wood), the minimalism of the construction details and the sensitive combination of the artificial with the natural, generate amongst themselves, paradoxically and ambivalently, a place of tension and tranquility. It is a place that is dynamically and interstitially built in what we call a subtle tension-calmness of forms, proportions, tones and nuances among all the components of the space, and in the physical, functional and perceptive interactions between the object/the house and the subject/the occupant. A place where the operational vector towards the *figural* is precisely that permanent and dynamic "being in relation" that the forms under the light and shadows reveal, even though their atmosphere at first glance is one of stillness. We are talking about an intentional and explicit system of relations that the place reveals, where both the filling and the emptiness, the indoor and the outdoor, the light and the shadows, the most private and most social, natural and cultural, are mere interstices that make up the space in the House in a way that is interrelated and undefined. It is intentionally an *in-between place* created by different spatialities, orientations and luminosities, in which uses and different types of privacy coexist. An intermediate place that exalts above all else the “interrelationship” or the "being in relation".

The House N was designed according to a geometry oriented by a principle of “repetition in difference”, in which no space is exactly the same as any other. The similarity, ambivalence and formal, perceptive and functional versatility are the results of this principle, where the rooms are both segregated and in continuity. An ambiguous situation of “semi-openness” is established among the other spatial environments (neither completely closed in/oppressed nor avowedly open/diaphanous), in a constant reverberation of continuity and discontinuity in the interior, or between the indoors and the outdoors. As Toyo Ito [3] argues, this condition causes a sensation of reciprocal distance to emerge among the remaining rooms, which is both proximity and distance at the same time. We’re talking about a condition of “oscillation” and ambivalence or ambiguity, resulting from a constant "being in relation" among the forms, spaces and uses that is evident in this house, which makes a more creative, flexible and versatile habitability or occupancy possible, which is thus more easily adjustable to the different conditions, changes and events of current daily life. In the House N, Fujimoto has intentionally generated an intermediate spatial-formal condition that, on the one hand, evokes a feeling of security and proximity among the family members and, on the other, implies a way of living/occupying that promotes a certain psycho-corporal tension that stimulates the connections within the family and interactions in the place. However, it is a condition that, when applied to dwellings for larger families, would surely imply that the privacy of its members would be compromised. It is an architecture that promotes a mysterious interrelationship and interaction between space-experience-user, as Ito explains: “(…) in Fujimoto’s architecture, the human relations are open to the outside and are therefore complex and diverse. (…) the users experience the elimination of the boundaries between the interior and exterior. However, these experiments enclose an essential contradiction that can be perceived in the architecture. (…) Of course, the interior part of an indoors is physically an internal space, but psychologically it gives way to a mysterious interior space that is perceived as if we were in a courtyard. (…) we obtain the unprecedented experience of an indoors that equates to an outdoors. (…) This type of spatial experiences is extraordinarily exceptional.”.[3]

4. The creative, ambiguous and silent *in-between place*: A home between the house that is a small city and the city that is a large house

In conclusion, we can say that House N is an architectural place that in its subtle formal tension and spatial and functional ambiguity, affects or moves the body (as a whole) of those who experience, occupy or live it. In other words, it is an architecture that has been projected with the intention of promoting a synaesthetic spatial experience in which the sensorial possibilities of the entire body are necessarily used. It is an architecture that intends to build a place to experience both action and

contemplation. An architecture designed to be a single-family dwelling, but in the end could house other programmes or uses (a studio, study, work office, shop, etc.). Contrary to the obsessive lucidity, functionality and homogeneity of modern dwellings, Fujimoto proposes here an architecture that integrates the unexpected, sensorial and ambiguous –and even the senseless– the value of which is focused on the interactions between space, use and the body, in the house and between the house and its context (natural, artificial, cultural and human). It is an architecture that exalts above all else the serene interaction between space-user, the non-hierarchical relationship between form-space-light-function-use (centred on the ambiguous relationships among the three boxes and subsequent spatial correspondences between the interior-interior and interior-exterior), and the multitude of possibilities for occupancy and perception that could be promoted by the place in interrelation with the body. It is a home architecture that intends to be ambiguous in concept, in the spatiality and programme, and in the spatial relationship that it establishes with the body/user/individual, the street and the neighbourhood, evoking an idea of home (singular and collective) where simultaneity, ambiguity, interrelationship, communicability and the cooperation between house and city, privacy and relationality, are unexpectedly and intentionally adopted as a value, there where *the house is a small city, and the city a large house*, there where the home becomes world heritage: natural, cultural and human.

Among gradual changes in the environment and without any strict limits, the space, form, function, light and shadows of this House N by Fujimoto become unusually imprecise, floating, surprising, predictable and unpredictable all at the same time. In other words, they become *figural* in the interaction that they promote with their inhabitants and in the relationship that the house establishes with its surroundings (streets/other buildings/the neighbourhood) during the day and at night: the space is borderline, the function is versatile or indefinite, the use ambiguous and the perception of the interior and the exterior, between opacities and pure transparencies, is dynamic and unexpected. As Fujimoto states in his text *Primitive Future*: "This place that seems to be coming from nowhere somehow produces a very mysterious otherness. A window of a window of a window… the light that shines from the other side, like the light through trees in a forest or gaps between clouds, appears before us with unintentional unexpectedness. All the things floating between these rectangular clouds coexist with the unpredictability and surprise of otherness. A place where uncertainty and lucidity coexist.".[2]

The House N is built as a literally *intermediate* place, which in a specific, Cartesian and precise manner (without any formal and material ambiguities), evokes the value of the interrelationship, of interaction, of the interstitial, of the borderline, of the "occupiable", which being more comprehensive than “inhabitable”[ii], includes it. A place that evokes the value of indetermination in the spatial and functional versatility and flexibility. And it is also an architecture that evokes the paradoxical value of the *intermediate place* in that it is a place of relationship and subtlety unstable and potentially tense intimacy, generated in a refined and silent simplicity or formal minimalism of its formal orthogonal and Cartesian structure, nested and perforated from “the box within the box”, where all the elements, dimensions or orders generate a constant relational tension with one another, and a creative interrelationship among the users, the house and its context. It is an architecture that is proposed as an *in-between place* in its minimal formal expression and maximum creative exaltation, there where everything is silently an *interstice* and a *relationship*, ambivalent and borderline between continuity and discontinuity. In it, everything oscillates dialogically between pairs and dilemmas, in that permanent and tranquil interrelationship between one thing and another: between here and there, between doubt and clarity, between house, street and city; between home, intimacy and relationality. Fujimoto defends it like this: "(…) life in this house resembles living among the clouds. A distinct boundary is no-where to be found, except for a gradual change of domain. (…) is an outdoor space that feels like indoors and an indoor space that feels like outdoors. Is a nesting structure, the inside is invariably the outside, and vice versa. My intention was to make an architecture that is not about space or about form, but simply about expressing the richness of what is "between" house and street. (…) I imagined that essentially the city and the house are no different from one another but are just different approaches to the continuum of a single subject, or different expressions of the same thing: an undulation of a primordial space where humans dwell.".[4]

Fujimoto’s architecture, which is at the same time both theoretical and experimental, rational and sensorial, attempts to explore the interstitial tropes of the concepts, forms and functions. It is an architecture that values above all else the relationship and interaction, in that imprecise, interstitial and silent condition between *becoming* and what in it can also be *being*, creatively, at each moment: the value of the present moment, of the instant that “meanwhile appears”, of the unexpected or unscheduled, of an infinity of in-between spaces and moments in a progression of possibilities. It is an architecture of progressions and architectural discoveries from which, as Fujimoto advocates[2], the scale of "the palm of the hand, to the scale of furniture, to the scale of the house that encloses it, to the urban scale, to the planetary scale, to the cosmic scale" that intentionally inhabit that tolerant

aesthetic-spatial-conceptual *in-between space* that is built between the modern legacy of a lucid, crystalline and visual architecture, and the fluid, haphazard, sensorial and non-objective (neither objective nor subjective, rather somewhere in between) real and virtual complexity of the topics and experiments of contemporary architecture. An architecture that investigates and proposes *in-between places* that evoke both Christine Buci-Glucksmann's concepts of *image-glass,* regarding the simple sense of origin or directionality, elegant clarity or pure transparency, and of *image-flow*[iii][5], regarding the dynamics and a complex place of affectation/interrelation in contemporaneity.
Between visibilities and invisibilities, nature and culture, privacy and relationality, indoors and outdoors, light and shadows, closeness and remoteness, is the architecture and the everyday life of Fujimoto's House N. A house and a home that is built and reveals itself in the vision and in daily life in this in-between place. A tense architectural-existential place of empathy and estrangement, and thus of important resonance, stimulus and intimacy among people, the new sense of home and the city. A place that promotes an "implicit and at the same time relational being" or, as Sloderdijk says, an "being-in-the-complexity," a "being-in-the-chaos" or a "ecstatically being in the world"[6], there where "the house is a small city and the city a large house", as Aldo van Eyck advocates evoking an image/idea of ambivalence where the part and whole, small and large, individual and collective, private and public, coexist in simultaneity.[7] In other words, one does not exist without the other.

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Fig. 3: The in-between as interstice between nature and culture, privacy and relationality. The house is a small city, and the city a large house: House N, Oita, Japan, 2006-2008, Sou Fujimoto.

[i] The term “figural” was used for the first time by J. F. Lyotard as an adjective meaning the opposite of “figurative”. Deleuze takes the term “figural” from Lyotard and also juxtaposes it to “figurative”, and also to “illustrative”, “narrative”, “representative” and “figuration”.

[ii] We distinguish between “inhabit” and “occupy”: “inhabit” means occupying by habit or custom, while “occupy” is a much more comprehensive and versatile form of occupancy.

[iii] In the field of thought and artistic production, Christine Buci-Glucksmann distinguishes among the concept of image-flow, associated with the idea of complexity, dynamism, corporeality and translucency, the concept of image-glass (both Deleuzian and non-Deleuzian), associated with the idea of simplicity, purity, lightness, superficiality, transparency and dematerialisation, which is integrated in the apology for the transparencies in modernity. According to Buci-Glucksmann, the image-flow is associated with a condition of "contemporaneity" in its rhizomatic senses of complexity, entanglement, reverberation, affectation (as opposed to neutrality or indifference), and that is revealed in an ambiguity that is somewhere in between deep and superficial, reality and virtuality.[5]

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The circle line "AbbracciaTO": an infrastructure in Turin for active proximity tourism as a driver of territorial transformation for a healthy city

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Abstract
In the period of Covid-19, the current research aims at investigating new urban strategies, related to slow mobility routes, in order to explore the many places of interest that are located in our cities, enhancing them as opportunities to explore new possibilities for active, proximity and knowledge tourism. The current pandemic situation forces us to redesign our "playground", in terms of distances and daily movements in the city: home-work, home-school and for recreational activities related to leisure, reconsidering the many already existing opportunities of places that are located nearby our homes. The research investigates the case study of the circle line "AbbracciaTO", in the municipality of Turin, as a design-oriented urban strategy, able to connect places of interest, exploiting the potential of linear connections along the four rivers passing through the city (rivers: Po, Dora Riparia, Sangone and Stura) and the green spaces already present in the city (parks, gardens, tree-lined avenues etc.). From the methodological point of view, the itinerary, 60 km long, has been drawn through mapping techniques, by combining the top-down approach (geospatial data management with GIS tool) and bottom-up approach (street-level survey with GPS). The whole itinerary allows exploring the city with different eyes, keeping together heterogeneous elements such as well-known cultural heritage (including UNESCO sites), museums, contemporary architecture, industrial archaeology sites with parks, monumental trees, urban orchards, factories and new urban development and refurbishment sites, even located along the marginal areas of the city. The pleasantness degree of the route has been evaluated by combining the experience in the urban environment with the experience in the open spaces.

Keywords: proximity tourism, slow mobility, green spaces, mapping

1. Introduction
The current pandemic situation and the very serious crisis, which we are going through and that widely affects society and the economy, actually offers an opportunity for a profound reflection about more efficient use of the territories, starting from few selected and light actions, which could be implemented immediately. In a medium and long-term perspective, more structured actions could then be envisaged, which could primarily concern places where there is a greater concentration of people and activities, such as in larger cities. Here, however, it is worth promoting a more articulated and widespread strategy, which considers walkability and bicycle mobility as an efficient and safer way to move people, and which can take advantage of deeper attention, given by the current situation, eventually considering the role of tourism as a catalyst agent. Actions to achieve a more structural change should ensure better usability of the spaces where it is possible to carry out outdoor activities, better accessibility to the places of cultural tourism and green spaces "in" the cities, towards the peripheries "around" cities and in the territories "between" the cities. The opportunities that our cities offer in the territorial dimension are very little valued as resources for leisure and tourism. The presence of linear green and blue systems, such as avenues, rivers and canals, which make it possible to create continuous pedestrian cycle paths, exiting to areas outside the city, could be significantly enhanced [1].

From an operational point of view, it would be advisable to consider first of all the open spaces, even the minimal ones. The cases are certainly not homogeneous: in many cases, the areas are in fact easily accessible, but of limited size; similarly, the largest ones, are in many cases quite distant from the more densely populated areas, and in any case, they result difficult to reach. In fact, there is no network connection system that makes places of interest mutually accessible. A system made up of dedicated paths, which make it possible to bring the main open spaces closer together and to connect them at the same time to the more densely built-up areas, in an overall logic of accessibility, would facilitate their use also in a tourist key.

2. A ring for slow mobility around the city of Turin: searching for an image

The specific landscape of Piemonte region, is well known due to its unique natural and historic features. The scene is made by the natural resources of the crown of mountains surrounding the capital city and by the valleys with rivers descending and converging to the centre. This landscape has been enriched by landscape design actions carried on through the centuries by the Savoy dukes and kings, creating a system of three concentric rings of places that support strong mutual connections between Turin and the surrounding landscapes. The Savoys have therefore been able to consciously build, since the mid of the sixteenth century, their capital city, well-integrated in a clear territorial system that is still perfectly readable today, based on three rings at the urban, metropolitan and regional scales interconnected through radial boulevards, crossing the productive agricultural landscape between the Alps and the City and connecting all the main centres of the Region. In the urban area of Turin, within a radius of 5-10 km along the 4 rivers and following roads that have been absorbed by the actual urban framework. The system is including the river Po and the tributaries Sangone, Dora, Stura, connecting with urban residences such as the Villa della Regina, the Valentino Castle, the Regio Parco, Mirafiori. In a metropolitan scale dimension (radius of 20-30km), also following the so-called "Corona di delizie" one could reach for example the hunting lodge of Stupinigi, the Castello di Rivoli, Sant'Antonio di Ranverso, the historic centre and the lakes of Avigliana and the Sacra di San Michele, the Venaria Reale. On a wider regional scale (radius of 50-80 km), more UNESCO heritage sites, such as the castles of Racconigi and Agliè, the cities of Ivrea and Biella, the wine landscapes of Langhe Roero and Monferrato could be included, to create a system of castles, cities, agricultural landscape strongly integrated with nature. A fourth ring could be also recognized if we extend the view over the mountains, where many hunting lodges and huts were built especially in the second turn of the XIX century to host the hunting activities of king Vittorio Emanuele II [3]. The whole system on the regional scale is a wonderful example of the physical evidence of the activities of the Court, throughout more than four centuries of the reign. The network of rivers could perfectly support a spatial territorial strategy - not only based on touristic interest but also to develop a stronger territorial cohesion - to connect the sites, developing routes that could follow the already existing radial and ring roads. Such a strategy could easily be implemented to improve the use of the river banks (and the open spaces related to them), to connect these polarities located around, like satellites around a planet. The riverbanks would be effectively practicable with continuity, starting directly from the river Po which crosses the entire urban centre.

3. The circle line “AbbracciaTO”: an infrastructure in Turin for proximity tourism

3.1 Key design principles

The definition of the route starts from the search for an ideal figure, clear to remember: a ring, not a route that goes from A to B, but rather a circular cut, which affectionately embraces the whole city from north to south, following with precision the banks of rivers, or looking for traces of the history from historical maps that are still legible in the contemporary city, unveiling them as archaeologists in the post-industrial landscape. A figure to be built step by step, but also useful to "keep in mind", to orient yourself during the journey. Mental geography that at a certain point appears clear on a map, and helps us to build a new idea of the city.



Fig. 1: a) the circle line along the rivers - 21 km; b) the circle line through gardens and parks - 31 km; c) the circle line along the tree-lined avenues - 23 km; d) the whole circle line in the city of Turin.

The City of Turin is located in a truly unique position, in close relationship with the different landscapes of its four rivers (Po, Sangone, Dora and Stura), which flow between the crown of mountains that surround it on the horizon and the hills. A circular route, which largely follows the banks of the rivers passing through the main quarters, the parks and other open spaces, allows you to embrace the whole city, highlighting the different river environments, linked to the places and activities that the very presence of water made it possible (Fig.1). The figure follows the banks of the rivers, structural components of the urban form and elements of continuity, the connection between the mountains and the plains and ecological corridors that are passing through the cities. A track that marks new intersections and that discovers open directions towards the landscape and that surrounds the city, towards the Savoy royal palaces, the UNESCO heritage sites, towards the mountains: along the Sangone, which takes you to Stupinigi, the Dora to the castle of Rivoli (but then also in Sant'Antonio di Ranverso, the Sacra di San Michele and Susa), La Stura at Venaria Reale ... not to mention the Po, which can almost be seen descending from Monviso, and is thought of while crossing the plains, and passing by Staffarda or from Carignano (Fig.2).



Fig. 2: The AbbracciaTO map. The first drawing conceptualizes, in one single territorial image, the idea of connecting different places of interests and urban innovation opportunities. The drawing has been made by pencil and transparent watercolours layer, corresponding to the main structural components of the urban form.

A map drawn, with a pen mark, but which is also a digital trace loaded on the mobile phone, to be followed in reality. So, the GPS becomes not only a device that guides us, making us follow a trail of pebbles, like Tom Thumb…. but also a writing tool, which draws a figure and at the same time records a trace that we can share with others. For those who, like me are urban planner, the bike, with the GPS, then becomes a sort of drafting machine on wheels, which thanks to the satellites that revolve around the earth, records an analogue and digital drawing, first designed, then experimented on the ground and finally shared [3]. And maybe then again modified, thanks to the contribution of others, in a virtuous circle that takes place before, during and after the actual bike ride. And in the end, we can draw a real territorial project, not only a map of the city that exists but also of the one we would like to be. Cutting the territory to discover its deepest layers, as if it were an organism, or a machine, to be disassembled and reassembled according to its joints, organs and mechanisms that make it work, but also the traces left by history. To discover that an ancient road, which connected the villages once far from the centre, in the countryside, is still visible, and it is perfectly walkable, among the immense unfortunately empty factories, shopping centres, new roads and large neighbourhoods of the factory town.

3.2 Analysis of the open spaces and element of interests along the circle line

The design of the circle line AbbracciaTO, has been supported by the urban analysis of the open spaces, that are crossed by the route. The analysis has been performed by combining the “top-down” approach, by using GIS mapping tools, and the “bottom-up” approach by using GPS tool. The big amount of open-access geospatial data, available through the municipality geoportal and open street map datasets, allow mapping the data by using GIS techniques [4]. The analysis has been carried out along the whole route of AbbracciaTO, with the aim of analyzing the relationships between human perception and the surrounding spaces. In fig.3 it has been drawn the linear development of original the circle line, with the main aim of comparing, in a synoptic way, the stretches of the route that are along the four main rivers of the city, the ones crossing the public green spaces, the ones going through agricultural spaces, the ones going through the edges of the main industrial areas and the ones going through the built environment. Despite more than half of the route is going through green spaces (parks, gardens, riverbanks), the perception of the surrounding landscape is continuously varying, intersecting wide-open spaces that allow perceiving the crown of the western Alps, with more traditional urban stretches, that, however, allow perceiving unusual skylines of the city.

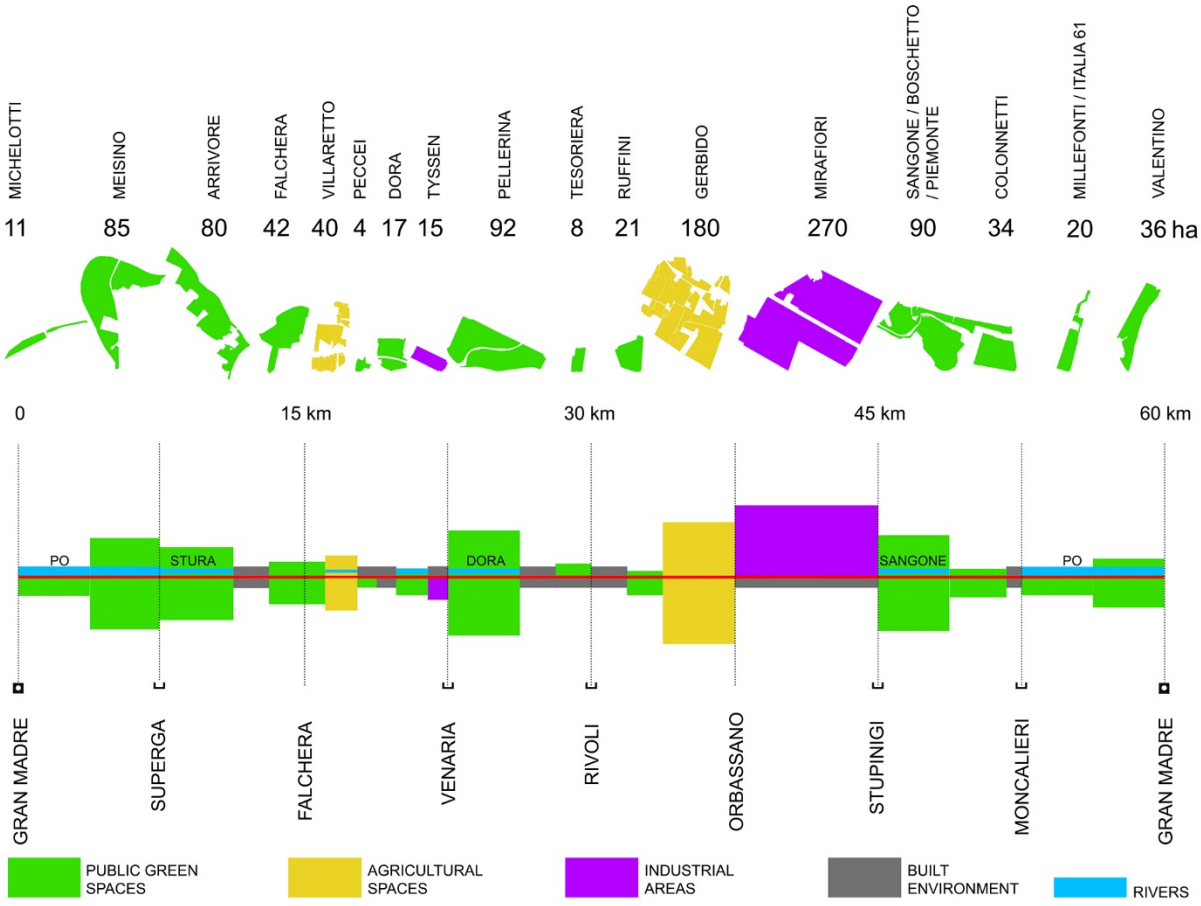

Fig. 3: Synoptic table with the linear development of the circle line “AbbracciaTO”, with evidence of different typologies of the open spaces that are crossed by the route.

Seeing the synoptic table (fig.3), it is evident how the circle line is connecting different kinds of open spaces in the city of Turin. The size and the shape of the crossed green spaces are not always the same along the route. Despite the route is completely drawn inside the municipal border of Turin, the perception to be in a city is not always confirmed by the experience along the route. The atmosphere along with the crossings of some large green spaces that are available in the city (e.g. Meisino Natural Reserve, at the confluence between rivers Po, Dora Riparia and Stura, or going through the Pellerina, the Falchera, the Sangone and Boschetto parks) is very quiet and peaceful. Furthermore, the stretches along the Meisino Natural Reserve along the Po river and the Boschetto park along the Sangone river, correspond to the wildest stretches of the circle line. Some other green spaces are size-limited and are characterized by an urban character. In some cases, (e.g. Dora and Peccei Parks) their specificity is to be an industrial archaeology park, with traces of the recent urban transformation of the city of Turin. The circle line also runs along two large industrial areas in the city. The one located in the south-west of the city, the FCA car factory of Mirafiori and the one on the north-east of the city (ex-Tyssen Krup steel factory). The perception, circumnavigating these two large areas is surreal, especially during the weekend when the surrounding avenues and the parking lots are almost completely empty.

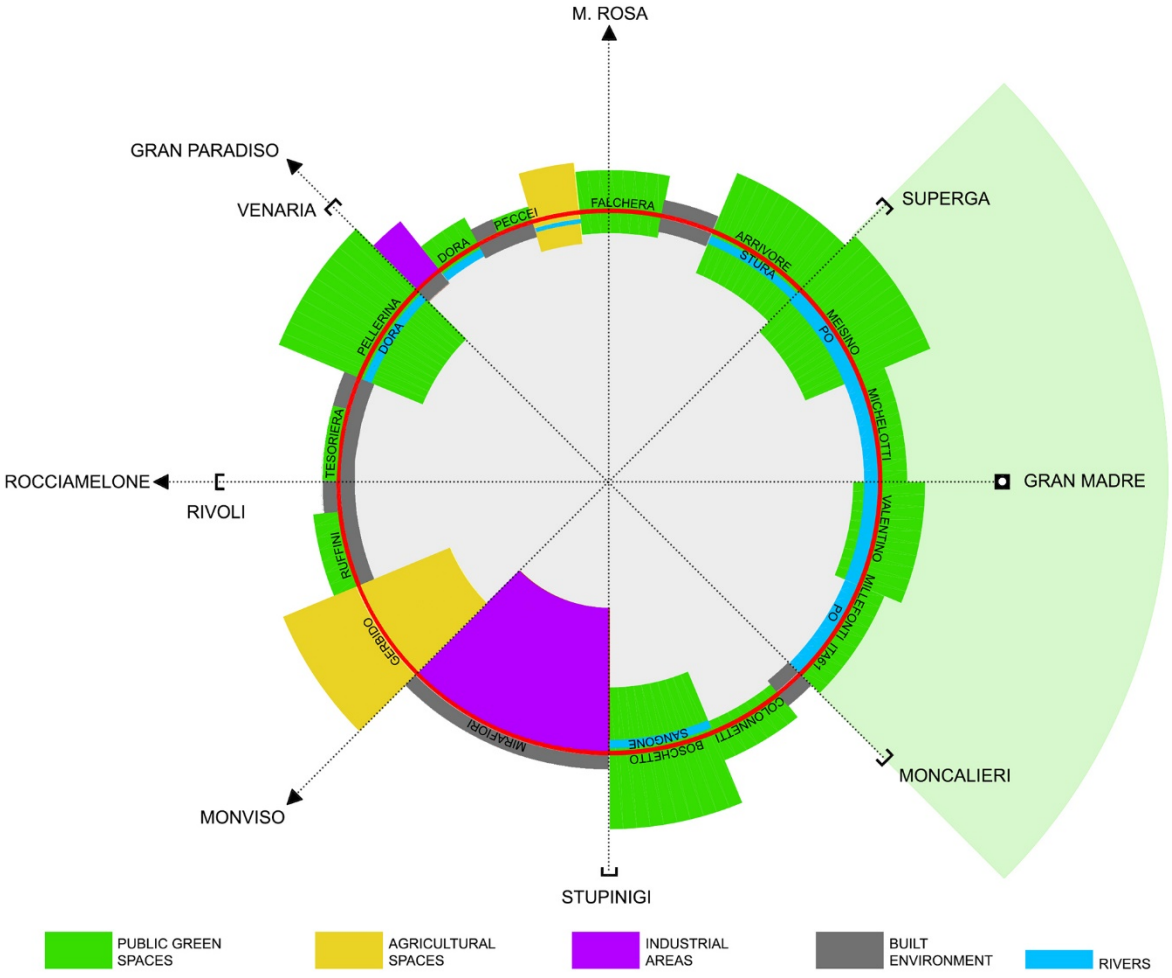

Fig. 4: Infographic of the circle line AbbracciaTO. The scheme synthesizes the experience along the route, anticipated by the fig.2, specifying, proportionally, the size of the open spaces that are crossed in a more symbolic way. On the external side, the most relevant visual landmarks to the city of Turin have been drawn. On the western side the Alps peaks of Monte Rosa, Gran Paradiso, Rocciamelone and Monviso are the main visual references. On the eastern side, the hills of Turin with the basilica of Superga are the references of the urban landscape.

In contrast to the massiveness and robustness of the industrial areas, there are the agricultural areas, that are intercepted by the circle line in the southwest and northwest of the city. In the southwest, there are areas of the Gerbido, where there are farmhouses still operating in the field of agriculture and breeding, but also historical chapels and suburban monumental villas. The areas of the rural landscape are characterized by a higher level of openness of the field of view, which allows perceiving the western Alps, especially the peak of Monviso, which is the visual reference in this part of the route. The other fringe agricultural area is located northwest of the city, between the Falchera neighborhood and the

Stura river. This area is more fragmented and less uniform than the previous one. The limited extension and the more impacting urban transformations of this area, such as the presence of the city dump of Basse di Stura and the waste management plants, profoundly influence the perception of this area.

4. Conclusions

A map drawn, with a pen mark, but which is also a digital trace recorded with GPS, also available on personal hand devices, to be followed and implemented as a support to design strategies. So, the GPS becomes not only a device that guides us, making us follow a trail of virtual pebbles but also a writing tool, which draws a figure and at the same time records a trace that we can share with others. For planners and architects, the GPS then becomes a sort of drafting tool which, thanks to the satellites that revolve around the earth, records an analogue and digital drawing, first designed, then tested on the ground. and finally shared. And maybe then even modified, thanks to the contribution of others, in a virtuous circle that takes place before, during and after the actual bike ride. And in the end, we can draw a real territorial project, not only a map of the city that exists but also of the one we would like to achieve. Such an integrated system may enhance the use of slow mobility routes for the enjoyment of the landscape and the development of cultural and environmental tourism in a sustainable way, improving accessibility with public means of transport, in a vision that considers active tourism and sustainable mobility in the cities and in the territories as fundamental components to achieve a more healthy environment and lifestyle, also with reference to the Sustainable Development Goals 3, 9, 11 of the UN 2030 Agenda.

In conclusion, the method described is based on a combination of analysis and synthesis, corresponding to two subsequent phases: one based on abstract, metric approach integrated by GIS, and one based on direct experience of places. Both contribute to generating a sharp territorial figure. A mental and synthetic geographic image as a final output (Fig. 2, 4), that has a solid communicative value and can effectively support a stronger design strategy on open green spaces [5] that are interconnected with slow mobility routes.

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The post-war industrial reconstruction of Naples: the contribution of the Studio Architetti Mendia Carile-Maione

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Abstract
After World War II, when huge programs and founds for industrial reconstruction invested Naples, several professional studios were commissioned to design numerous works, including the Studio Architetti Mendia Carile-Maione, composed by Elena Mendia and Delia Maione. From its foundation (1954) and throughout the 1960s, the engineer Lugi Tocchetti and La Società per il Risanamento di Napoli, of which he was the general manager from 1949 to 1965 and then the president, was the main client of the studio. The engineer was linked to the IRI (Istituto per la Ricostruzione Industriale) since the years in which he had participated with Giuseppe Cenzato at the Fondazione Politecnica and at the Triennale delle Terre d'Oltremare. Thanks to this special client, who Mendia e Maione met for the first time in the 1950, when the were employed in the Technical Office of the Mostra D'Oltremare, chaired by Tocchetti, the two architects worked until the second half of 1960s, in several important industrial projects. The paper focuses on some professional assignments entrusted to Elena Mendia, among these, the IRI Centre for vocational education and training - the Camim of Naples, built between 1957 and 1963 in Poggioreale district. Starting from this case study, the goal is to retrace a crucial phase of local history, in which architecture played a central role in the economic revival and not only for the city.

Keywords: Industrial heritage, Recovery, Post-war architecture, Elena Mendia

1. Introduction
After World War II, huge programs and founds for industrial recovery, reconversion and reconstruction invested Naples as well the Mezzogiorno. Among the institutions responsible, the IRI (Istituto per la Ricostruzione Industriale) certainly played a crucial role throughout southern Italy.
The Institute had been already founded before the war, in 1933, by Alberto Beneduce with funds from the Bank of Italy and the Treasury, following the national crisis of 1929. Conceived as a temporary public enterprise for bank recovery and the reorganization of shareholdings in companies held by banks, given the structural crisis of the Italian banking system due to the close interdependence between the banking and industrial sectors, it was stabilized in 1937. It was in this way that IRI played a fundamental role in Southern Italy during the reconstruction and economic boom, especially for the reconversion of the productive apparatus and for its recovery [1].
Between 1946 and 1947 IRI contributed substantially to the creation of the Svimez (Society for the Development of Industry in Southern Italy) composed, among others, of Pasquale Saraceno, Donato Menichella and Giuseppe Cenzato. The society, in which a large part of Italian public and private industry took part (Fiat, Pirelli, Olivetti, the iron and steel and electricity sectors, including SME), was a real nerve center of the debate on Southern Italy, which still today studies its economic conditions and promotes industrial and financial initiatives [2].
It was within Svimez that the Cassa del Mezzogiorno was created in 1950, based, once again, on state intervention to support and promote entrepreneurial activities. The Cassa was based on years and years of studies on the Mezzogiorno based on Nitti's well-known assumption that "the southern question was an industrial question" and on the principle of the State acting as a regulator of the economy, but there were also the theories of the American New Deal, which, since the 1930s, had led to the launching of the economy through agencies and public funds. The fact that the Liberation of

Italy started in the south of Italy and that it took two years to complete it played a significant role, which was taken advantage of by the southernists industrialists of IRI and Svimez to find foreign funds and technologies for the reconstruction of the industrial system [3]. When the Italian government joined the Marshall Plan in 1948, the European Recovery Program (ERP) financed 40% of the first three years of the Cassa [4].
It was undoubtedly the largest public investment in the Mezzogiorno ever made, driven by a public body with wide-ranging authority, powerful economic means and which coordinated infrastructure interventions by different administrations. The Cassa financed industry, banking operations and the building program, including Ina-Casa, and of course all the industries controlled by IRI, whose presence extended, even after World War II, to many significant production sectors: steel, infrastructure and transport (Autostrade), telecommunications, electricity (SME) and the radio and television system (RAI). At the same time, companies, professional studios and credit institutions took advantage of the large sums transferred to the South [5].

2. The Studio Architetti Mendia Carile-Maione and its customers

At that time, several Neapolitan professionals were commissioned to design numerous works in industrial sector, as well as in private and social housing, including the Studio Architetti Mendia Carile-Maione, composed by Elena Mendia and Delia Maione.
From its foundation (1954) and throughout the 1960s, the engineer Lugi Tocchetti was the main client of the studio. Mendia e Maione met Tocchetti in 1950, just after the degree, at the Mostra d'Oltremare, when they were hired as architects at the Technical Office to coordinate the works for the recovery of what remained of the Triennale delle Terre Italiane d'Oltremare (1940) after the bombing. Tocchetti, who was the director of the Technical Office of the Triennale, became the director of the Mostra, encouraged the work of the two architects throughout the reconstruction of the complex, which was completed in 1952 [6]. Those years were fundamental for the apprenticeship of the newly graduated professionals, who had the opportunity to deal with the largest Neapolitan construction site of the time, coordinating the various designers and being hired for their work. Mendia's name, together with that of Delia Maione, is linked to the project for the Teatro dei Piccoli (1952), the new theatre for the children in the amusement area, next the Zoo, but their contribution to the reconstruction of the Mostra was much more extensive: it ranges from the design, restoration and fitting out to the general coordination of entire pavilions and graphics. Was Elena Mendia together with Delia Maione who supervised the reconstruction "as it was" of many of the complex's architectures, organising all the work and directing the construction sites, many of which cannot even be attributed to them, as the pavilions were designed by the authors in 1940. Some of the pavilions designed by the two architects are: the Italian Labour Pavilion in Europe (Mendia), the Tourism and Communications Pavilion (Mendia-Maione), the Merchant Marine Pavilion (Mendia-Maione), the Asia Pavilion (Maione), the Social Security Pavilion (Mendia-Maione) [7].
With the resignation from the presidency of Luigi Tocchetti in 1954, also Mendia e Maione left the Technical Office, to found their own professional office, of which the engineer remained the main client until the end of the 1960s. The contacts with the construction companies they had made during the setting up and management of the construction sites and, above all, the relationship built up with Tocchetti during the experience of the Mostra were fundamental in launching their professional careers.
In those years, the engineer was the general manager of La Società per il Risanamento di Napoli (of which became president in 1965), dean of the Faculty of Engineering (from 1956 to 1970) and he was consolidating his role in IRI and in the the group of personalities revolving around the institute, with whom he was in contact since the years in which he had participated with Giuseppe Cenzato at the Fondazione Politecnica and at the Triennale delle Terre Italiane d'Oltremare (1940). After the war, the world of southern Italy's entrepreneurs continued to revolve around Giuseppe Cenzato who, at the head of SME and the Fondazione Politecnica del Mezzogiorno, member of the board of directors of La Società per il Risanamento di Napoli, collaborator of IRI, president of Svimez from 1960 to 1969 and consultant to the Marshall Plan, managed an important part of the reconstruction of southern Italy. The so-called "SME group" was formed around him, and Luigi Tocchetti was a full member of it: *that group of people whose activities and cultural inclinations were linked to that great economic and financial centre conditioned the entire economic life of the city* [8].
Since the 1950s, the engineer held senior roles in the IRI group's Società Autostrade Meridionali (SAM), of which he was a director in 1952, vice-president in 1966 and then president in 1974. Tocchetti was the responsible for major road projects, such as the Naples ring road from Agnano to Capodichino, built in 1958 by Italstat, the Naples-Canosa-Bari, Pescara-Canosa and Rome-Civitavecchia, as well as the doubling of the Naples-Pompei motorway and its extension to Salerno, a project that won the Inarch prize in 1961 for its ability to preserve and enhance the landscape of the Campania coast [9].

3. The IRI Centre of Naples for vocational education and training - Camim

At the end of the 1950s, in view of *industrial expansion, the absorption of agricultural workers, and the technical modernisation of plants* [10], IRI promoted the creation of various centres for vocational education and training in Italy, in the areas with the highest concentration of group companies: in Trieste, Milan, Genoa, Terni, Taranto and Naples. In 1957, while the government was extending the activities of the Cassa per il Mezzogiorno until 1965, with a law encouraging the creation of industrial "concentration zones" which paved the way for the so-called Industrial Development Areas (Asi) and Industrialisation Nuclei (Ni) in the Mezzogiorno [11], IRI commissioned Tocchetti to design a vast indoor centre in Naples (14,000 sq.m.), in via Lauria in Poggioreale, which was named Camim. It was intended for inter-company initiatives for young people and adults who aspired to be employed in the metalworking, shipbuilding, ship owning and electrical and telephone services industries; half of the centre was built with contributions from the Cassa del Mezzogiorno. Its aim was to raise the level of preparation of the workers, without conditioning their future choice of work *all the more so as employment is almost automatically assured by the growing need caused by the industrialisation of the Mezzogiorno* [12]. At the time, the IRI group employed 27,000 people in Naples, 19,000 of whom were workers, and the Centre planned to train 250 young people every year in two-year courses and 500 adults in six-month courses held in two daily shifts. The engineer entrusted the project to Elena Mendia and Pasquale Sasso, who were responsible respectively for the architectural design and the direction of the works, which were carried out by the Della Morte company in three years.

In accordance with IRI's principles to be applied in the various Italian training centres, *to facilitate pupils' integration into professional life and to allow them to complete their cultural and social training* [13], the main space of the entire composition coincided with the 6,000 sq.m. workshop, comprising the adjustment, welding, carpentry, turning, milling and grinding departments. Around this central space, which has a special double-shed roof to ensure natural, diffuse lighting from both north and south, are the classrooms for 800 students, designed as subsidiary environments where practical learning can be complemented by theoretical teaching. Overall, the study spaces were redesigned to offer a wide variety of solutions, alternating between places for small group discussions, normal classrooms, larger classrooms for debates, lectures and projections, chemistry and physics laboratories and drawing rooms complete with technigraphs. Mendia also personally designed the assembly hall, which is covered by a reinforced concrete slab formed by crossed beams, the canteen, the gymnasium and the outdoor sports areas, which contributed to the pupils' education. All the furnishings, according to IRI's instructions, were "designed not only from an instrumental and functional point of view but also from an aesthetic one, so that the presence of beauty is a means of education and a creator of a better relationship between the instrument and man" [14]. In particular, the canteen, with the kitchen attached, was designed to be a place of recreation and rest, with large windows, blue laminate tables and a yellow stoneware floor.

Much care was given to the urban layout and, as in many of Mendia's projects, to the outdoor spaces, paths, parking areas, but above all to the gardens and trees, which were inserted taking into account the conformation of the ground, which was lower than the road surface. An external portico led to the sports area, where there was a gymnasium with related services and a regulation basketball court, a large space for outdoor gymnastics, a properly drained football pitch with a reinforced concrete stand for 500 seats. Tall trees were planted and transplanted as adults, including a series of tall conifers in the classrooms, which, together with the lawn in the sports areas and the planting of flowerbeds, pleasantly enlivened the complex.

As confirmation of the importance of the work, the foundation stone was laid in 1960 by De Gasperi himself and the tricolour ribbon was cut on 7 March 1963 by the Minister for State Participations, Giorgio Bo, who acted as Prime Minister Amintore Fanfani, in the presence of the President of IRI, Giuseppe Petrilli, and numerous other authorities, including Giulio Pastore, Minister without portfolio for the Cassa del Mezzogiorno.

4. MCM and the industrial assignments

In the early 1960s, Mendia worked for another company in the IRI group: Manifatture Cotoniere Meridionali (MCM), the largest cotton complex in the South, whose plants were installed in the province of Salerno in the first half of the 19th century, first in the Irno Valley, in Fratte, and then in Nocerino, in Scafati, along the Sarno river, by the Swiss Wenner entrepreneurs [15].

With the same group from the Camim, headed by the engineer Luigi Tocchetti, Mendia designed the new factory in Nocera Inferiore between 1963 and 1964 for the manufacture of textiles, which replaced the warehouses built in the 1930s. The factory consisted of two bodies: a double-height atrium, which included the refectory and the social centre, and a lower volume, which housed the large processing room measuring 80 by 45 metres, with annexed dressing rooms, services, warehouses and offices. The reinforced concrete structure of the processing hall was of great value, with pre-stressed "saetta" beams, designed by Tocchetti, Sasso, Mendia with Michele Pagano and Federico Mazzolani, so as to

support the horizontal actions of the shed ribs of the roof, which in turn was supported by hollow intermediate beams that also had the function of containing the air conditioning system ducts [16].
In the same period, the Studio Architetti Mendia Carile-Maione also worked for another company controlled by IRI, the Selenia. Founded in 1959 from the merger of other companies located in the province of Naples specialising in the production of torpedoes during the war, it was first reconverted to missiles on the basis of NATO agreements and then, in 1970, with the transfer to STET, IRI's telecommunications company, to the production of equipment for civil use, such as radar, navigation instruments and electronic complexes [17].
In the Asi area of Giugliano, the two architects designed the Selenia II plant between 1973 and 1978, which, with a covered surface area of 37,000 square metres, was one of the largest construction sites run by the two professionals. The factory consisted of a single large shed lit from the roof by a series of transparent vaults with an electrical opening system. The complex also included 3,500 square metres of offices and a large canteen, which was soundproofed and equipped with an innovative air conditioning system. An outdoor storage area for consumables, as well as a large car park and an outdoor green area completed the project. At the beginning of the 1980s, the two architects designed the canteen and car parks for Selenia I on Fusaro, and the access system integrated with the porter's lodge. With these industrial orders, the work for public bodies came to an end for the Studio.

5. Conclusion

The economic boom that swept through Italy from 1952 onwards for around ten years was a pervasive phenomenon that changed the urban and rural landscape of our country: houses and lifestyles underwent a radical change and building, in particular, was a powerful driver for the Italian economy among the new free-market based neoliberal politics [18].
The Autostrada del Sole, a true symbol of the “economic miracle”, was inaugurated in 1964. Car traffic gradually increased on its lanes from Milan to Naples, so that from 1956 to 1965 it rose from one million to five and a half million cars, and then to twenty-one million in 1985. With this impressive equipment, the IRI extended its activities to the field of infrastructure, thus applying *de facto* entrepreneurial management to public works. Many historical analyses have interpreted the “miracle” as an exquisitely private phenomenon, not governed by an adequate presence of the state to guarantee the pursuit of collective needs [19], but this interpretation cannot be taken as an absolute paradigm even if one thinks of the important role played by the Cassa del Mezzogiorno and IRI. If the effects were in some cases quite different from what was hoped for, this certainly cannot be attributed to the lack of public intervention, which was preponderant at the time, especially if one considers the subsequent trend towards privatisation that involved many companies and banks from the mid-1980s, not to the “sale” of the Banco di Napoli in 1997 and of La Società per il Risanamento di Napoli itself in 2003 [20].
In this panorama of strong acceleration of the building sector and the public intervention, also in industry, the contribution of the architects was very important because it helped to recovery the industrial heritage as well as drive the development of our cities just after the conflict. Today, with a great crisis in public intervention and of the role of the architects, looking back at this past and at the heritage it has left us could indicate other possible paths. Retracing the professional history of the Studio Architetti Mendia Carile-Maione and highlighting their work may also be useful for this purpose.





Fig. 1, 2: Camim, external views, 1963.





Fig. 3, 4: Camim, one classroom and the kitchen, 1963.





Fig. 5, 6: Camim, one classroom-laboratory and the canteen, 1963.



Fig. 7: Camim, the central workshop, 1963.

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Bamiyan Unesco Heritage Site.
Memory of places. The new Museum of local traditions.

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Abstract
This proposal focus on Contemporary architecture as answer for post-war urban and rural places and is inserted in *Contemporary Architectural and Urban design relationship with tradition and identity of Places* research carried out by the author.This objective is pursued working onarchitecture of museum typology, its variation over time, and with both theoretical and operative aspects.
Some of the Placesthat have been investigated by the research have as a common condition of post-war sites and some of themhave been recognized and protected by UNESCO in the Near East including Aleppo, Baghdad, Bamyian, Kandahar and Mosul.
This proposal presents the project for the new Museum of Local Traditions at the Bamyian site in Afghanistan on the Oxiana's roadway (Robert Byron, 1924). This research began in 2014 from theUnesco competition of the area (which aim was to protect and to preserve identity of place and its cultural heritage after big budda's demolition of 2002) and continued until 2020 as University research.
Research work have been carried out trying to establish a deep bond with this far away and high emotional Place recognized as cultural heritage context. That part of the research has been focus on critical redraw of places and its main built architectures, in order to learn and understand natural and anthropic rules and traditions, to discover hidden metrical rules and space declinations, to unearth stratigraphy proportions and traces of landscape identity.
Last step of research has been focus on the proposal for a new Museum of Local Traditions as results of both place bond and typological aspect of museum typology and as operative verify of the theoretical research process.

Keywords: Memory, Archeology of war, Site Specific, Museum, Architectural Design

The objective of a call for tenders promoted in 2014 was the rebuilding of the lost memory of Bamiyan, included in the Unesco cultural heritage protection program in 1986, a place wounded by war events in the late winter of 2002. The competition was held to gather international attention at the fragile context of Bamiyan with the aim of the construction of a new museum for local traditions and cultural center, preferring architecture that could work with memory as a building material.
Over the past few years, some international research institutions, including the University of Florence, have been interested in the protection of Bamiyan vallery's cultural heritage; these research interest were puruing the definition of strategies and new maps for the conservation and harmonization of life in the valley even in the difficult geopolitical and environmental situation of the context.
The contribution of these international entities has led, among other studies, to a mapping work of places and to a information and data collection, including the construction of a planimetric framework which is currently the only precise and faithful testimony of documentation of the built heritage. The research project here presented has contributed with new elements of site analysis. Thanks also to these knowledge and support tools introduced into the scientific community, the deep understanding of Bamiyan valley and surroundings has made more accessible.

This paper summarizes a research carried out within the Department of Architecture of the University of Florence[1] regarding the contemporary architectural design in relation to the local identities and traditions of highly historicized contexts.
This research has included in its operative dimension some case-studies all set in areas affected by war and military destruction; this choice has made considering the validity of the *archaeological context of postwar* in relation to the themes of ruin and memory.
The case studies has been investigated in the Near East, including Syria, Iraq, Afghanistan, starting from participation in design competitions promoted by institutions including Unesco, some projects have been developed for the construction of new buildings, mainly museums and cultural centers, some of which have been selected among the finalists or prized. Among these are: Aleppo with the new Museum of Memory of the city and local culture located below the citadel (awarded project as top shortlisted in 2019); Baghdad with a new cultural center in the bombed area next to the Hay al Seray complex (2018); Bamyian with a project for a new cultural started in 2014 for the international competition and carried out as research project until 2020, with an educational center and Museum of local traditions in front of the caves left free from the destruction of the giant Buddahs presented here; Kandahar with a new settlement for war widows (shortlist project 2020); Mosul with the reconstruction of the religious and cultural complex of Al Nouri (prized 2021).
The methodological structure of the research was aimed to demonstrate a solid link between place analysis and architectural design, and to confirm also that in some relevant cases the project can be configured as an expression of an in-depth analytical interpretation that is able to draw up key elements for an overall figural reasoning of the project itself.
Analisys were aimed for studying the ideally stratigraphic nature of places over time. They were articulated on the identification of invariant characters in the reading of the main moments of synchronic and diachronic transformations of the anthropic context of Bamiyan valley.
The identity and tradition of the places, their practices and their architectural types and the forms that they have developing during time, have allowed the architectural design to take on connotations, forms, materials and figures around which to build the new Museum of the Local Tradition.
The role of Memory has been placed at the center of the dual process between analysis and design, as a synthesis device of the overall system. It acted as a powerful tool capable of a deep contamination in the elements of the project, avoiding direct repercussions in mimetic aspects and avoid superficial only formal-related configurations. Rather it modulated the relationship between materiality of architeture and immateriality of spaces of the new museum.
It defined type canons around which the use of the system of designed spaces will have to articulate its assumptions, becoming a wall, column, entablature, room, light, shadow, street, square, border, spaces for unspoken words.
The immateriality and the difficulty of passing on through the hard exercise of memory, of interpretation configured one of the most relevant aspects captured by the research presented here which, like any research that has to do with these themes, can only be partially shaped by the set of readings, mostly objective, of the observer.
In this critical condition, the research attempted to put into practice some tools of the urban phenomenon, in the primary attempt to provide a knowledge base for subsequent project operations.
It has been focused on the research for a metric rythm to be discovered in the historical and contemporary built spaces and buildings, with the aim of discover if some measurements could be set as a identity character of the places. This research has been analyzing almost all the planimetrical dimensions of the surrunding buildings in the Bamiyan valley and in the close high top valley and mountains.
The built enviroment has led the new proposal for the museum of local traditions to follow some place rules to develope the large functional system required. The space of the museum has thinked as a gate to the role of the cave in Bamiyan and mountain of Afghanistan tradition.
It has driven to define the main exhibition hall underground related to top natural light system and with the view on the valley. This approach also led to create an underground but open air public square where the life of the museum and cultural center can take part; this specific space is surrounded by the rythm of wall and semicoloumns reading from historical artifacts rythm translated in contemporary architecture language.
The overall dimension of the buildings has been set to agree with the preliminary analisys of the built enviroment respecting the original characthers and identity types.
The museum has been divided in two main parts to better define the roles of the functions requested and to better clarify the relationship between new design and historical context of the valley.

[1] Design research (2014-2020) Riccardo Renzi with the collaboration of Margherita Falcioni, Giulia Pagliazzi, Elena Ceccarelli, Anna Dorigoni, Diego Betti, Francesca Cantale, Virginia Vivona, Gabriele Marinari, Giacinto Cicatiello, Novella Lecci, Jovana Markovic, Allen Rwaich.

The main museum part has been set as a downhill place following the earth levels, avoiding to touch it and to modify the original aspetc of places. The cultural center, also set as an educational center for childs, has been placed instead as an indipendent building.
Both of these buildings are related by a system of measurement that chain them in to a traditional measurement system read in the place and building analisys of the valley and with some classical reference of measurement system. Both of the buildings plays with solid surfaces, natural light and with the role of the cave for the valley historical cultural heritage.
Museum building has set to put main exposition hall underground has also the target to put in relationship the museum with the valley and with the absence of the big buddas in the high caves placed on the opposite side of the valley itself. From the heart of the exposition hall, engraved inside the earth of the place, five tunnels-caves had the role to drive visitors to take a full view to the valley and the empty caves of the mountains.
With this operation the inside, cave-engraved, spaces of the museum have been ideally and phisically related to the emptiness of the opposite mountains caves.
The valley has been thinked to be a immaterial part of the exposition with a constant present, visible and invisible but set as a continuum space link for the visitors that could perfectly fell the presence of the identiy of Bamiyan valley and its historical, cultural, social and artistic heritage and traditions.
Cultural center building has instead thinked as the opposite of the museum. It has set as a four full walls protecting an empty inside space covered by movable tent on the top. This space has set as a protected from sun, wind, snow, cold, and partially from rare rains events for childs to play and for social activities to be set.
The natural light has been driving the space of this building that plays with the role of the rectangular shape built enviroment on the high valleys urban settlments and their idea of perimeter wall and empty courtyards inside. This building has been designed with four walls cutted at the left angle to admit people inside the public space and eve to avoid the idea, that a central entrance could have led to, of principal and secondary facades. All the facades have thinked as main facede with the same function of the other three. Underground this building has been excavated in the ground to set functional spaces required and even to get in touch, as the museum but in smaller scale, with the view of the valley.

Images
Fig. 1 Bamiyan valley. Analisys of built heritage.
Fig. 2 Preliminary design for the Museum of Local Traditions
Fig. 3 Sketches and Physical Model
Fig. 4 Valley section and museum section
Fig. 5 Entrance view and plans
Fig. 6 Axonometrical view and diagrams
Fig. 7 Museum. Exposition hall, view from inside.
Fig. 8 Cultural center
Fig. 9 View from the valley

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Corridor landscapes along Po river: Cremona's case

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Abstract
The research work, the object of this paper, is included in the "Fragile Territories" project of the Department of Architecture and Urban Studies of the Politecnico di Milano.
Due to the pandemic, we are assisting at a big change in our lives and the future of our cities and surrounding landscape. In this meaning, devoted to degradation to the detriment of expanding urbanization, the landscape of Cremona was and still can be sustained to remain one of the main riches of the region. Thus, to rekindle its environmental sensitivity, the strategies trigger its up-gradation as a peri-urban system that will serve not just as a disconnected land that the user is only in touch with its production but also with the land itself. In other words, the intention is to force delightfully the users to consume the landscape as both a productive and an aesthetical one; creating and branching up then new ecological components linking rural to urban, natural to build, and humans to non-humans.
To reach that matter, we led a mapping analysis considering both the territorial and the municipal physical scopes of Cremona, then we managed the findings into a set of strategic directives allowing us, in the end, to sense how punctual interventions can exert pressure on the territory and bring it gradually to its high environmental sensitiveness.
This is the aim of this research about the local landscape between Cremona city and Po river, a green corridor similar to many other situations in Italy and abroad, deserving to be studied as the main topic.

Keywords: rural-urban connectivity, productive landscape, active promenade.

1. Analysis and methodology

Initiating the work with a larger scale analysis to understand rightly Cremona in its physical context, we come up with a variety of layers that speak the myriad of natural features the region has. A dense hydrographic line of an artificial nature, consisting of canals and artificial riverbanks, characterizing both the city and the countryside. The province is devoid of reliefs, but the territory is shaped by the river valleys, both of the current rivers and of the relict ones *(Serio Morto, Morbasco, Delma, Lisso, etc.)* which have modulated the plain with slight undulations and small deep depressions a few meters above the floodplain. The waterways are also a prominent asset for recreation and attracting wildlife.
Significantly wooded areas are found along the course of the Po, from Cremona municipality to the south-east of the province. The woods present in the area are composed of three main categories: riparian wood, softwood, and strong wood. The various passages of the dynamic succession of the Po Valley vegetation can be found represented in this latter and understand how this evolves from the stages of greater hydrophilia to those in which it frees itself from the water. The management of the herbaceous vegetation of the wood allows observing graceful blooms that have become unusual in much of the surrounding area, such as those of the snowdrop at the end of winter, of violets and primroses, anemones and Scylla in spring, hypericum, and bluebells in summer. From the initial 28 species found for the provincial territory, narrowing the inventory down to those found in the municipality of Cremona led to categorize them into their families and quantify them to identify the essential ones. Salicaceae is the most abundant tree family with 6 species found in the municipality (LIU, NIJHUIS, 2020).

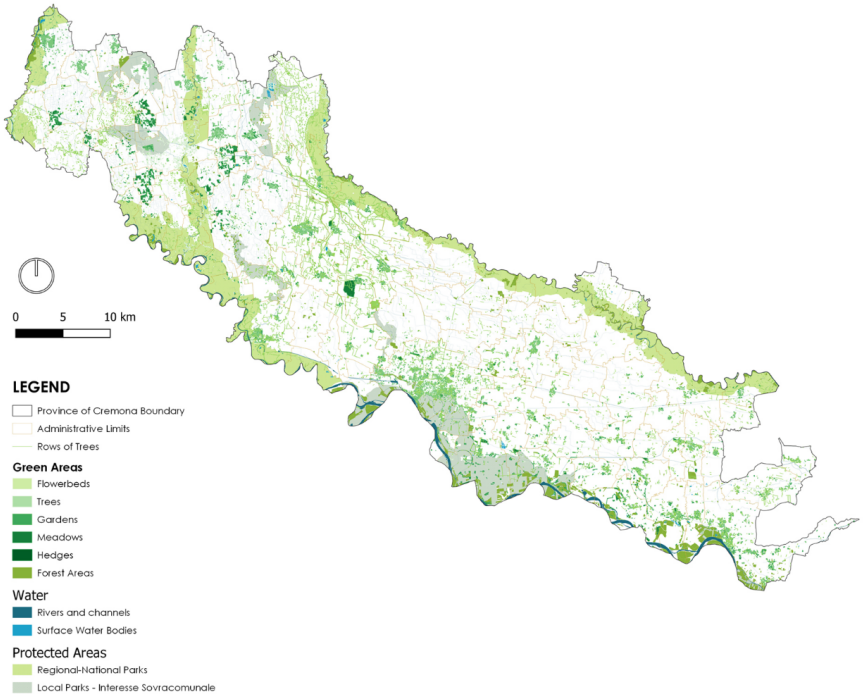

Fig. 1: Cremona's territorial ecosystems.

Tackling the protected areas, there was a conservation policy starting from the 1980s to preserve large areas affected by rapid development processes. The major intervention concerns the project called "Ten Great Forests of the Plains" which allowed the formation of vast green systems with multiple functions in harmony with the rural ones. This is verified thanks to a GIS application analysis that we run over the years 2018, 2019, and 2020. The satellite images obtained from Sentinel-2 data over these years enable the computation of the indices - Normalised Difference Vegetation Index (NDVI) and Normalised Difference Tillage Index (NDTI), which help in the identification and representation of vegetated areas (and their density) and the distinguishment between built-up areas and bare soil respectively. It can be observed that there has been a gradual rise in the density of vegetation in Cremona over the three years.

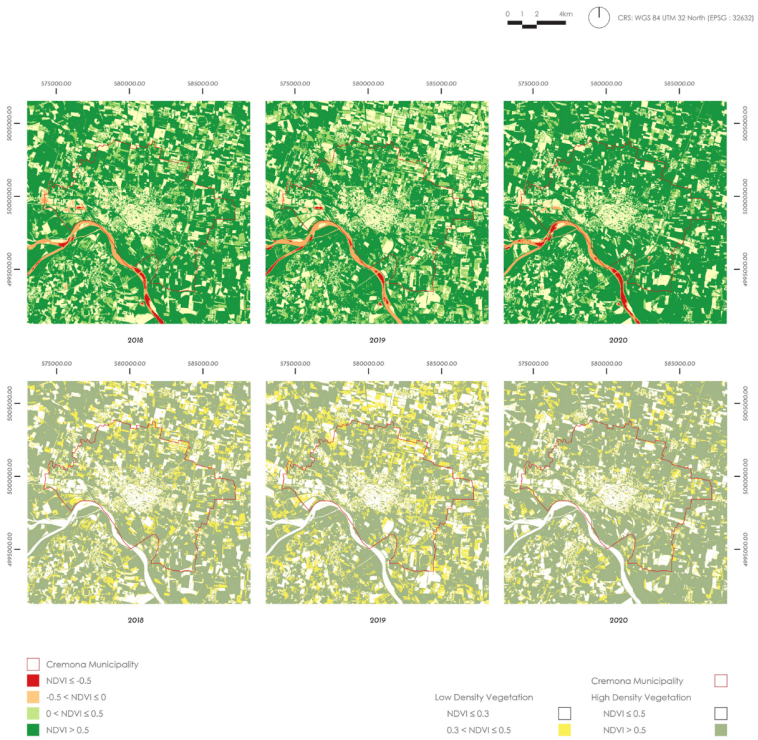

Fig.2: Long term evolution of built-up areas using Normalized Difference Vegetation Index (NDVI), in 2018-2020.

The analysis of the built-up areas through various indices point to the efficiency of NDTI, in the representation of the built fabric. Yet, these indices have some percentage of error as we compare the evolution from 2018 to 2019 (Geoportale Regione Lombardia, 2021).
Observing the agricultural scape, the land is formed following two main patterns. The first called "intensive agricultural activities" is typical of the primary landscape in the province of Cremona. It is characterized by an intensive production activity based on the high use of chemical fertilizers and pesticides. The second named extensive agricultural activities' is typical of a much smaller part of the province. It is characterized by high production activity. A richer landscape exists, with smaller fields with tree lines and hedgerows and a close irrigation canal network. Both patterns are pointed by isolated "*cascine*", which over 200 of them in the province of Cremona are stated abandoned. Cascina in Italy, "*cascina a corte*" refers to a type of rural building tradition of the Po Valley. A typical Cascina is a square-yarded farm (sometimes having multiple yards) located at the centre of a large piece of cultivated land. The ones located close enough to larger urban areas as Cremona are often specialized in cultivating fresh perishable vegetables that were very profitable in urban markets. Therefore, activation of these rural identity-holders will allow a contextual response nay a land palimpsest.

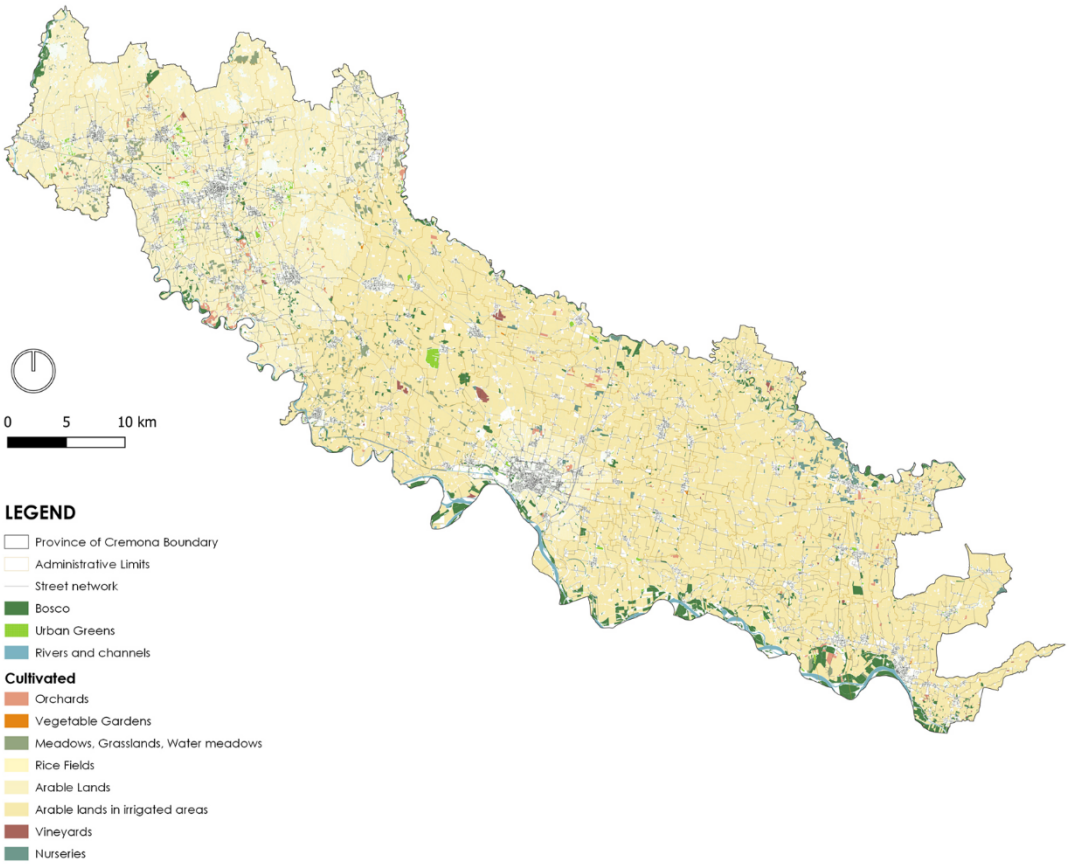

Fig. 3: Cremona's territorial urban and rural systems.

Apart from mapping, inventorying, and layering the existent, looking at historical graphics (maps, postcards…) permits to stem other identity-holders. The religious buildings and venues are the most ones, followed by cultural components consisting of places of events and occasions, signifying the violin history of Cremona and which is so-called the 'Violin City' as it claims to have invented the violin.
For what concerns roads infrastructure development, this latter was mostly confined within the city wall and there was only one main connection to the river which was used for trades. In the 19th and 20th centuries, people started to utilize its strategic location, which is between Milan, Verona, and Genoa. Hence, most of the road infrastructure was developed on its connection. Also, more roads were formed to connect the city to the river, but this was mostly for military purposes.
Regarding the historical natural value, it is interesting to note that city users have used a lot of water elements in streets and buildings aesthetics. Speaking about the riverfront, the areas of the historic floodplain of the Po and the adjoining fluvial territories are of fundamental importance in the development of the *Cremonese* territory linked to the irrigating waters of the productive countryside (Sereni, 1961). This being said, urban landmarks, historical avenues, and water flows can go hand in hand to

interlace with the green system offering a complete wisely used and appealingly apprehended landscape.

2. Research strategy

The chosen strategy area can be defined as an in-between space which the two edges of it are the city's urban landscape and the river Po. It has the double characteristic of dividing and connecting two opposite types of environments: the built and the rural one. The site is composed of a multitude of elements despite what can be seen just at first sight (Bianchi, 2019). The main presence is one of agricultural fields considered to be an advantage for the area thanks to their proximity to some residential cores of the city; in this case, a peri-urban agriculture. This typology of the landscape also hosts several *Cascine*. In the end, what consistently will link the edges and the in-between space, is an eco-promenade overlapped with the main avenue that links the southern built environment of Cremona to the Po riverfront making it a pedestrian-friendly path branched up from the city to the river.



Fig. 4: Natural environment of the area of intervention.

The observer's view is influenced by several elements along this path, as we walk from the historic centre towards river Po. The first zoom-in plan (Fig. 5) focusing on the cultural landscape takes the forefront, and the path along *Corso Vittorio Emanuele* the second provides visual frames of historically significant structures, such as the *Chiesa* and the colonnade of the theatre's entrance. There is a change in the paving which marks the transition from the historic centre outwards.
As we move away from the city centre we observe that, at the junction where the path takes a turn, there is an abandoned structure with a tower that becomes a landmark along this path, which we see in the perspective view on top. We then begin to approach the agricultural fields along with *Via del Sale*, where the landscape directs the gaze. The agricultural fields align themselves along one edge while the row

of trees along with the other, thereby providing a panoramic view on the fields as seen in the perspective view.

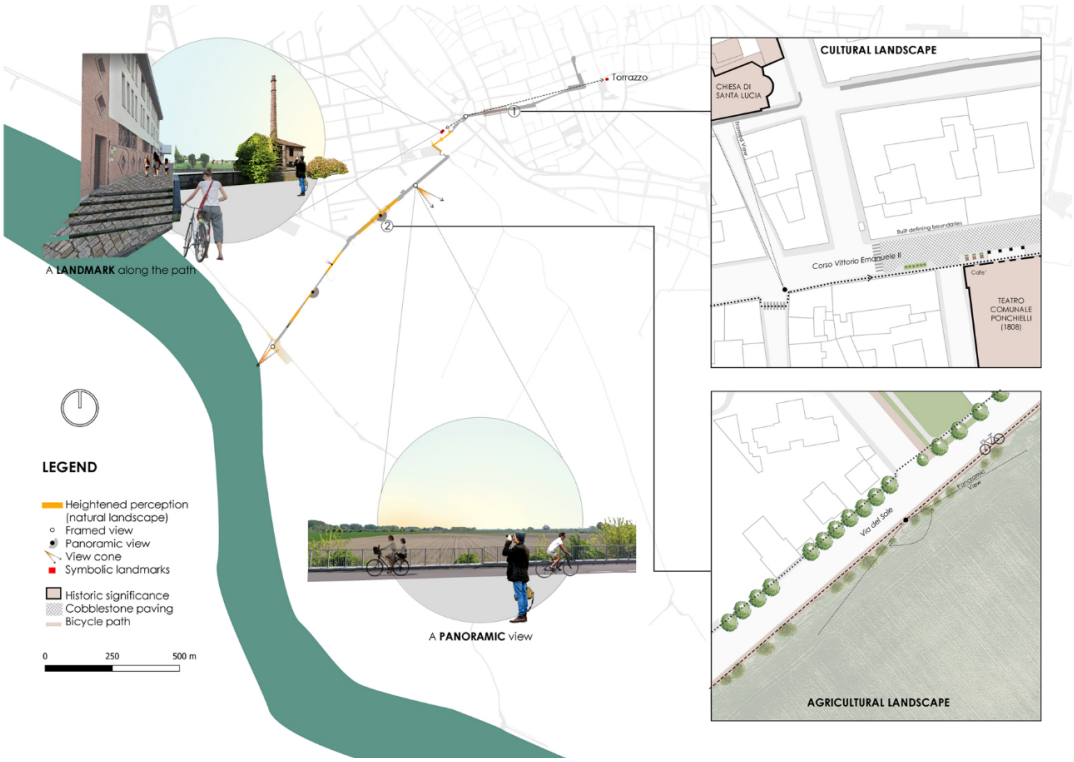

Fig. 5: Cultural landscape perception by the user's gaze.

Before our eyes meet the panoramic agricultural landscape, the first sight glimpse is obtained through a small view window, the first perspective on the top left (Fig. 6). This area has a great potential to be developed further as a pause point along the bicycle path.
The zoom-in plan on the top right looks at a stretch of tree-lined avenues that create a serene experience along this pathway, with small-leaf linden trees and box elders on the other side, both species being different in their visual aesthetics, directing the gaze towards the glimpses of the park that we see through the tree-lined stretch.

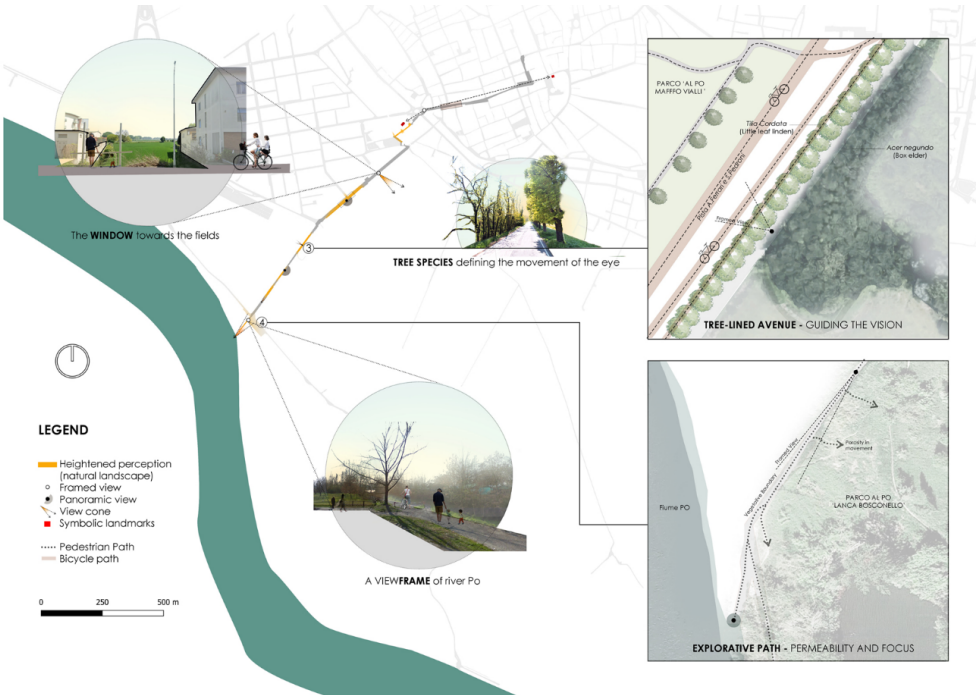

Fig. 6: Agricultural landscape perception by the user's gaze.

As we approach the river edge, the tree-lined edges define and frame the view, with a porous edge that merges into the *Parco al Po Lanca Bosconello*, the other end of our circuit.
Overall, we observe a possibility in developing soft mobility on the main promenade with more integration with the agro-landscape.

3. Key points' scenarios : conclusions

To foreshadow palpable strategy outcomes, we acupunctured the proposed network with main points of pressure as areas of possible interventions. Each will have a main directive scenario.

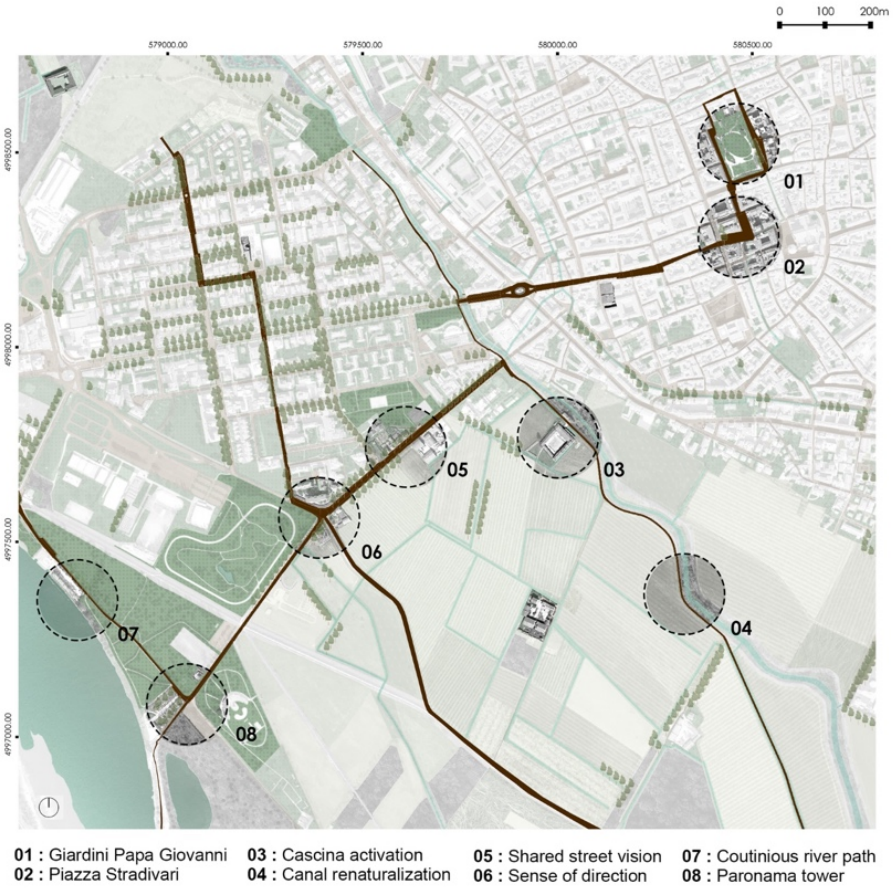

Fig. 7: Strategical key points identification.

The starting point of the path is the *Giardini Papa Giovanni* in the urban area. The aim at this junction is to connect it to the countryside by creating a series of tree-lined paths, thereby establishing a stronger relationship between the urban and the rural.
The intention regarding the historical centre is such that it welcomes people to use the space for leisure activities. Currently, the situation is interchangeably used as a vehicular road lacking rest zones and greenery. For that reason, we demarcate clear areas of vehicular road, soft mobility, and the central *piazza*'s space to welcome people use the space and linger around a bit longer, we introduce street elements like lighting, seating furniture, planter boxes and use locally found vegetation. For the *piazza* flooring, which was initially concrete, we propose permeable paving with stones that allow water percolation to the ground aquifers.
The intensification of agricultural production systems during the last decades had an enormous impact on landscape structure in agro-ecosystems. Landscape elements like hedges and vegetational rich field margins disappeared and crops are cultivated in large monocultures. To let beneficial insects, play a role in these 'ecological deserts' and to fulfill their food requirements in form of pollen and nectar (Winkler, Karinn 2005), the research proposes the establishment of flowering field pockets as a combination of pollinators, nitrogen fixers, and suppressors to conserve the biodiversity in fields. All these flowers are common to the Cremona region and grow perfectly regarding its climate conditions. The nitrogen fixers convert the nitrogen of the air into a usable form for soil. The pollinator plants attract bees and other pollinators. The suppressors suppress the growth of harmful plants in the soil. Part of the existing Cascina will work as a flower market and a storage unit for the new yields.

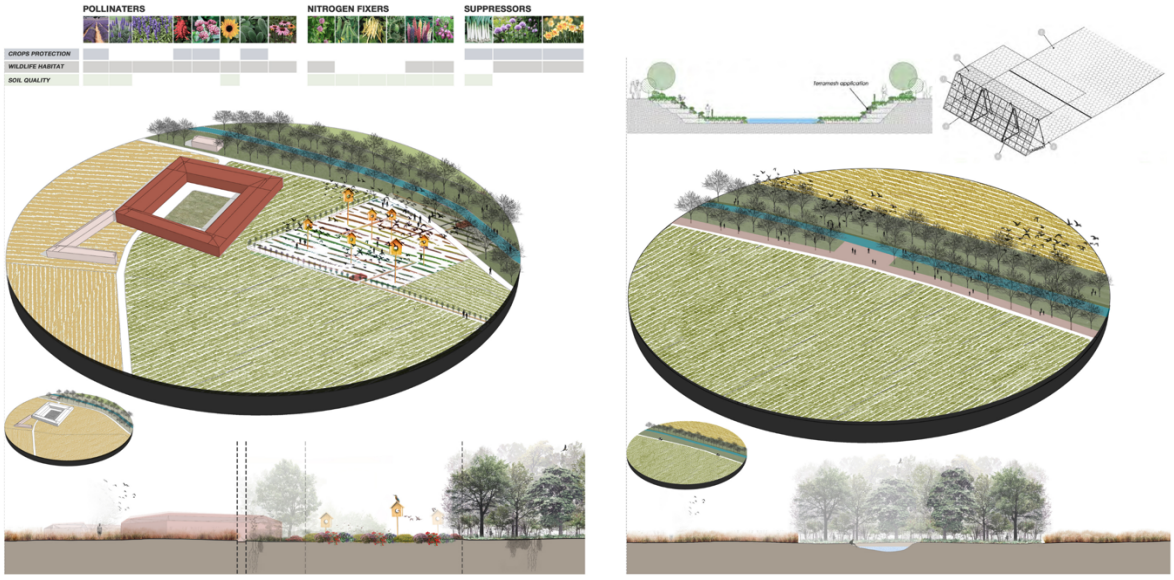

Fig. 8: Intensification of the agricultural production and Cascina activation.

Fig. 9: Canal renaturalization example.

Other implementation concerns the renaturalization of the canal crossing vertically the main path and separating the urban and the peri-urban areas. Here we propose modular terra mesh walls that will provide effective flood protection by stabilizing earth embankment. Moreover, this will help increase green areas around the waterbed and result in the formation of new little ecosystems in the gradually generated ecotones (Fig. 9).
Another junction develops into an important bridge between *Parco Igino Sartori* and the fields, with a series of wooden platforms overlooking the fields. A new community garden is created within the park, with a new defined entrance replacing the existing entrance (which is also a car parking) further ahead along this path. Provisions for kiosks can allow the community garden product to be sold in this square. The idea is to incite pedestrians and cyclists to pause and absorb the transition towards the rural fabric while ensuring preference for pedestrian movement over motorized transport.
For the point close to the river and the natural forest. The intention here is to replace the existing barren land (used for parking by the people using the boat club adjacent to it) with a pedestrian-friendly space that connects with the forest. As to strengthen more the attraction to the area, we propose a panoramic tower that will have 360 degrees view of the urban, rural, and natural landscapes.
Finally, considering the riverfront which serves at present as an escape for the locals to stroll, walk and sometimes bike along. The aim is to break the discontinuity of the existing path parallel to the river. The proposal is to relocate or adjoin the inaccessible private areas to provide a better public space for users to enjoy and be aware of their waterscapes.
All these strategies described so far should be fundamental policies for the management of future scenarios between urban areas and the surrounding landscape, imagining a regeneration of all the neglected and abandoned or polluted parts of the human being's environment. Only if we invest in health care and a clean world, in a real use of all territories - and not just in the consumption of urban areas - will we be able to reverse the current trend of unsustainable lifestyle on the planet.

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Landscape Perception

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Abstract
The debate about landscape is often ambiguous, surrounded by an aura of vagueness that complicates any attempt to give it a universally accepted definition. The term landscape is continually compared to the elusive character of the word itself, where both the significant and the signifier are vague. In this abstract it is possible to consider landscape as a system, or better, as a system of systems and its complexity derives from such an assumption; the scholar's ability to examine its true essence is measured exactly on the aptitude to understand the complex nature of the landscape system. The way we perceive places depends on both our feelings and the variability of external conditions, both the land conditions and the transformations that have shaped the land itself over time. Moreover, we can state that the landscape perception coincides with both material and immaterial mental representation of the territory features, more or less consciously elaborated by the individual, applying the interpretative models proper to the group he or she belongs to. Every place is made up of not only things but also people, that is why the affective and emotional component becomes a sort of 'emotional shell' that gives meaning and delimits the chosen territories we feel to belong to.

Keywords: landscape, perception, system, system of systems.

What we see is not what we see, but what we are.
(Fernando Pessoa, *Il libro dell'inquietudine, 448*)

1. Complexity of the landscape system
The debate about landscape is often ambiguous, surrounded by an apparently ineliminable aura of vagueness which made it complicated and still complicates any attempt to give it a universally accepted definition. The ideal form of landscape must continually be compared to the widely elusive character of the word itself, where both the significant and the signifier are vague from a semantic point of view.
That is why the nature of the landscape, its essence, can be defined as liquid by analogy with Bauman's definition of modern society "where strategies formulated in response to changing living conditions quickly become obsolete, before the actors themselves have any chance of learning them correctly" (Bauman, 2011, p. VII). Transposing this concept from society to landscape, we can state that the latter is liquid, as its significant changes even before the observer begins to fully understand it.
An essential element of the landscape complexity lies in its intrinsic polysemy, as it can easily be deduced from the innumerable interpretations given by the several disciplines studying it. In such a sense, the effective image proposed by geographer Giuliana Andreotti is clear and she says: "the problem of the landscape interpretation is not in the landscape itself, but in the man, who has to interpret it" (Andreotti, 1997), underlining how each point of view corresponds to a different landscape definition.

We can certainly consider the landscape as a system, or rather as a system of systems according to lots of scholars; its intrinsic, inevitable, and incontrovertible complexity derives from this assumption and every observer must be aware of it; every scholar's ability to examine its true nature is, in fact, measured on the ability to understand the complexity of the landscape system. As Tinti observes, quoting numerous theorists' opinions, "the complexity of a system is not a property of such a system, but a property of the currently available scientific representation of the system, that is (...) a property of the system made up of (a) the observer, who builds the model, and (b) the model itself" (Tinti, 1998).
The author himself, referring to Morin, Bateson and others' studies, underlines the absence of a pyramidal hierarchy among the characteristics common to all complex systems; the presence of a single component, governing the behavior of the whole, would determine an extreme simplification of their description, potentially reducible to that one of the subsystem-leader, which is impossible in the landscape system drastically characterized by circular and recursive relationships among the elements that compose it.

2. Landscape production and interpretation

The landscape debate mainly focuses on two dialectical nuclei: the former concerns how to produce-perceive places, relating to the symbiotic relationship established between the man and his surrounding environment; the latter concerns the methods of interpretation-assessment, concerning the capacity of the scientific and humanistic disciplines to elaborate analytical and descriptive methods able to reveal the landscape components, interpreting their significant and weighing their value. Even not examining closely the partially cryptic issue of Heideggerian "Dasein", it is worth to be considered here everybody's awareness of belonging to a specific place and, therefore, the knowledge that man's sensitive existence necessarily depends on being part of a place, a landscape that is scene and representation of our life, at the same time. As if to say that we cannot be recognized as individuals if we do not continually compare ourselves with a place, we call identity, in a dialectical way.
Since the landscape issue has become part of a wider scientific debate about the ecosphere and anthroposphere, the problem of an effective definition of landscape has arisen, from both an epistemological and a perceptive point of view. Despite the wide-ranging debate, any univocal and universally accepted definition of landscape has not been elaborated yet; it is probably due to the plurality of paths followed by each discipline, which has adopted different theoretical instruments and analytical methodologies, depending on its specific aims, often coming to original and discordant conclusions.
The investigation into biological, cultural, and emotional mechanisms, the landscape perception is based on, is particularly complex, and it is reasonable to admit that an excessive simplification of definitions (or an exasperated reduction of models) may lead to partial elaborations producing intrinsically and ontologically incorrect conclusions. That is why investigating the experience of places, we tend to privilege only the visual perception against all other sensations; we carry out a simplification that is partly misleading, so scientifically unacceptable.
"... however, a jumble of individual living and non-living things is not a landscape in itself, since they are important the images or metaphors that people create about these things, the moods coming from them, as well as the observer's reflections and interpretations about what he or she has seen and through which mental relationships are established with the things perceived ..." (Küster, 2010).
The places, where we spent our childhood and our own character was formed, belong to us as we belong to them, and this interweaving of correlations between the inner self and the outer self is the basis of our recognition as individuals, creating that peculiar feeling of belonging that characterizes our "being in the world" (Heidegger, 2011).
How we interpret places depends on our feelings and variability of the external conditions, those specific ones to the area and the transformations that have taken place over time and contributed to shaping it. The rapidity of these transformations is decisively influencing our ability to interpret the phenomena that characterize the landscape, as old and consolidated elements are overlaid with the new and sometimes discordant ones. The never-ending and apparently chaotic flow of tangible spatial events and invisible immaterial phenomena determines the consciousness of the landscapes belonging to us and we belong to. This consciousness is at the origin of the sense of belonging that allows us to live comfortably in a territory, removing any feeling of alienation and disorientation.
The activity of learning and re-elaborating the perceived world is also influenced by the memory embodied in objects and by the myth, that is the story each community elaborates about its own history. The universe of information, that characterizes each territory, feeds the human emotional experience. Due to "emotional economy", it tends to privilege some information considered as essential and characterizing, and it tends to ignore others, which are perceived as background noise and that are not considered in the formation of that inner and primordial feeling that Christian Norberg-Schulz has defined as genius loci, as it was used in the classical world to evoke the intimate link established between the characteristics of the place and its inhabitants' feelings (Norberg-Schulz, 2007).

Then Lynch explained how the perception of places depends on the recognition of archetypal signs structuring the image of the territory (particularly the urban one), which are the following five: paths, landmarks, margins, hubs, districts. These elements allow everyone to elaborate his or her own mental map that serves for orientation in the urban context. So, everyone can move from a place to another, reach his or her workplace, come back home, look for places of entertainment, through the memorization of characteristic signals, indispensable for not getting lost in the semantic chaos of the metropolis (Lynch, 2008).
If, however, we intend to apply this method of analysis in the extra-urban context to an entire territory, then it will be appropriate to think again this stock of signs, adding others, removing some or, more simply, adjust the definitions of each element to adapt its meaning to the new spatial dimension.
If a larger extension does not necessarily correspond to a greater complexity, we must consider that different factors become predominant in the open space in comparison to the urban context. For example, the width of the visual horizon becomes an essential element. Margins, hubs, and landmarks change dramatically in size, assuming essentially a natural appearance; orography, vegetation and the presence or absence of animals become predominant elements, that have little or no importance in the urban context. The view sweeps over a vast expanse of territory and the "sky view" goes from being a demanding parameter of well-being to describing a condition of appearance, which concerns the user's emotional sphere and not the physical one.

3. Landscape-generating perception

Perception simultaneously involves all the senses, which activate the neuropsychic chain of specialized areas of the brain responsible for the reception and interpretation of external stimuli. However, the human sensory apparatus is influenced by the observer's emotional condition, which changes continuously, depending on individual habits, but also according to the culture and beliefs of the social and ethnic group he or she belongs to. So, about this issue, we can state that the landscape perception coincides with the mental representation of both material and immaterial characteristics of the territory, elaborated by the individual applying, however, in a conscious or unconscious way, the interpretative models of the group he or she belongs to. *"Each individual creates and carries a personal image with him or her, but there seems to be considerable agreement among the members of the same group. These group images win sympathy among large sections of the population, showing interest in urbanists, who aspire to model an environment that will be used by lots of people (...) We will be interested, above all, in what we may call the "public image", the common mental picture that large sections of an urban population carry with them: areas of sympathy that can be expected to arise from the interaction among a single physical reality, a common culture and an equal physiological constitution"* (Lynch, 2008, p. 29).
It is the interlacement of territory, culture, and sensitive physiological entity (man) that determines the landscape image, so that everyone perceives the surrounding reality in an original way, but always according to criteria and ways shared by all members of the community.
The homogeneity of ways of interpreting and evaluating external stimuli is a feature shared by the entire human beings and does not only distinguish certain groups, since studies and experiments, made within the field of neuroscience, have shown that the human sensory apparatus generates common emotional responses, which are based on universal aesthetic-evaluation criteria, independent of either ethnic, or social, or cultural differences.

4. Landscape assessment and governance

Each landscape is perceived differently by each individual, depending on both his or her previous experiences and the time spent there, and it is normal that each person's opinion of a place changes little by little he or she hangs out at it. Every place is made up of not only things but also people, that's why the affective and emotional component becomes a sort of "emotional shell" that gives meaning and delimits the chosen territories, we feel we belong to. According to Norberg-Schulz, "we can understand how belonging, which is implicit in the term identity, means something more than being at ease. Identity means living a world including both the place and the community one belongs to" (Norberg-Schulz, 1996).
Another element can further, and even more fully, define the character of the place where you live, and that is the memory, the narration, the story told by others and that one which each person elaborates over time; it is precisely the story which becomes myth in the very long term, that distinguishes the scholar's judgement from the common man's visceral judgement.
That's why the assessment of a landscape, carried out for management and decision-making purposes, shall be emended from any emotional redundancy to implement a proper synthesis between the common social feeling and the objective analysis from the experts; in assessing a territory, they give importance to other factors, too, that do not depend on sensory perception, they are: maintenance level, services quality, inhabitants' cultural level and their civic sense, environmental noise, urban order and construction quality.

5. Change

"No man ever enters the same river twice, because the river is never the same, and he is not the same man"; the quotation of the well-known assertion attributed to Heraclitus, the great philosopher of Magna Graecia, is perhaps obvious, but almost inevitable to introduce the issue of landscape change. (Diano, Serra, 1980)

The question is not a trivial one, since it is the basis for the numerous lines of thinking which deny or invoke the landscape intrinsic vocation to change as an essential attribute, time after time. The inevitable change of territories does not correspond, as someone believes, to the loss of identity, since things change because of either men's action and will or natural event effects (almost always due to the combined action of these two causes), but these changes, as it happens with men, do not lead to the loss of identity. The roses in our gardens change with each flowering, but this change does not affect their recognizable individuality in our eyes and each time they flourish again they are always 'our roses'.

In nature, change often happens slowly and is imperceptible to our senses, so it is impossible to record the moments of transition from one condition to the next one. Everything that surrounds us is constantly changing, objects become old and their primitive functions decay, people grow old and change both in their general physical features and in the most minute textures of their epidermis, the color of their hair changes and gradually it loses its former vigor, their behavior and habits change together with their outward appearance, often at the same time; yet, we continue to recognize, love, appreciate or criticize them despite it, because their intimate nature and recognition do not change in our eyes.

Free territories, scarcely anthropized, are influenced by slower rhythms of change than highly anthropized territories; if we compare the times of geological transformations to those concerning the duration of either our lives, or our entire civilizations, we immediately notice the difference. We can, therefore, state that the essential quality that characterizes anthropic action compared to nature action is the deep difference in the times when changes happen.

Yet, the greater rapidity of anthropic transformations of the landscape does not imply their immediate or inevitable transience; there are, in fact, either buildings, or territorial accommodation, carried out in a short time, having a considerable permanence level, and other accommodation that, although produced more slowly, have a rather ephemeral life cycle.

Anthropic transformations generally follow a design that foresees their function and duration, while changes created by nature respond to precise intrinsic rules written in the biological language of DNA, but they are not designed to satisfy an only and well-established task. Moreover, nature tends to act in a harmonious way, avoiding sudden changes but in the case of exceptional events, while human activity is almost always dictated by impulses and extemporaneous needs that do not obey rules that are already written and unchangeable over time.

In an overall view, the change of a 'small' component rarely determines an appreciable variation of the overall image, while in an urban context, even a minimal addition, a variation of either the grain or the color of a surface, can be perceived as a compromise of the place image consolidated in the collective memory.

6. Static and dynamic

It is practically impossible to outline a stable and stationary landscape picture, as the ancient landscape painter did, because any description, even if limited, does not exclude the possibility of elaborating a potentially infinite number of other representations using other *lenses*, that is, different points of view and other *eyes*, our own eyes, but at different emotional moments. Dependently on the different states of mind, we enter a perceptive condition that we will call a *representational loop*, which indefinitely generates different images of the same place.

The landscape, interpreted in this way, appears as a space-time *continuum* in a perpetual transformation, dependent on both the work of nature and human action; its cycles of transformation include phases of construction, settlement, abandonment, and rebirth that can affect large parts of the territory or limited areas, determining either slow and imperceptible or rapid and traumatic changes (Küster, 2010). Variability and changeability are, therefore, attributes of the territory, whose landscape image can be considered as the epitome and the collection of those intrinsically complex processes, that determine its recognition, at the same time.

We mentally record overall images and detailed views of the landscape and associate emotions and memories with each one of these views. On the one hand, the act of perception depends on rational intelligence involving conscious and formalized reasoning, on the other hand, it is related to what Daniel Goleman has defined as emotional intelligence, inherent in the deep (primordial) layers of our brain, that attitude that grasps the sensory world instinctively a moment before rational intelligence begins any kind of conscious processing (Goleman, 2019).

To describe a landscape comprehensively, we must, therefore, use interpretive schemes able to go beyond the mere sensory experience to penetrate and interpret the emotional essence of the place. This type of intellectual attitude presupposes a study approach that abandons, at least partly, the scientific method to elaborate descriptive methods that are less objective and systematic, more like the methods conceived by writers and poets than to those ones normally adopted by experts.
It is certainly no coincidence that a poet such as Petrarch is considered as the initiator of intellectual speculation on landscape. The poet seems to have been among the first to interpret landscape as an autonomous entity, recognizable and worthy of attention other than simple and pure aesthetic contemplation. The cognition of landscape is an intellectual act that presupposes not only an acute sensitivity, but also the ability to interpret and assume as a single, coherent system the set of visual and emotional stimuli provided by the scattered and apparently dispersed elements of a territory.
Each time we observe the environment surrounding us, we summarize the signals received and gather the individual elements, which compose it, into a single complex image; the mechanism is practically that one described by Gestalt psychology, according to which we are able to perceive a formal synthesis of an image, even if it may appear incomplete and fragmented at a first glance; we join the interrupted lines and complete the discontinuous circuits in order to outline an image that has got a complete sense. It seems that it is our intimate need to conceive an image as complete and totally defined that determines the overall vision of the landscape as a recognizable entity.

7. Tactile experience

"80% of stimuli come to us through sight, and we often forget that there are four other senses that can give us additional information, symmetrical with visual information or even contrary to it. Children, driven by their curiosity, use the sense of touch to discover things; it is sad, however, that over time their curiosity is crushed by signs saying, "Don't touch!". "Having something in your hand" or "Touching with your hand" are just two of the sayings that refer to a certainty: it is as if touching with your hand has an authoritative value" (Borcos, 2017).
Tactile experience in the perception of a place is as important as visual and olfactory experience. It is not necessary for this experience to be real; it is enough that the relationship with the architectural surfaces and that one with the vegetal cover of natural sites occurs even only by contiguity. Observing closely the grain of either the finishing materials, or the trampled ground or the boundary hedges, has the same effect as a direct tactile perception. You do not need either to touch a wall in the middle of summer to feel its warmth, or to crumble a soft stone with your hand to feel its texture, because the basic sensations of roughness, warmth and smoothness are present in each of us at a psychic level and are perceived both if we really touch the objects and if we only imagine we are touching them. The tactile experience is essential to perception because the complete cognition of things does not depend just on sight; we could never fully enjoy a beautiful, beloved face if we did not complete this gratifying experience with a tactile caress.
The judgement about places is, therefore, meaningfully influenced by tactile sensations; on a large scale we grasp the chromatic, dimensional, and topological relationships established among the elements of the landscape; on a small scale, the proximity one, we assess the material consistency of minute things, thus completing the complex weave of the sensitive. Overlapping these sensations, we can mentally rebuild a unitary and global image of the landscape before us, we fully savor its beauty, evaluating in detail and globally its intimate material consistency, mentally relating it to the chromatic and luminosity values.
The tactile experience is the one that, more than any other, puts our body, our being material of the same consistency as the things surrounding us, at the center of the landscape; we touch, act, and move in a context, we are an essential and ineliminable part of, otherwise we miss the landscape, the real one for our consciousness, that is the perceived one.

8. The beauty of places

It is likely that the perceived beauty of a landscape can only be considered as a deception, a sort of psychological compromise that allows everyone to enjoy what a given area has to offer, beyond its real attractiveness. It is possible to love and appreciate the most hidden and apparently mediocre landscapes, but that have remained truer; in such a sense, the harsh and wild territories of archaic Lucania will be equally enjoyable as the green and delicate ones of sweet Umbria, or the sunny landscapes of inland Puglia more than the rough coasts of the complicated Ligurian morphology; the urban modesty of Ascoli Piceno will be appreciated as much as the artistic magnificence of powerful Florence.
The 'rate of beauty' of a place is difficult to assess just as it is difficult to compare places that differ in grace and beauty. Grace and beauty are problematic definitions at a linguistic, philosophical, and psychological level, and discussions about their (subjective or objective) nature have been and continue being a hard issue and a source of great ideological opposition. Different civilizations,

historical periods and countries around the world seem to have different conceptions of beauty, which therefore seems to escape a single, irrefutable definition that is valid in any place, at any time.
The judgement about (male and female) human beauty seems to come from considerations, that are extraneous to aesthetic canons in a narrow sense of the word, in various periods and countries and they are linked with more general conceptions of the world surrounding us, its understanding and reduction to geometric, numerical, and proportional canons that have been elaborated by different thinkers or internalized by entire peoples over time.

9. Cityscape

Immense rest of emotions / Under low clouds / That threaten rain. / Silent city / Dying feeling of melancholy. / I wake up. / Under these clouds / In front of this city / Full of emotions (Dell'Olmo, 2018).
The city full of emotions in this poem is the one we refer to when we think of the cityscape meant as an excellent identity place.
The city is a concentrate of landscape because signs, emotions and relationships gather here more than in any other anthropic place. Neither the village, nor the hamlet, nor the vast territories can be compared to the city, which is different from them, not only and not so much for its size as for the plurality of meanings accumulated there over time. Augustin Berque has stated that today's city is full of yesterday's city, an assumption that can be fully shared, since it is undeniable that the stones and urban places, we walk on today have been walked on by other men (with other cultures and aspirations) in times gone by, each one filling the streets and buildings, lanes and courtyards, houses, and gardens with his own meaning (Berque, 2016).
What little or big of these places has come down to us seems to have a different perception from those who created them or previously inhabited them. This seems to be the elusive 'rule' of the urban environment, which appears to be stable, even being in a continuous evolution. The historical city, in fact, seems immutable, representing the identity core of our spatial experience, fixed in the memory together with all its dense and complex meanings. It is the historical city, the urban core[1], that strenuously opposes the disordered expansion of today's metropolises that encompass larger and larger parts of a territory.
Despite its apparent and deceptive solidity, the cityscape is considerably more fragile than the *country landscape* (the territory), since even the smallest change (e.g., the grain or color of a building surface) can compromise its consolidated image. On the contrary, in a large territory, the change of just one or a few components is unlikely to cause appreciable changes to the overall image.

10. Measuring a landscape quality

One of the scholars' desires, almost always unexpressed and inhibited by a deep sense of scientific modesty, is to identify objective criteria for evaluating the perceptible landscape quality, at least of restricted and adequately limited areas, those parts of a territory commonly referred to as *landscape units*[2].
That is why some considerations elaborated in the past, outlining a (qualitative) methodology for assessing the perceptive quality of specific landscape units are reported here. Three basic criteria are considered for this purpose, which can "measure", each one from a different angle, the perceptive value of a place; they are respectively: *character, coherence and belonging*.
Character, on the one hand, is meant as the recognition level of a landscape framework, as a unique place that cannot be replicated in any other context. *Coherence*, on the other hand, is defined as the territory ability to express the existing link between the place and the economic-productive system of the population living there, in landscape terms. Finally *belonging* concerns both material and immaterial identification level, established between inhabitants and their place. Each studied territory will be, therefore, characterized by different recurrences of the three parameters considered and their trend, represented graphically, and it will give an overall quality-perceptive assessment, a sort of score useful for defining the differences in value between landscapes in pairwise comparisons.
The progressive loss of character, coherence and belonging that has characterized the evolution of a meaningful part of the territory, particularly affecting what was once defined as the agrarian landscape, is now beginning to affect the consolidated tissue of the historic cities.
Nowadays in the territory as well as in the cities, primitive archetypal traces are flanked and superimposed by new elements that materialize either in discordant isolated signals or in minute and widespread image alterations.

[1] This refers to the definition of urban core, the current declination of the Greek agora and the Roman forum, as described by Siegfried Giedion in his fundamental essay *Architectural Breviary.*

[2] Landscape units, as you can see from the definitions given in lots of landscape plans, represent well-defined territorial areas with specific, distinctive, and homogeneous characteristics of formation and evolution.

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WORLD HERITAGE and DESIGN for HEALTH
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Healthy Living in Heritage Buildings and Resilience by Design

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Abstract
Buildings, that are valued for their cultural contribution to our world, have an obvious disadvantage which comes with aging of construction materials especially masonry and wood, but also with materials which emerged in industrial age. Aging, for instance, may cause dust, moisture, and mold and lead to health problems. There are many other aspects of buildings whose design reveal disadvantages regarding health over time, which may be the main cause of their abandonment. The common assumptions, as lack of understanding of their socio-economic value or the suspecting that their concept cannot be associated with contemporary living, may be of secondary or no importance for the heritage future. Starting from the hypothesis that the further use of some buildings may carry lethal health risk and therefore their re-use may exceed the overall benefit, in this paper we focused on the newer research of correlation between materialization and health, case studies and actions on strengthening the resilience of built heritage by design.
Keywords: health prevention, heritage buildings, design

1. Introduction

A decision not to keep a building with heritage value may be based on lack of understanding of their potential and values, but also it may be rooted in objective understanding of state of the building which, upon analyses, may implicate a health risk and choosing other strategy for preservation of their unique values - rather than re-use. Making right decision comes from good understanding, and in this paper we addressed the problem of understanding the magnitude of health risk when using a heritage building for living, working or business. “The quality of the environment is a powerful determinant of human health. The World Health Organization (WHO) estimated that 22% of the total global burden of disease in 2012, including 12.6 million deaths each year, was due to environmental risks, including exposure to air pollution, chemicals, or radiation; inadequate water quality; and poor sanitation.[12] The effects on children are even greater; 26% of all deaths worldwide among children aged <5 in 2012 were attributable to environmental risks[13]“.

Housing conditions are recognized as related with health of their inhabitants, and newer studies are directed to estimating magnitude of housing-related impact. World health organization uses EBD – environmental burden of disease associated with inadequate housing and GBD – global burden of disease (Braubach, et al., 2011). Firstly, house-related risks are identified, and for each of them, it is given the health impact. Health impacts are defined as number of deaths, number of disability-adjusted life years (called DALY) or number of persons suffering from an associated health outcome. EBD is expressed as EBD per 100 000 people per year for particular territory (country). This approach provides valuable statistical information, for estimating expected risk.
Annual increase of housing stock is relevant but limited. Majority of houses/apartments are old, as shown on figure 1. Due to electronic monitoring of building permission, nowadays there is exact information about number of building permissions for new buildings compared to permissions for renovation of heritage buildings, and renovation of building for living in total (Fig. 2). The number of housing buildings with heritage value at the same territory is small percentage of the total.

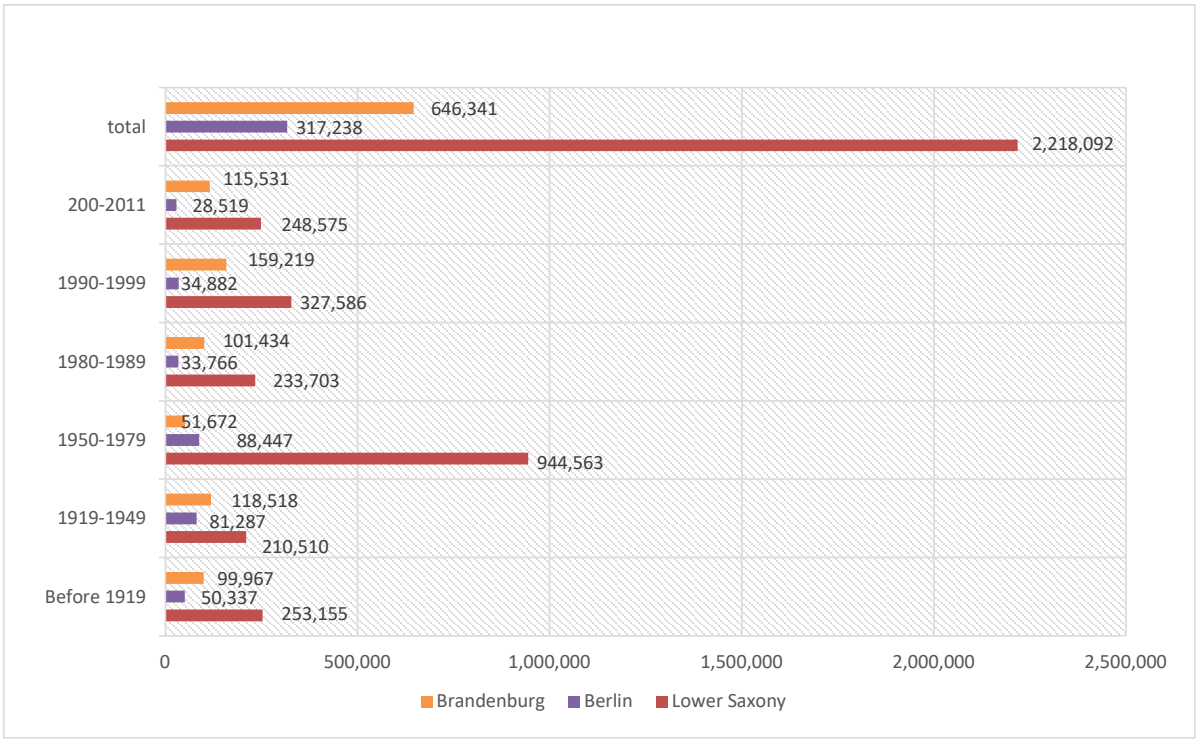

Fig. 1: Statistical overview of housing stock according to age – comparison of Lower Saxony, Berlin and Brandenburg (2011)

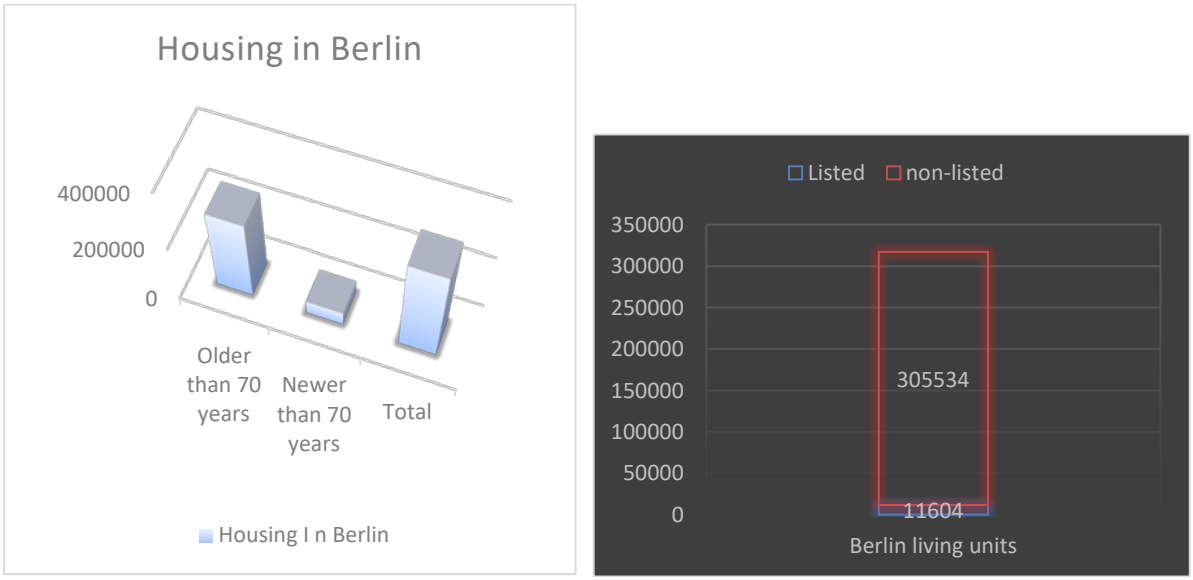

Fig. 2 (left) Statistical overview of buildings older than 70 years in Berlin – Despite being heavily bombed in the WWII, Berlin has surprisingly high number of buildings older than 70 years. The data origin from 2011 and number of new living units according to rate of issued building permits could have increased by up to 173943. Compared to Berlin, a number of old buildings is expected to be higher in those cities with historical centers designated as WH. **(right)** Number of buildings for living listed as heritage in Berlin compared to total number (data from the year 2011).

The importance of this issue became so high, that environmental diseases became concern of newly developed medical discipline known as "Occupational and Environmental Health". (Lead Poisoning: Historical Aspects of a Paradigmatic "Occupational and Environmental Disease", 2012). Heritage buildings are not good representatives of “old buildings as environmental health” because they are

better maintained in average than other aging buildings. That may imply that overall negative impact of old non-heritage buildings can be higher than impact of heritage buildings due to better maintenance.

2. Materials and methods

Interdisciplinary scientific articles were used as a source of documented cases of health risks which emerged in old buildings and heritage buildings, providing material for statistical analyses of their frequency and comparison.
Content analyses were used to determine relation between a design and the health risks. Various analytic-synthetic models were used in order to generate recommendations regarding increasing resilience to health risk.

3. Causes of health-danger in historic buildings, research and offered solutions

Architects deal with one building at the time, and their approach is more detailed: each building is an entire world. In the process of preparation for renovation, every house is, typically, examined for possible health risks. The examination may include: mold, lead poisoning, radon leaks, damp, old water-damage, asbestos, non-grounded outlets, rusty iron, pests, rodents and birds, danger of carbon monoxide poisoning, danger of formaldehyde smoke in interior space, clay pipes etc.

3.1 Mold

Mold belongs to the group of air-polluters, and as such it may help developing chronic diseases of respiratory organs, as well as cardiovascular system and cancers. Research on mold, as one of the most obvious dangers for health in old buildings, in recent years has showed progress regarding methods for automating of inspection control.
Mold appears on wood, stone, dump etc., in fact on any material which contains moisture. Mold does not appear only in building parts (as walls, roofs etc.), but also on furniture, paintings and similar. Some methods use moisture assessment, thermography, 3D-imaging-based methods of surface color, a water-vapor pressure etc. One of solutions proposes measurement of moisture, as foundation for mold, by a non-intrusive method – using 3D laser scanner, and then translating output regarding reflectivity index into usable data with a complex algorithm (Moisture detection in heritage buildings by 3D scanning, 2016). In some cases methods are suitable for serving multiple purposes, as detection of mold and other problems, as existing of thermal bridges.
Archaeological sites, are typically effected by mold, which may be significant dangerous for on-site researchers and visitors. Typical examples are tombs, which may develop fungi due to the biodegradation of wood. *Stachybottrys chartarum*, known as “toxic black mold” which develops in soils and indoor buildings.

3.2 Lead poisoning

Lead poisoning description dates back from the 2nd c BC Hellenistic physician Nicander of Colophon identified the acute effects associated with high-dose exposure. The lead poisoning became well known in popular culture due to Jerome Nriagu's paper published thirty years ago, arguing that Roman civilization collapsed as a result of lead poisoning. Although it is not considered as such, it lead to Clair Patterson's action which convinced governments to ban lead from gasoline, which spread worldwide, and led to overall recognition of lead as threat to public health. (Lead in ancient Rome’s city waters, 2014). In Europe, lead became much more frequent in industrial age, and well documented like e.g. in England (which is rich in lead). Nowadays, lead poisoning typically happens to children who live in inadequate environment and without proper supervision. It originates from use of lead in many construction materials, in particular paint, which in the past was not encapsulated into non-harmful substances like today. Cost of pediatric treatments of such diseases is very high. For example, “in US, the annual cost of environment-related diseases in 2008 was $76.6 billion, which is 3.5% of total health care costs” (Building Healthy Community Environments: A Public Health Approach, 2018) (Trasande, 2011). The reason for high cost in lead poisoning lies in huge damage that it may cause to health – including permanent consequences due to neurological complications. The sources of lead in built environment are: lead added to petrol, lead from an active industry, such as mining (especially in soils), lead solder in food cans, lead in products, such as herbal and traditional medicines, folk remedies, cosmetics and toys, lead released by incineration of lead-containing waste, lead in electronic waste (e-waste), lead in the food chain, via contaminated soil; lead contamination as a legacy of historical contamination come from former industrial sites, drinking-water systems with lead solder and lead pipes, lead-based paints and pigments, as well as ceramic glazes. (WHO, 2010).

3.3 Radon leaks

Exposure to radon is the second leading cause of lung cancer (following tobacco smoke) in many countries, including the USA (National cancer institute, 2016). “Radon decays quickly, giving off tiny radioactive particles. When inhaled, these radioactive particles can damage the cells that line the lung. Long-term exposure to radon can lead to lung cancer, the only cancer proven to be associated with inhaling radon. There has been a suggestion of increased risk of leukemia associated with radon exposure in adults and children; however, the evidence is not conclusive... it is estimated that more than 10 percent of radon-related cancer deaths occur among nonsmokers.” In general, a core challenge for communicating radon risk and promoting radon remediation relates to the fact that *radon threat is inherently perceived as either being low or simply non-existent*. The threat from radon can easily be downplayed to justify inaction. The risk from radon is natural. The nature of radon and its threat level serve to minimize an urgency to act accordingly. The attention should be drawn to floors, because the leaks come from soil. The effect of radon leaks can be eased by regular ventilation, manual or, preferably, automatic.

3.4 Asbestos

Asbestos is an established human carcinogen found naturally in rocks and widely used by industry. It was created in 1901 by the Austrian Ludwig Hatschek who patented the blend and sold it in 1903 to Alois Steinmann who in turn opened the Schweizerische Eternitwerke AG in 1903 in Niederurnen and became popular due to high resistance to heat and insulation. Asbestos was used until the eighties for the insulation of buildings, roofs, ships, trains in the form of a fibro-cement composite for tiles, floors, pipes, paints, flues, and also in firefighters' suits, in cars (paints, mechanical parts, friction materials for vehicle brakes and clutches, gaskets) and also for the manufacture of ropes, plastics and cardboard, even as a component of the bottom shelves of bakery ovens. Some studies carried out on the material led to the discovery of its harmfulness to humans. Asbestos cement, All types of asbestos can cause mesothelioma, lung cancer, and nonmalignant Asbestos-related Diseases such as asbestosis and pleural thickness (Risk Factors of Mortality from All Asbestos-Related Diseases: A Competing Risk Analysis, 2017) the incidence rate after diagnosis of mesothelioma was 3,600 per 100,000 person-years.

Trade restrictions introduced in Europe in the 1980s onwards have contributed to its declining use in some countries over the past decades. However, the asbestos latent period most commonly reported of 20–40+ years from the beginning of exposure means that in case of malign pleural mesothelioma, incidence rates rose steeply until the 1990s in most European countries and the United States. This continued increase over the past two decades in industrialized countries is yet to peak worldwide. In case of any combined sources of exposure, the patient was assigned to the highest exposure group according to the following order: labor, household, and environmental. (Risk Factors of Mortality from All Asbestos-Related Diseases: A Competing Risk Analysis, 2017). In Serbia Asbestos was prohibited for production for decades and since 2011 prohibited for any use. Since 1992 its use began to be prohibited in Italy, and law in 1996, n. 510 established the terms and procedures for its disposal and extraction.

Since 1995 there has been a general ban on the manufacture and use of asbestos and materials containing asbestos in Germany. Only demolition, renovation and maintenance work are excluded from the ban. The ban has been in effect across Europe since January 1, 2005. Russia, Ukraine and Kazakhstan, China, India, Thailand, USA asbestos is not banned. Canada announced that it would impose such a ban in December 2017 and in the USA its use was severely restricted. It means that asbestos is banned for numerous applications and there is a control of safe removal of asbestos from existing buildings.

Asbestos has been used use for construction purposes over a century and it was frequently used in many countries between the two world wars implicating that a number of the buildings among them are listed as heritage nowadays. Fortunately, asbestos is not visually attractive which contributes a smaller number. Asbestos does not have good aesthetic qualities, but it is considered of good characteristics and cheap, industrial material. However “inconspicuous “and “cheap” were never in good terms with built-heritage. Typical places where asbestos can be found in older homes include: roofing shingles, siding, stucco, flooring and pipe wrapping.



Fig. 3 Asbestos roof coverings roof salonit plates (frequently used material in the 1970s in Serbia)



Fig. 4 Low-asbestos shingle (Braunschweig, Germany)



Fig. 5 Removal of asbestos fibrocement

3.5 Other mechanical, chemical and physical threats

Dust is often not literary a polluter; however, it may cause asthma which counts in lethal diseases. Many threats act as combined polluters – effecting environment in more than one direction. E.g. rusty iron may lead to water pollution; old water-damage pollutes directly, deteriorates wood and affects mold; non-grounded outlets my cause fire, smoke and carbon-monoxide poisoning in interior; dump pollutes directly, affects mold and pollutes water. Rodents and birds destroy mechanically, pollute and affect mold etc. Formaldehyde, a recognized health risk, is commonly used in OSBs (Oriented strand boards) and for laminated timber (in Germany since 1906) (2018). In Germany, a formaldehyde in indoors is formally considered a risk since 2006. Although some of the listed dangers (as non-grounded outlets, carbon monoxide poisoning or huge amount of formaldehyde) are lethal, they are not related exclusively for old buildings and they are considered lethal only in huge amounts or under particular conditions, and therefore not further discussed in this paper.

4. A case studies of newer research of health risks and designs which increase resilience

A. Newer approach in analyzing wood deterioration and decay has been done by using light and scanning electron microscopy studies to observe the micromorphological characteristics of the wood - (Fig. 6), and subsequently, culturing on different media was tested in order to isolate fungi. (Assessment of biodegradation in ancient archaeological wood from the Middle Cemetery at Abydos, Egypt, 2019). The fungi discovered included on tomb in Middle Cemetary at Abydos, Egypt were allergenic (Aspergillus, Cladosporium Penicillium, Chaetomium) pathogenic (Aspergillus, Chaetomium) toxigenic (Aspergillus, Fusarium, Penicillium); also they included Stemphylium Talaromyces (which belongs to Penicilium subgenera) (id).

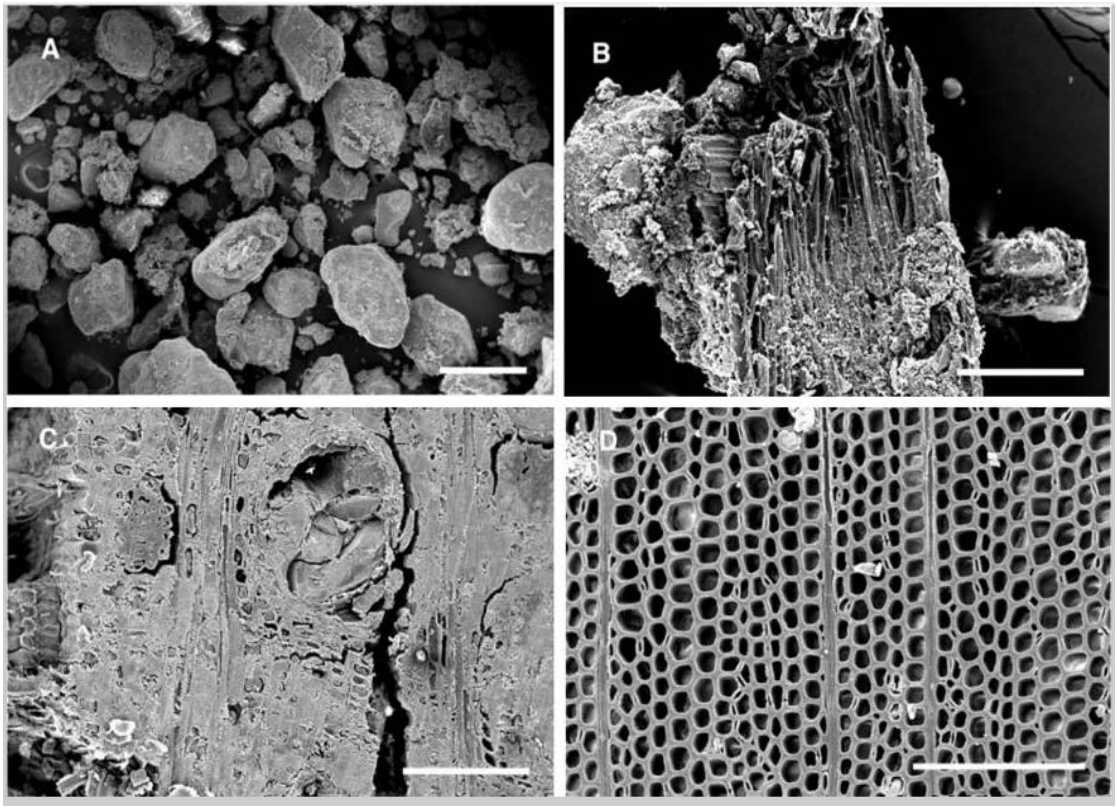

Fig. 6 Micromorphological characteristics of the wood

B. Lead water pipes used in the Ancient Rome *(fistulæ)* were used for measuring concentration of lead in drinking water. By measuring Pb isotope compositions of sediments from the Tiber River and the Trajanic Harbor, the present work shows that “tap water” from ancient Rome had 100 times more lead than local spring waters (Fig. 6).

Another probable source of lead poisoning was wine. “This theory” (that the main cause of lead poisoning was fistulae, comment by the authors) “has been partially challenged; lead poisoning would have derived from wine and not from water intake. The raw water came directly from the mountains and was therefore rich in calcium carbonate, which would have coated the pipes and formed a strong protection against the release of lead salts. Rather, it was the widely used wine preservative, the so-called *sapa*, a preparation of must, which was slowly cooked in lead containers [1]. This substance (which sees an etymological link with the Latin verb *sapio*, "to taste good") was also able to sweeten a poor quality wine, due to the content of lead acetate (also known as "lead sugar") produced during cooking”. (Lead Poisoning: Historical Aspects of a Paradigmatic "Occupational and Environmental Disease", 2012).

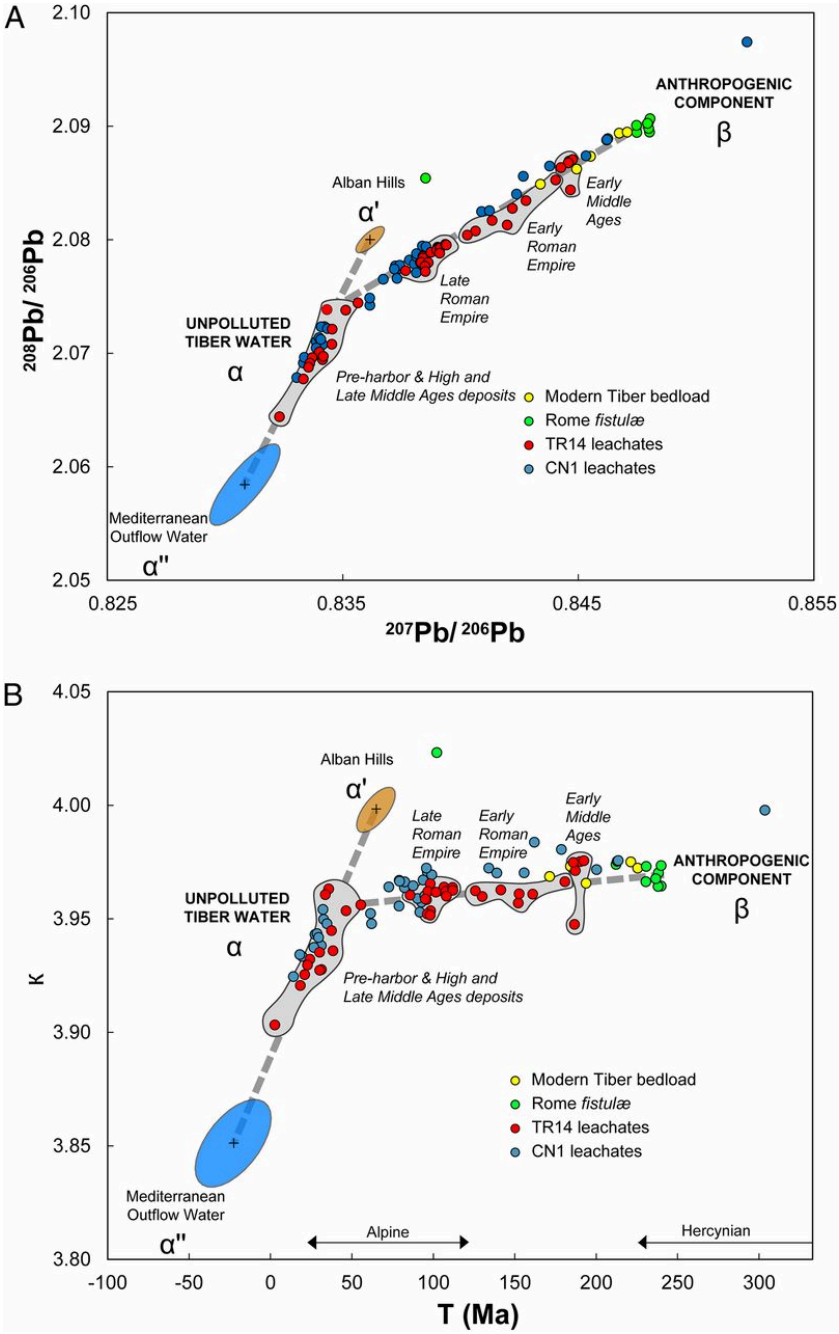

Fig. 7 Results of measuring Lead (Pb) isotope compositions of sediments from the Tiber River and the Trajanic Harbor

C. Radon

In 2015/16, the ministry in charge for environmental issues in Serbia launched campaign in order to measure radon in 6000 buildings in Serbia by the Agency for Ionizing Radiation Protection and Nuclear Safety of Serbia, as a regulatory body in the field of radiation and nuclear safety and security in the Republic of Serbia, with the technical support of the International Atomic Energy Agency. The research was conducted with active participation of citizens, measuring level of radon in their homes and, additionally, in schools and kindergartens. The result of the study showed that the level in radon in Serbia has “average level for Europe”. A group of scientist from Vinca Institute for nuclear sciences (Izvori nesigurnosti pri klasifikaciji radonskih zona, 2-4.10. 2019) analyzed sources of uncertainties in classification of radon zones. They pointed out that the concentration of radon, inter alia, depends on type of unit (rural-urban, house-apartment, if there is a basement or not), quality of building, type of construction materials, ventilation related tightness of door/windows and living habits and/or climatic conditions. The research conducted by governmental bodies in 2015/2016 took in the account numerous data on the location where radon was measured, including age of a building/living unit.

They did not found the connection between age and increased concentration of radon, however –the analyses are said not to be completed yet. The study did not check how many of those buildings were under protection for heritage value. It is related with the purpose of the study, and that was mostly to determine the scope of the problem and steps of action in case the level is extreme, as well as how to address the problem on national level.

D. Asbestos cement plant

Effects of asbestos were conveniently analyzed in the surrounding of asbestos cement plant near Barcelona. A non-parametric method was applied to estimate the full relative risk surface in order to estimate the mesothelioma risk and environmental asbestos exposure (EAE) due to an asbestos-cement plant (The relationship between malignant mesothelioma and an asbestos cement plant environmental risk: a spatial case–control study in the city of Bari (Italy), 2008). A cement processing plant remained in this zone for 90 years (1907–1997). This is a community-based cohort study with catchment population of 485,578 people (2007 Census) assigned to 14 Primary Care Centers in a low socioeconomic area (according to the Gross Domestic Product per capita, 2012) [18] of the region of Barcelona (Spain).

A spatial case–control study including 48 malignant mesothelioma (MM) cases occurred in the period 1993–2003 selected from the regional mesothelioma register (RMR) and 273 controls. The disease risk was estimated by means of a logistic-regression model, in which the probability of disease-occurrence is expressed as a function of the classes of distances (Fig.8).

Table 3

Characteristics of ARD death overall and by gender and age group, Barcelona (Spain), 1970–2006 ($N = 544$).

Outcomes	Number of events (%)	Follow-up time (yrs)*; mean (SD); median (IQR)	Person-years at risk	Incidence rate/100000 person-years (95% CI)	Log-rank/Breslow test; P values
Death from all ARD					
Overall	167 (30.7)	8.5 (9.1); 4.1 (1.5–13.7)	4611.4	3600 (3092–4191)	
Gender					
Men	142 (26.1)	9.4 (9.8); 4.8 (1.6–16.2)	3746.2	3764 (3191–4439)	0.073/0.164
Women	25 (4.6%)	5.9 (6.4); 2.8 (1.3–9.0)	865.2	2890 (1952–4276)	
Age groups					
<50	30 (5.5%)	18.9 (10.4); 21.5 (12.2–28.5)	1551.4	1934 (1352–2766)	
50–59	43 (7.9%)	11.9 (9.6); 10.0 (2.9–19.5)	1652.6	2602 (1930–3508)	
60–69	40 (7.4%)	6.3 (6.4); 3.6 (1.4–9.8)	846.4	4726 (3466–6443)	<0.001/<0.001
70–79	42 (7.7%)	3.2 (3.2); 2.4 (0.9–4.6)	452.3	9065 (6674–12311)	
>=80	12 (2.2%)	2.2 (1.9); 1.8 (0.8–2.8)	108.6	11045 (6273–19449)	

ARD: asbestos-related diseases; SD: standard deviation; IQR: interquartile range; CI: confidence interval. *The follow-up time for death from all ARD was defined as the number of years from the date of diagnosis to the date of any ARD-related-death or to censoring.

Fig. 8 Risk factor of mortality from all asbestos-related disease: A competing risk analyses

E. Dust

In heritage buildings dust cannot be avoided, and it is expected to be worse than in contemporary urban buildings. In certain number of cases dust causes asthma which may have a lethal outcome. Asthma is a chronic respiratory condition that often develops from controllable environmental factors, uch as poor air quality. House dust mites are commonly associated as the greatest contributor to asthma and it can be controlled – dominantly by controlling humidity. In a survey of Athens-Clarke County (Georgia, USA), on 1354 households, in 2016, 17% reported at least one member of the household with asthma which is 7% of population included in the survey. (Improving Housing Quality to Reduce Asthma Rates and Healthcare Costs in Athens-Clarke County, GA, 2019) Although there could be other causes for this illness, research shows that there is a strong link between asthma and poor indoor air quality. Death rate from asthma is possibly not as high as in the cases mention above. Some researchers argue there is an exaggeration regarding number of death among reported asthma deaths and that only cc 60% of them can be directly related with asthma. Studies which included experiments with interventions aimed at improving conditions included education and simple cleaning procedures; showing modestly reduced potential exposure to risk factors associated with asthma mortality and morbidity. (Allergen levels in inner city homes: baseline concentrations and evaluation of intervention effectiveness, 2007). There is no evidence of architectural interventions on reducing dust apart from common architectural innervations applied also on non-heritage buildings.

5. Results

Among numerous pollutants, content analysis revealed particular impact on health in indoor of mold, radon, asbestos and dust-causing asthma as leading pollutants with fatal outcome. Relevance was determined according mortality rate.
We analyzed 45 scientific papers in medicine, civil engineering, architecture, heritage preservation, physics and ecology (Fig. 9).

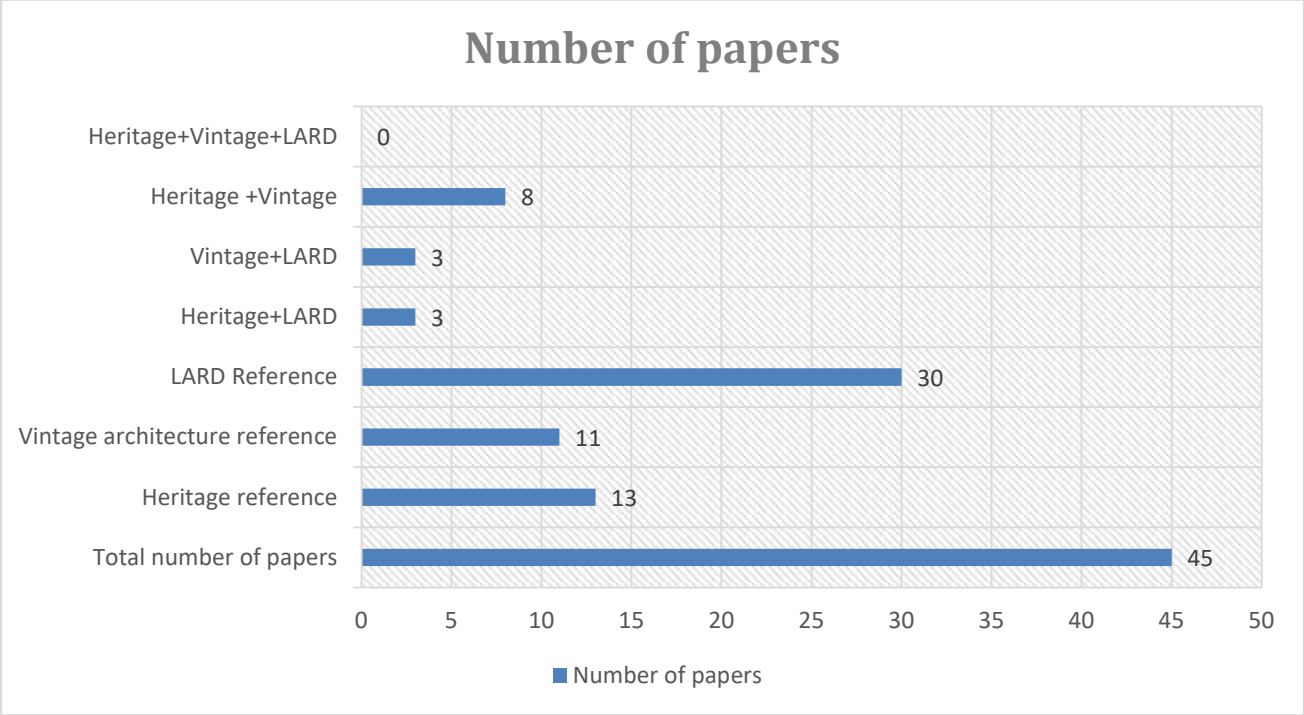

Fig. 9 Statistics of analyzed paper. LARD stands for Lead-Asbestos-Radon-Dust

We were not able to define the contingent which would allow scientifically valid comparison between old buildings in general and heritage buildings, regarding health danger on permanent users. In many countries old buildings are preserved as if they are heritage, because of so-called vintage effect.
There is a clear relation between particular materialization and lethal health risk.

- Mold is related to use of wood and stone, as well as every other biodegradable material which absorbs moisture.
- Lead is related with use of products which can come in contact with water/food or used in a way which can be taken by mistake as such. Lead can be safely used in products which cannot pollute water or food and in products in which they are properly coated in cases of accidental intake. Lead has poor aesthetical qualities which disqualifies its application in cases where it is relevant.
- Radon is related to (a) tightness of floors and (b) application of some materials in interior which naturally contain radon, as granite, versus using materials which don't contain it, as wood. It is also related to (c) healthy/unhealthy living habits of general knowledge, as regular ventilation, appropriate tightness of doors and windows which allows permanent ventilation in balance with energy efficiency, not using basement for living etc.
- Asbestos is related to type of application on the building, which means that it causes health problems when it is used for products generating dust that could be inhaled, e.g. façade, roof etc. The application of asbestos is so risky and sensitive that two approaches are becoming common: total ban or limited use in products which enable that asbestos is hermetically sealed. Asbestos has poor aesthetical qualities which indicate that it should not be applied as visible construction material by any means.
- Dust-causing-asthma can be best resolved by non-architectural methods. Although heritage building may have more dust than others, its removal and reduction by architectural means are the same as in non-heritage buildings.

6. Discussion: summary of alternatives, algorithms and consequences

Nowadays, technology allows detailed analyses before a new product appears on the market, and many countries have legally regulated such process in order to prevent mistakes causing danger to public health which were common in the history. Rehabilitations of buildings which were built in the industrial age carry risk of the pollution caused by construction materials. Those risks are untypical for present conditions, and therefore handling them requires particular knowledge and skills.

Content analyses did not reveal that heritage buildings were at higher or at less high danger than other buildings of the same age, due to lack of data. This research did not reveal average percentage of buildings abandoned for the reasons of pollution. Such research should be conducted in the future.

A common point of all lethal pollutant analyzed above is that they are aesthetically unacceptable, even for common eye, and certainly for architects, who are trained to the point when they react instinctively to wrong choices of construction materials. If an object appears repulsive – in Western architecture, similar to living nature – it should not be used. That is merely an instinct, which reflects deeply rooted values of Western civilization embodied in term kalokaghatia. In architecture, this sense must never be ignored by reasons of profit (e.g. treasure hunting at archaeological sites, extra profit in construction business) or even other fairly-appreciative qualities (in case of asbestos or lead) or simply neglected due to inertia (as in case of mold, dust or radon).

That is why it is less likely that heritage buildings, when they are protected (also) for aesthetical values, have such materials used in a way causing health risk. If that is the case, despite all odds, such materials must be replaced with safe once, regardless authenticity.

If, on the other hand, a building with remarkable aesthetic qualities is abandoned by the users, it indicates that some invisible rule of construction or maintenance was neglected or ignored leading to decrease of quality of living or even to death of the owners. As explained above, the deterioration of floors may lead to significant radon leak, and abandonment of a building, and consequently full devastation.



Figure 10 Heritage risks (ICCROM, 2016) (RH stands for relative humidity)

Increasing resilience to health risk by design goes into two directions: aesthetical evaluation (“Bon goût, bonne vie” – good taste, good life), and strengthening protocols. Algorithms for rehabilitation should include steps according to our newer knowledge. Similarly, to increasing effort in automatisation of monitoring of old structure, there are efforts to automatisation of pollution monitoring. Some parameters are easier to control than others. E.g. moisture is easily monitored and therefore mold as well. Taking as role model algorithms for monitoring of heritage, “the usual maintenance procedures are the classic maintenance on request…and the cyclic preventive maintenance, which is aimed to prevent any damage and is based on an evaluation of the optimum maintenance period.” structures (Extending the life-span of cultural heritage structures, 2018) The worst disadvantage of the first approach is that the damage is already occurred and the maintenance works, if still possible, require the interruption of the use of the building or at least an important limitation to it, with obvious

negative economic effects. The disadvantage of the second approach is the difficulty in the definition of the optimum maintenance period.
A suitable alternative is to use two levels of monitoring:

- The continuous monitoring, which is to be preferred, whenever possible;
- The periodic controls by means of non-destructive techniques, which should be done in any case for those tests that cannot be substituted by the online monitoring".

Among other stakeholders, ICCROM took part in supporting dissemination of knowledge about this issue. ICCROM recognizes the health risk discussed in this paper as only a few, among other heritage risks (Fig. 10). "The public health approach to solving environmental health problems is a stepwise process that includes:

- Defining the public health problem (identifying health risks of concern)
- Measuring the magnitude (understanding measures of disease or exposure in the population)
- Identifying key determinants of risk (including epidemiologic, social, and political factors)
- Developing and recommending policies (ways to reduce risk and promote health)
- Assessing health effects of policy options (e.g., Health Impact Assessment [HIA])
- Implementing and evaluating policy choices (tracking changes in community health)" (Guyer, 1998)

The previous explains why and how heritage building should be tested regarding public health risks. Unlike it may be the case with non-heritage buildings, authority already has mechanisms of control and imposing legislation, including facultative heritage management plan.

Recent trends in evaluating built heritage, include talks of "inflation of heritage", and question if that is, at all, heritage protection or dealing with nostalgia for the past i.e. vintage architecture. It is possible that number of old buildings with further increase along with our understanding of the reasons which lead to their devastation. There is an obvious and legitimate alternative to the effort of removing lethal pollutants from environment and that is a demolition, making space for a new building. However, the demolition also has its "price" – footprint on environment, economy and social development. Some of these consequences are also lethal in long terms.

7. Conclusion

Preservation of a building is based on estimation on its value for society. Any decision has its "price", and that refers to preservation of heritage building, just as well. In cases of heritage buildings, there are two "prices" – one for preserving a building and another of not preserving it, which significantly differ because they are based on different inputs. In this paper we focused on problems of keeping a building in any-permanent use and overviewing a health risks which lead to lethal consequences. Estimation of a frequency of lethal health risks in heritage buildings compared to non-heritage buildings of the same age, and detailed analyses of automatisation of maintenance-control should be part of additional research.

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Appendix

Table for fig. 9

	Title	DOI	Pibisher	year	heritage	vintage	direct relation with LARD
1	Mobilization of asbestos fibers by weathering of a corrugated asbestos	10.1080/15459624.2020.1867730	Journal of Occupational and Environmenta	2021	no	no	yes
2	Development of the "National Asbestos Profile" to Eliminate Asbestos-Related	10.3390/ijerph18041804	International Journal of Environmental Res	2021	no	no	no
3	Improving Ventilation and Indoor Environmental Quality in California K-12 Schools		Governer of California	2020	no		yes
4	Affordable Housing in Regions with Naturally Occurring Asbestos	10.1089/env.2019.0027	Environmental Justice	2020	no		yes
5	Assessment of the Elements and Oxides Concentration in the Dust of A	10.26389/AJSRP.T290120	Journal of Nature, Life and Applied Sciences	2020	no	yes	yes
6	Radon in houses of Kowary – Sudety Mountains, Poland	10.2478/nuka-2020-0024	Nukleonika	2020	no	no	yes
7	The Evaluation of Radon-Protective Characteristics in Engineered and Existing	10.1088/1757-899X/753/3/032076	Conference Series Materials Science and E	2020	no	no	no
8	Degradation of Cultural Heritage Buildings	10.36728/icone.v1i1.1268	CC BY-NC-SA 4.0	2020	yes	no	yes
9	Maintenance management of heritage buildings in Iraq	10.1108/ECAM-03-2020-0157	Engineering Construction & Architectural M	2020	yes	yes	no
10	Risk Analysis of Heritage Building in Jakarta	10.32535/ijabim.v5i2.862	International Journal of Applied Business and I	2020	yes	yes	no
11	CULTURAL ECOLOGY OF HERITAGE BUILDING ADAPTATION IN TH	10.13140/RG.2.2.22741.45281	Preprint	2020	yes	yes	no
12	Investigating parameters affecting maintenance of heritage buildings in I	10.1108/IJBPA-09-2020-0078	International Journal of Building Pathology	2020	yes	no	
13	Review on structural health monitoring for restoration of heritage buildin	10.1016/j.matpr.2020.09.318	Materials Today: Proceedings	2020	yes	yes	no
14	Vivienda y derechos sociales en el área metropolitana de Barcelona	ISBN: 978-84-87881-44-2	Área Metropolitana de Barcelona	2019	no		yes
15	Estimation and analysis of ventilation rates in schools in Indian context:	0.1088/1757-899X/609/3/032046	IOP Conference Series Materials Science a	2019	no		yes
16	Retrofitting heritage buildings	10.4324/9780429346903-4	In book: Sustainable Building Conservation	2019	yes	no	yes
17	ENVIRONMENTAL MICROCLIMATE MANAGEMENT AND RISK IN TH	10.5194/isprs-archives-XLII-2-W11-269-2019	The International Archives of the Photogra	2019	yes	yes	no
18	microclim US : hourly estimates of historical microclimates for the Unitec	10.1002/ecy.2829	Ecology	2019	yes	yes	
19	Housing and health Opportunities for sustainability and transformation partnerships		The Kings Fund	2018	no		yes
20	Age effects in the price of commercial real estate		Amsterdam school of realestate	2018	yes	no	yes
21	Historic Indoor Microclimate of the Heritage Buildings: A Guideline for P	10.1007/978-3-319-60343-8	Springer	2018		yes	no
41	Building Healthy Community Environments: A Public Health Approach	10.1177/0033354918798809	Public Health Rep.	2018	no	no	yes
42	Extending the life-span of cultural heritage structures	10.1007/s13349-018-02	J Civil Struct Health Monit	2018	yes	yes	no
24	The external cost of asbestos in the housing market	10.1080/13504851.2017.1327114	Applied Economics Letters	2017	no	yes	yes
43	Risk Factors of Mortality from All Asbestos-Related Diseases: A Competing Risk Analysis.		Canadian Respiratory Journal	2017	no	no	yes
26	AGE, TIME, VINTAGE, AND PRICE INDEXES: MEASURING THE DEPRECIATION P	10.1111/ecin.12383	Economic Inquiry	2016	yes	no	yes
27	New Concept of Historical Indoor Microclimate - Learning From the Past	10.1016/j.proeng.2016.08.811	Procedia Engineering	2016	yes	yes	no
28	Quality of Life and Housing	DOI: 10.7763/IJET.2015.V5.491	International Journal of Information and Educa	2015	no	no	no
29	The Impacts of Affordable Housing on Health: A Research Summary			2015	no	no	yes
30	Environmental exposure to asbestos from geology to mesothelioma	10.1097/MCP.0000000000000053		2014	no	no	yes
31	El impacto de la crisis en la relación entre vivienda y salud. Políticas de buenas prácticas para reducir las desigualdades		Gaceta Sanitaria	2014	no	no	yes
32	Calculations of risk: Regulation and responsibility for asbestos in social	10.1179/2049396713Y.0000000022	International Journal of Occupational and E	2013	no	no	yes
33	Lead Poisoning: Historical Aspects of a Paradigmatic "Occupational and	10.5491/SHAW.2012.3.1.11	PMC3430923	2012	no	no	yes
34	Environmental asbestos pollution — Situation in Poland	10.2478/s13382-012-0003-0	International Journal of Occupational Medi	2012	no	no	yes
45	Reducing the staggering costs of environmental disease in children			2011	no	no	yes
36	Allergen levels in inner city homes: Baseline concentrations and evaluat	10.1038/sj.jes.7500638	https://www.nature.com/jes	2008	no	no	yes
44	The relationship between malignant mesothelioma and an asbestos cement plant environmental risk: a spatial case–control study		Springer	2008	no	no	yes
38	Planning and undertaking asbestos surveys of social housing	10.1057/palgrave.jba.2940012	Journal of Building Appraisal	2005	no	no	yes
39	Effect of environmental interventions to reduce exposure to asthma triggers i	10.1038/sj.jea.7500367	Journal of Exposure Analysis and Environ	2004	no	no	yes
40	Housing and Health: Time Again for Public Health Action	10.2105/AJPH.92.5.758	American Journal of Public Health	2002	no	no	yes
41	The Seattle-King County Healthy Homes Project: Implementation of a Compre	10.1289/ehp.02110s2311	Environmental Health Perspectives	2002	no	no	yes
42	Models of Radon Entry	10.1093/oxfordjournals.rpd.a081563	Radiation Protection Dosimetry	1992	no	no	no
43	Control of Radon in Houses	10.2307/3577766	Radiation Research	1990	no	no	yes
44	INDOOR AIR POLLUTION — RADON IN HOUSES	10.17159/caj/1986/7/1.7348	Clean Air Journal	1986	no	no	yes
45	Asbestos and health		Occupational Health; a Journal for Occupa	1971	no	no	yes

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Knowledge and Conservation: The recovery of an underground path

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Abstract
The topic we want to deal with concerns the underground path located in the "bowels" of the historic center of Camerano (Ancona). The construction of the caves probably dates back to the first excavations in the mid-fourteenth century, but their expansion and modification continued until the recent partial segmentation interventions, often improperly carried out over the years by private individuals from the accesses of their respective cellars and by some consolidation interventions, philologically not very attentive to the peculiarities of the places, carried out in the years "60 /" 70 following some collapses that occurred under the route of the current Via Maratti.
The use of this underground labyrinth has fulfilled various purposes over time: from sandstone quarry for future building constructions (many of the buildings in the historic center are made up of blocks of sandstone) to place of worship (the most representative environments have a planimetric conformation typical of churches of the '500 and' 600), to shelter and refuge for the inhabitants (from Muslim raids to the Second World War), to simple cellars for the optimal conservation of local wine.
These underground structures were not built on the spot, rather they are the result of a millenary activity of excavation, expansions, collapses, adaptations to the evolution of the different needs of the population and which today, after the restoration and enhancement works, is finally possible admire in their full extent and beauty.

Keywords: underground, labyrinth, cave, restoration, enhancement.

1.Section
The historic center of Camerano (AN), built in ancient times, is crossed underground by an extensive network of man-made caves excavated in different eras which constitute one of the environmental peculiarities of the history of the city for their undoubted geomorphological interest referring to the entire Conero area.
Their construction dates back to the first half of the fourteenth century according to the first documented excavations, but their expansion and modification extended from the seventeenth to the nineteenth century, up to the most recent partial segmentation interventions, often improper by private individuals in the accesses of the respective cellars, and with Civil Engineering consolidation interventions, sometimes philologically little attentive to the natural characteristic of the place, but unfortunately necessary and urgent following the collapses occurred under the current Via Maratti route in the decade between 1965 and 1975.
The use of the caves has also served different purposes over the years: from sandstone quarry to provide building material (many of the buildings in the historic center are in fact in blocks of sandstone) to underground place of worship, shelter from Muslim coastal raids and from various wars over time as well as cellars for storing wine, etc., changing their morphological and architectural peculiarities from time to time.
It is a known characteristic, highlighted by the numerous remains identified as prehistoric settlements, notably in the Conero area and in Dalmatia, of presenting a "gradina" urban conformation (from the Serbian-Croatian gradina, grad = city), that is a type of fortified settlement built through the leveling of the top of the hill on two tiered levels and its subsequent enclosure with dry perimeter walls.



Fig. 1: Underground path before restoration.



Fig. 2: Underground path before restoration.



Fig. 3: Underground path before restoration.

Camerano (as well as other hamlets of Ancona, such as Poggio, Massignano and Montesicuro) stands on one of these “gradina” and also presents evidence of a Picenian necropolis, with findings of funeral objects dating back to between the 11th and 3rd centuries B.C.
The presence, since pre-Roman times, of underground structures such as connecting tunnels, defense tunnels and wells - easily excavated in the compact sandstone boulder - constitutes the settlement base. It is possible to hypothesize that the main volume of the excavations took place starting from the fourteenth century – supported by the presence of an inscription on an underground pillar dating of 1327 A.C. - in order to provide shelter for the populations against the frequent raids of Muslim pirates from the neighboring Conero coast, attracted by the presence of fresh water sources.
These underground excavations essentially took place in the area of the Sassone tuff cliff, under the current Palazzo dei Ricotti, which, above ground, corresponds to the perimeter of the ancient medieval castle of Camerano.
The absence - otherwise inexplicable - of remains from an ancient wall of the castle would suggest that the inaccessibility on three steep sides of the cliff constituted a more effective, economic and less obvious form of defense and temporary shelter of the population in case of external attack.
It is certain that these underground structures were not built on the spot, but were the result of a millenary activity of excavation, expansion and adaptation to the successive and different needs of the local population.
It should be noted that the most representative rooms currently visible have a planimetric conformation characteristic of Baroque churches, with circular central plans typical of ecclesial architecture between the 17th and 18th centuries. It is still to be assessed whether some signs engraved on the wall, in the shape of the Maltese cross, may rather refer to real episcopal consecrations of the underground cult environments (see for example those in the Ricotti Grotto), where masses were possibly celebrated, as supported by the presence of stone parts of altars in the underground room connecting the Corraducci and Mancinforte Caves.
It appears no coincidence that these underground "churches" recur in correspondence with the above ground churches.
The caves, which once undoubtedly constituted a significant underground complex of a labyrinthine type, with various entrances, all communicating with each other with more or less hidden passages, were later divided into various sections.
Masonry obstructions were created, following the use as shelter during World War II, by the owners of the buildings connected to the caves, in order to prevent underground access from one property to another.

In fact, during the surveys carried out, surviving traces of wooden or metal gates erected in the past were found in locations where the actual caves began to be used as cellars or storage space for the houses above. However, these gates, while protecting the individual properties, did not completely prevent the circulation of air and ventilation through the entire underground complex, thus avoiding the formation of excessive humidity. The erosion of some clay layers and the consequent subsidence of the upper layers are probably the most likely cause of the collapses that have occurred in recent years.

The scarcity of oral and written sources on the caves of Camerano as well as those in other surrounding villages is to be noted. In facts, although the caves are a notable artifact in terms of size and importance in the urban and social environment of the community, they are indeed seldom mentioned, except for brief hints, in any manuscript of the time, or in any text of local history.

The only logical explanation that we can try to attribute to this lack of historic records, which is moreover common to all the settlements in the territory of Ancona which have similar underground development, is that of a form of confidentiality, which in the past communities may have used to keep hidden their places of shelter and refuge: a sort of "military secret", which everyone knew existed, but which no one felt authorized to speak of. It was not possible to carry out a definitive dating of the formation of the current caves, as enlargements and renovations certainly occurred in later times, on a nucleus of hypogea already existing in remote times. However, it can be said that the town has had its "urban" evolution underground almost parallel to that of the surface.

The feasibility study for the of restoration the underground system complete path, strongly desired by the municipal administration, in order to allow its integral access and crossing, thus recovering the historical memory of its development and enhancing the characteristic environmental peculiarity of the Cameranese subsoil, has led to an in-depth dimensional and critical survey of the caves themselves, combined with historical archive research, testimonies and some introspection essays, with the aim to identify the connecting passages, closed due to collapses and / or simply buffered over the years.

The plans of the caves in the state prior to the work have been drawn up showing the real elevations above sea level and accesse through private properties. The underground complex has discrete geomechanical characteristics, essentially due to the high degree of cementation of the sandstones and the reduced frequency of fractures. The areas characterized by greater fracturing of the sandstones and alteration of the clayey levels were consolidated by the Office of the former Civil Engineering service after the earthquake of 1972. Consolidation works were carried by means of walls, vaults and buttresses of full exposed bricks which compromised the visual and material originality.



Fig. 4: General plot plan of the unitary underground path below the historic center of the city of Camerano.

A key point in the recovery of the complete underground path was to provide it with a main entrance completely independent from private accesses. This has been achieved through a room located in Via Maratti, connected to the cave called “Corraducci”. Three emergency exits have been integrated as well in order to ensure access and visit of the caves in the most functional and safest way possible.
The typology, compatibility and accessibility characteristics of the caves before the restoration works are described below, project drawings and photos of the state before and after the works are also shown.

1.1 “Burchiani” Cave

The cave called "Burchiani" had its entrance in a building located in P.zza Roma, which in itself constitutes a block between P.zza Roma, Via S. Francesco and Via S. Apollinare and is located near the most probable location of the ancient Porta dei Santi which was the gate of original Castle. The cave consists of a straight and steeply sloping corridor that descends deep inside the Rock called the Sassone for about 50 meters. towards the NE, ending in a circular room that has considerable dripping. Peculiar of this cave is the reinforcement of walls and vaults by small blocks of tuff cemented together that is observed in its initial section. About halfway down the corridor there is a short flat stretch along which several branches open, all however obstructed with old masonry works and one of which certainly connected with the cave called "Zolotti", and therefore with all the others in the historic center. A transverse arm, of about 13 meters in length, intersects the main axis of the cave before reaching a large circular room that has a large column of tuff in the center rising vertically towards the flat vault and has a circumference of about 12 mt. Since this environment is devoid of niches and not very suitable for hosting people or things due to the strong dripping, it is assumed that it has been dug in order to find water veins for the sole purpose of using them in case of siege of the castle to which it was connected . However, the planimetric design assumed by the cave is singular, which impressively recalls the typology of some Etruscan tombs that recall the shape of the so-called "cross of Venus".

1.2 “Corraducci” Cave

The initial corridor, about three meters wide, descends by means of steps into the subsoil and, on its sides, oak wood rails, used to slide the barrels down to the basement, provide clear evidence of the use of the first part of the cave as cellar for the building.
On the right, an uphill passage, now walled up, connected this tunnel with the “Gasparri” cave.

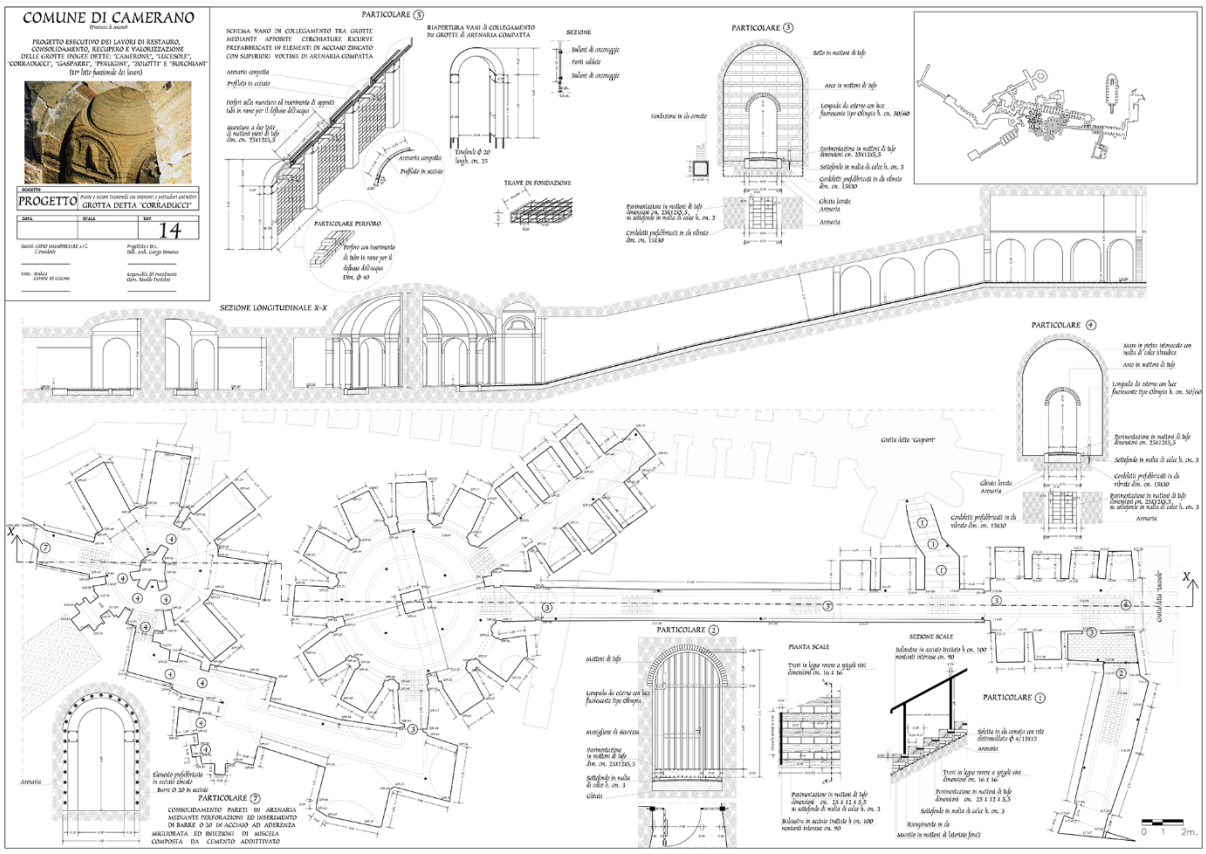

Fig. 5: Graphic design of the “Corraducci” cave.

From this initial corridor, where three niches, adapted to shelter the wine barrels, can be seen, a circular room is reached, very impressive in its overall appearance. The room is preceded by a small square-plan room with a domed vault decorated with elegant bas-reliefs made up of ornamental motifs in the style in use between the seventeenth and eighteenth centuries. The circular room also displays a domed vault finely decorated with bas-relief sails, underlying 12 niches decorated with fake columns surmounted by neoclassical capitals. In the center of the room a pillar, consolidated by a brick cladding, rises to meet the vault. The 1st niche to the right of the entrance continues into a corridor with 8 side niches dug symmetrically facing each other. The 3rd niche on the left of the circular room leads in turn to a subsequent vast room through a narrow opening that allows the passage of a single person: it was probably an easily concealable secret entrance or an easily defensible obligatory passage.

1.3 “Perugini” Cave

This cave consists of a first corridor orthogonal to the street and is cut, in turn, by another arm of 26 meters along the same axis of the "Gasparri" cave, which is in facts its continuation, from which it is separated by a wall. Continuing on the first corridor a very beautiful circular room is reached. The room is surrounded by 8 niches, including the one that absorbs the access corridor.The domed vault is finely decorated with bas-relief veils and, on the top of the columns formed by the spaces between one niche and the other, other small niches are carved out that give the whole an appearance of solemn harmony. The first two niches, respectively to the right and to the left of the access one, communicate in turn with the transverse arm of the cave. The second niche to the right of the entrance leads, after a short corridor, into an almost trapezoidal room with a maximum size of 11 meters in length and 9 meters in width.
This last room is supported in the center by a large pillar about 2 meters high.

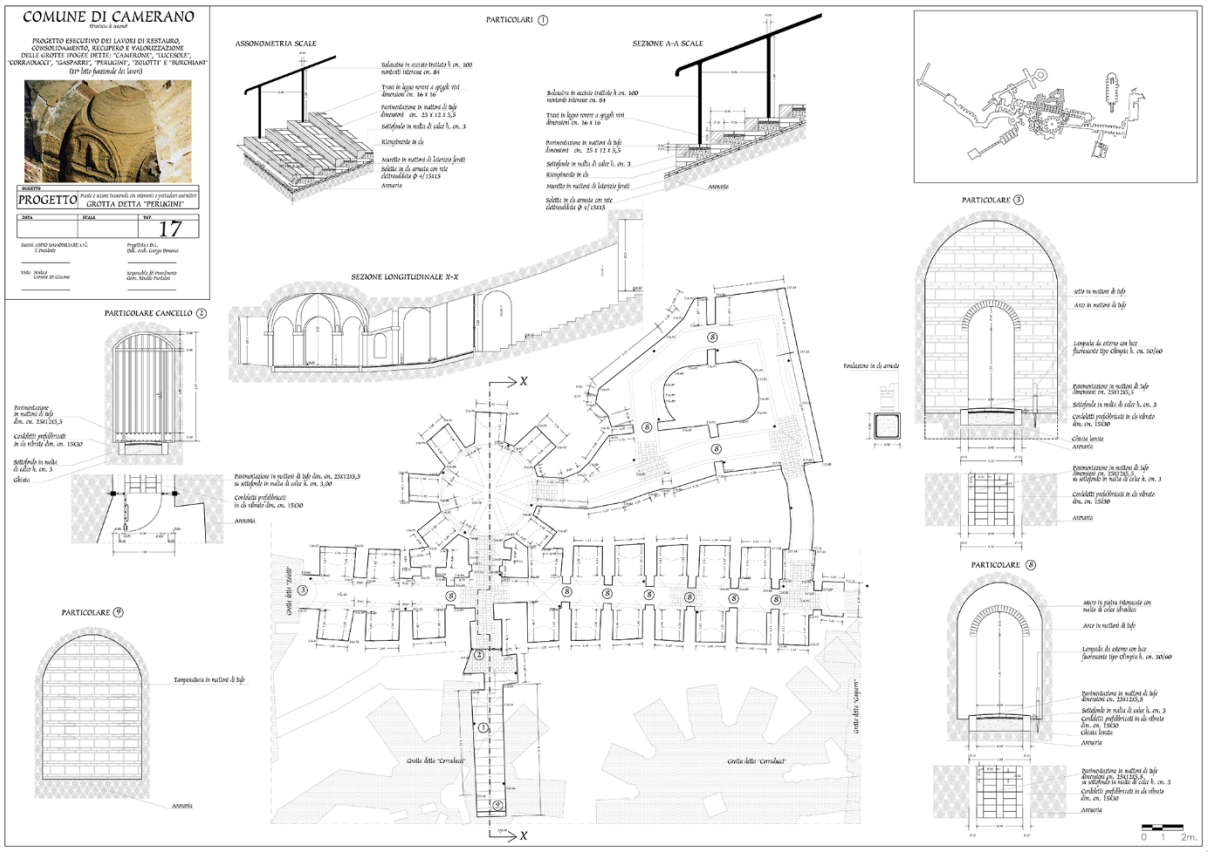

Fig. 6: Graphic design of the “Perugini” cave.

1.4 “Gasparri” Cave

A corridor about 8 meters long dug into the sandstone is accessed by means of a short ramp. The corridor has large side niches and walled continuations that lead, on the left, towards the cave called "Perugini" and on the right towards the caves of the Borgo. Then the cave bends sharply 90 degrees to the right, with a corridor of about 12 meters in length and with a height of the vault of about 3.10 meters. Four niches of vast proportions open symmetrically to the right and left of the aforementioned corridor, which ends in a room of extraordinary beauty: this environment,

perfectly circular with a diameter of 5.40mt, has walls decorated with ten bas-relief columns, with almost cubic capitals.
The domed vault of this circular room, which has a maximum height of about 5 meters, is decorated in the center with a beautiful ring made in bas-relief on the tuff in a perfectly circular design. At the end of the main corridor, there is a small square room with a domed vault, with a maximum height of about 4.10 mt., decorated above the arch with two side niches and as many bas-reliefs representing the trimonium surmounted by the cross.

1.5 “Zolotti” Cave
The cave called "Zolotti" is located under the building called the "Torrione", erected at the beginning of Via Maratti, which served as defense tower guarding entrance to the castle east of the “Porta dei Santi” gate. The cave access is from the house, having the same name, in via San Francesco. After a square spiral descent, the visitor reaches a basement where numerous consolidation works can been identified, carried out in recent times in a way certainly not preserving the integrity and originality of the underground path.
On the right the underground continues, dug into the sandstone and provided with side niches, for about twenty meters, bending first to the right and then to the left. In the middle of this corridor there is a short tunnel 90 centimeters wide which, starting from the bottom of a niche, appears blocked after a few meters, probably due to a collapse.

1.6 “Lucesole” Cave
The "Lucesole" cave is accessed from an existing trap door inside a building now housing a real estate agency, as the ancient connections with the cellars of the former Palazzo Corraducci and with the cave called "Ridolfi" (or "Il Camerone"), have been blocked with walls. The Lucesole cave consists of a single straight corridor along which seven large niches open symmetrically to the right and left and which joins the underground system called "Corraducci" and the other system excavated under the Sassone cliffs, namely the cave called "Ridolfi" (or "Il Camerone").
It is thought that the cave called "Lucesole" was also used as a cellar for the building above.

1.7 “Manciforte” Cave
The cave called "Mancinforte" is accessed both via a staircase from a building owned by the municipality and located in Via G. Leopardi, n. 2, and from a room located on the ground floor of the Mancinforte building, now closed because it is in direct contact with the headquarters of a credit institution. It was however possible to descend via the 17 m long staircase. which leads to a small room with two walled branches once communicating with the caves called “Burattini” and “Ballarini”. A second flight of stairs descends deeper, at an angle of 90 ° with respect to the previous branch, to a depth of about 18 m. below the external surface of P.zza Roma. The staircase ends in an almost rectangular room, equipped on the left with a small water collection tank from the abundant dripping. From here on, the dimensions of the cave become larger: the height of the vault, which in the two downward corridors was 2.00 and 2.20 m respectively, now it exceeds 3 m. Furthermore, the cavity is excavated in the sandstone, without terracotta cladding, as it was in the two previous corridors. The cave continues with a large sinuous tunnel which, initially, is flanked by 7 large niches on the left side, dug along a wall of about 20 m which extends straight from the dripping room, before turning 45 ° to the left. After a second loop, always on the left, a quadrangular niche is carved out which bears a bas-relief date: 1888. Continuing further, a kind of roundabout is reached with a central supporting pillar and various branches: two out of these are connect the cave with the "Costantini" and "Corraducci" caves.

1.8 “Ricotti” Cave
Access through a staircase leads to a vast underground room already used as a shelter for the barrels, as the numerous side niches testify, but which originally likely had a very different destination. The back wall, cut into the tuff, has two lateral passages respectively on the right and left and in the center a sort of large window opening onto an elliptical apse in which nine elegant niches arranged in a semicircle have been created. All this gives the cave the unequivocal appearance of an underground church, especially since, on the vault of this pseudo apse, a Greek cross is reproduced in bas-relief inscribed in a circle also in bas-relief. Under the "apse" there is then a semicircular "crypt", also equipped with small niches, which is accessed by a short descending staircase in front of the described cut wall, according to architectural forms noted in some Romanesque, early Christian or rupestrian churches. That the type of this cave, regardless of subsequent uses, recalls a church is also confirmed by the fact that various historical oral sources, consulted about this cave, have used the name of "church" or "underground church" referring to it. An interesting and supporting fact is also provided by the location of this hypogeum almost under the former church of S. Apollinare (the most



Fig. 7: Underground path after restoration.



Fig. 8: Underground path after restoration.

ancient church in Camerano time), already annexed to the castle itself and now unworthily restored and transformed into a municipal market.

1.9 “Ridolfi” or “Il Camerone” Cave

The cave called "Ridolfi" or "Il Camerone" consists of a large room which is reached by a straight access corridor which, starting from the courtyard of the Corraducci palace, penetrates the Rupe del Sassone and, therefore, bends to the right. The room, perfectly rectangular and of considerable size (about 100 square meters), has a barrel vault and, on the back wall, a strange curved niche flanked by two low-relief columns ending in a rounded shape. On the right wall, at the back, a passage opens up which, narrowing more and more, leads in a broken line, towards the outside of the cliff in NE direction. This obstructed passage probably allowed ventilation of the large underground room or also constituted a small exit sufficiently hidden from the outside by the existing vegetation. This hypogeum, in its overall aspect, is remarkably similar to other analogues of the Umbrian-Etruscan area, also excavated in the tuff. The environment, certainly intended as a meeting place in ancient times for civil or religious purposes, is indeed solemn and elegant even if these characteristics were somewhat compromised in 1833, when a stone consolidation wall was improperly built to support the vault that threatened to collapse.



Fig. 9: Underground path after restoration.



Fig. 10: Underground path after restoration.

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The impact of COVID-19 on Food socio-cultural meanings

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Abstract
Psycho-physical health and the relationship between the man and the environment are strongly influenced by food, regardless of culture and country of origin. The importance of food goes far beyond simple nourishment and assumes existential values. This is particularly evident in Chinese society and culture as expressed by the well-known chengyu *min yi shi wei tian* 民以食为天 "the people worship food as if it were heaven". Food with its divine qualities influences every aspect of human life, and above all, has an important social value. The industrialization and globalization processes that we have experienced in the last few decades have had strong impact on human life and health as well as on food. The Covid-19 pandemic phenomenon contributed to generate further changes. In this climate during which we are witnessing a severe restriction on individual rights and freedom, food has taken on new connotations, holding an even more central role in everyday life. Nowadays meals have taken on a different meaning, becoming a moment of social interaction and sharing. At the same time, they have served as a safety valve. Facing the deep anguish and stress generated by the spreading of the virus, people have been overwhelmed by an emotional vortex and have fled to food as a catalyst for emotions. This paper investigates the ways through which the pandemic has impacted on the production and consumption of food, and has changed its social and cultural meanings.

Keywords: Food, Covid-19, social, cultural, sharing.

1. Introduction

It is in the nature of things that environmental and/or social and political phenomena change lifestyles, modes of production, territory government regardless of what country or society you want to analyze. The complexity of the historical and cultural background of Italy enclosed within the borders of Europe, but projected towards the East and at the same time towards the Mediterranean - an elsewhere from which it absorbs a series of unexpected glances and voices - comes up again into all its strength following the pandemic emergency that forces us to lock ourselves at home and look inside while we dream of an 'outside' in which we can return to sail as soon as possible. An 'outside' that presents us with other socio-cultural maps that also influence us.
Our interest, on this occasion, focuses on the role of food which, more than other social rites, has its own language and function in interpersonal and intercultural relationships, and not just from today. Talking about food allows to us enter a network of intercultural convergences that simplifies our need to communicate and get to know each other, placing us in front of what we have in common in diversity.
Eating is a primary biological need, however, as the anthropologist Tullio Sepilli observes [1], the response through which this need is satisfied is of social nature and for this reason, it is strongly modified by the intermediation of a set of processes both within the same social context, and between different cultures, and in different historical environments and processes. The search, the collection,

the preparation and above all the sharing of food are activities with a strong cultural, social and symbolic meaning. Food represents an element of communication through which emphasizing one's ethnic, social and cultural identity. As a consequence, the dynamics relating to its consumption and sharing cannot ignore changes in society and time.
Following the processes of globalization and industrialization that have occurred in the last 30 years, societies have witnessed various changes in eating habits and in the ritual meanings related to them. In particular, starting from the 90s, daily family meals began to lose importance and undergo a process of segmentation and destructuring. In addition to this, the consumption of meals outside increased thanks to the appearance of the first fast food restaurants. In postmodernity, also known as the era of the affirmation of the individual and of his centrality, the image of the meal has become subjective. Food is eaten quickly and while standing up, it is portioned and even packed into pills. However, these habits have undergone further and incisive changes resulting from the great historical event we are still experiencing today that is COVID-19 pandemic.

2. The Rediscovery of Food's Sociability

The health emergency caused by the spread of the coronavirus has forced the world population to stay at home for a long time. Such precautionary practices have had a strong impact on access to food and on its consumption.[2] In this climate during which we are witnessing a severe restriction on individual rights and freedom, food has taken on new connotations, holding an even more central role in everyday life. The ban on going out except for urgent needs or emergencies inevitably caused a drastic and sudden change in lifestyle and eating habits.[3] All over the world there has been a significant change in the purchase planning, perhaps partly due to the choice of going out less to limit the possibility of contagion, thus also favoring the prevention of waste. At the same time, we have witnessed the rediscovery of foods and traditions. Furthermore, meals have taken on a different meaning, becoming a moment of social interaction and sharing. Due to the closure of places of socialization and the lack of recreational activities, we have recognized the sociability of food and its function as a social aggregator, as an element that facilitates the union between people and the sharing of moments between them. In fact, food has by nature a symbolic and relational meaning that goes far beyond the nutritional value and the physical need to eat.
Lunches and dinners are relational moments during which a process of building and sharing intimacy and closeness occurs, and an affective and emotional involvement is acknowledged. It is not surprising that a business or a leisure meeting is always accompanied by a meal. People communicate, exchange information, express emotions through food which appears as an act full of cultural and social
implications.
The restrictions imposed to fight the spread of COVID-19 across the world have made it possible to claim the cultural and social importance of food, particularly highlighting its conviviality. Eating, in fact, is never just eating, but sharing. To quote Plutarch "We do not sit at the table to eat but to eat together" [4]. For the human being, both food and the act of sharing it are fundamental.
During the quarantine, more time has been spent in the kitchen and at the table. An interdisciplinary research conducted on over 3,000 people by professors and researchers, with the collaboration of the students of the new Food Innovation & Management course of the University of Gastronomic Sciences of Pollenzo, revealed during the lockdown the rediscovery of an authentic passion for food and its value as an instrument of self-realization and sociality at the same time.[5] In fact, food has proved to be a fundamental element due to its identity and convivial value.
Being forced to spend much more time at home, people turned to cooking, delighting in preparing dishes and experimenting with recipes that usually did not have time to make or that were generally consumed outside such as pizza, homemade pasta or desserts. Consequently, there has been a reduction to the consumption of junk food and ready-made products and meals have become more regular and planned, occupying a place of primary importance in everyday life. In Italy, Istat data reveal that as for the consumption of meals, more than one in four citizens (27%) say that it took them longer to have breakfast, lunch or dinner. Meals have become convivial moments even on weekdays due to the fact that the whole family was present more often than in other periods. The share of those who dedicated more space to these activities than in the previous period is higher among the youngest (41.8% between 25–34-year-olds) and decreases with age.[6] During the confinement, the interviewees rediscovered the pleasure of spending time preparing meals (+0.57) and the harmony of cooking together (+0.4). These data are in line with the snapshot taken by Nielsen at the European level.
Similar effects have been reported throughout the rest of the world and in particular in the Chinese context. Even in a country with a background so different from the Italian and European one, the importance of food goes far beyond simple nourishment and assumes existential values. Food has always been considered humankind's most essential need, as we can infer from the well-known

chengyu *min yi shi wei tian* 民以食为天 "the people worship food as if it were heaven". [7] Throughout the history of China, food has carried out different functions: from a promoter of the civilization process, to a means of social and hierarchical division; from a fulcrum of ritual activities, to an instrument adopted by the emperor to control the population. [8] During the pandemic, Chinese people have reclaimed that importance. The restrictions on movement and socialization imposed by COVID-19 brought the Chinese population closer to cooking and extended the time they spent in the kitchen, offering an opportunity to unleash imagination and encourage culinary experimentation. A Chinese interviewee declares that "During the epidemic, there was nothing better than hearing the hot oil sizzling in a frying pan and the call 'Hurry up and come and eat' ". [9] Many families have thus rediscovered the value of sharing a meal, a value that had been forgotten due to the hectic lifestyle had pushed the Chinese, as well as almost every inhabitant of the world, to abandon home cooking in favour of restaurants and especially delivery providers.

3. Food as an emotional lifesaver

On the other hand, the forced and prolonged isolation experienced during the quarantine periods was not without its difficulties. The sense of precarity and uncertainty, the fear of contagion for oneself and loved ones, the distance from relatives and friends as well as a significant limitation on one's freedom of action have generated stress and psychological discomfort.[10] Individuals have given different emotional and psychological responses to the outbreak of COVID-19.[11,12] In the Italian context, with the #iorestoacasa decree (#stayathome decree)[13], the habits and lifestyle of the population have changed and the forms of socialization significantly reduced. Many citizens reported symptoms of post-traumatic stress, confusion and anger that inevitably influenced their approach to food, mainly in two senses: some began to eat more, especially those defined as 'comfort foods' rich in sugar, resulting in 'food craving' phenomenon, while others experienced loss of appetite.[14] This led to the develop of dysfunctional eating behaviors which is not surprising as there is a close and strong correlation between food and mind. Food is more than fuel or energy or calories that allow the human body to sustain and carry out all daily activities. It not only has a biological-nutritional value, but also an emotional-affective-relational one. In fact, it is often used to deal with some emotional situations. Specifically, negative emotions can induce a practice called emotional eating, i.e., eating more in response to negative mood [15, 16]. People eat out of boredom, they eat to pass the time [17, 18], to console themselves or to find psychological instant gratification.

This is not an isolated phenomenon, related exclusively to the Italian population. In every country food has served as a safety valve. Facing the deep anguish and stress generated by the spreading of the virus, people have been overwhelmed by an emotional vortex and have fled to food as a catalyst for emotion. In fact, also in China, the obesity rate has raised as a consequence of increased food intake due to emotional eating. According to a study conducted by the China Youth Daily Social Survey Center and a network of joint questionnaires, 73.7% of respondents (out of 3,005 interviewed) gained weight during this period of isolation. Susanna Wiegand, doctor of the Pediatric Clinic of the Charité-Universitätsmedizin Berlin, recalls that it is not only adults who have gained weight during the epidemic, but also children and adolescents are one of the key points. [19] Another research conducted on a group of students, in fact, shows that following the lockdown periods, the weight of young people has certainly increased also due to the lack of sporting activity. [20]

The growing number of infections and deaths and the economic recession caused by the spreading of the virus have generated strong psychological stress, which is indeed one of the major causes of weight gain. In fact it is now well−known that the constant tension and prolonged exposure to psycho-physical stress create an increase in the secretion of cortisol which facilitates weight gain and increases the accumulation of sugar in the blood, causing insulin resistance, diabetes and overweight.[21]

4. Consequences of COVID-19 on food sharing: the *gongkuai* policy

The social distancing measures necessary to reduce and prevent the spread of the coronavirus have also reached the dining table, changing in particular the habits linked to the consumption of meals. Among the guidelines for the world of catering indicated by The Italian National Institute of Health (Istituto Superiore di Sanità, ISS), for example, it is highlighted the need to avoid serving courses and appetizers in shared dishes and to prefer single portions. [22] Similar measures have been taken by the Chinese government, which have been promoting the individual dining system (*fencan zh*i 分餐 制) and the use of serving utensils known as *gongkuai* 公筷 (serving chopsticks) or *gongshao* 公勺 (serving spoons).[23] The impact of these kind of measures on Italian culture and in particular on Chinese culture both accustomed to sharing food is quite evident. As for China, the perceived change is so significant that they have been referring to it as to a 'table revolution' (餐桌革命 *canzhuo geming*) aimed at promoting 'a new style of table culture' (餐桌文化新风尚 *canzhuo wenhua xin fengshang*). In China there is not the concept of individual portions. Chinese cuisine is typically served centrally and

shared without the use of serving utensils. Each diner, in fact, despite having their own plate, uses their own chopsticks to pick food from the same dishes. Following the COVID-19 outbreak, Chinese authorities have launched several campaigns, in order to change this type of eating habits that could contribute to the transmission of the virus, first of all the custom of using one's personal chopsticks in the serving dishes. The goal is to encourage the use of common serving utensils and to favour individual portions rather than central dishes. The China Hotel Association recently promoted an initiative that invites catering companies to adopt sanitizing actions for cutlery and to encourage customers to use serving utensils so as to block the transmission of the virus at the dining table. Similar campaigns were launched throughout Asia after the outbreak of SARS in the early 2000s. The initiatives were successful in Hong Kong, while they were not in mainland China, except for cities such as Beijing and Shanghai where people are more aware of the importance of hygiene.

At the moment, many are becoming increasingly conscious of the seriousness of the problem and are trying to adapt to these new practices, also encouraged by promotions run by some restaurants that offer discounts to diners who use serving utensils. In addition to this, more than a hundred leading restaurants in Hangzhou have joined together to form a "Serving Chopsticks Alliance". Across the country, celebrities, political and economic key figures, tycoons, public health experts and teams of propaganda practitioners have been deployed to instruct the public through slogans such as '*fen can bu fen ai* 分餐 不分 爱' (Divide meals, not love), '*ni he wenming yinshi de juli, cha yi shuang gongkuai* 你 和 文明 饮食 的 距离， 差 一双 公 筷' (The distance between you and a civilized food is a pair of serving chopsticks) or '*duo shuang gongkuai duo fen anxin* 多 双 公 筷 多 份 安心' (More pairs of chopsticks, more relief). Nonetheless, resistance is still strong. In fact, the Chinese way of eating is extremely based on sharing. At restaurants and within the family, people generally eat from the same plate put in the center of the table, keeping only a bowl and / or small plate for themselves, with their own portion of soup or rice. Using personal chopsticks to share food is a symbol of closeness and intimacy. It represents one of the most authentic expressions of Chinese community culture. It is not uncommon for Chinese to use their own chopsticks (*sikuai* 私筷) to transfer food from common plates to those of other diners, generally younger family members or guests. This practice shows affinity, hospitality and generosity.

Disapproval of this kind of habits are already recorded at the beginning of the twentieth century. Some criticized the custom of eating together, labeling it as the most unhygienic of food practices, while others advanced solutions to preserve this tradition while respecting hygiene, such as the introduction of *gongkuai*. [24] However, these criticisms did not have an impact, since eating from the same pot or bowl had become a deeply rooted habit in China and neighboring territories such as Vietnam and Korea and it still is today.

The use of serving utensils is generally associated with formal contexts such as banquets or meals with strangers. *Gongkuai* - more common in Japan or Taiwan - tend to be found in fine dining restaurants in China and rarely used at home. If you are with family or with friends, asking for serving utensils can even be perceived as rude. In this sense, it is interesting to note the words of Liu Peng, a 32 years old educational consultant from the coastal city of Qingdao, who said that while he was accustomed to using face masks, he still struggles to accept the *gongkuai*. 'Maybe using chopsticks to serve is more hygienic, but eating is a time for all of us to relax and we don't want to be bothered by all these little rules' Liu said. [25] Similar is the comment of Ms. Song, a pregnant woman in Baoding, Hebei who affirms: 'I live with my in-laws. My father-in-law likes to use his own chopsticks to pick food for the boys. I suggested using the shared chopsticks. I didn't expect they would have opposed so strongly.' [26] From these words we can see how difficult it is to change traditional ideas in a short time. This is due to the fact that the culture of the table is one of the constitutive elements of the Chinese identity. The so-called 'communal eating', consisting in sharing food with family and friends, is rooted and has very ancient origins. According to Edward Wang, it began around the Tang dynasty 唐朝 (618–907). Defined as 合食制 *heshizhi* (common eating style) it was in contrast to the 分食制 *fenshizhi* (individual eating style) of previous periods. [27]

Sharing a meal allows you to improve and develop human relationships. It is no coincidence that when someone desires to extend or pursue a friendship with another person, they often suggest having dinner together. The use of serving utensils is seen as a hindrance to that, an attack on closeness, on communion. In fact, many Chinese people complain that the use of serving utensils creates distance between them and their friends or family. Furthermore, it could also cause embarrassment as its use would imply that one of the diners is infected.

In order to try to overcome these cultural doubts and mistrusts, the Chengdu Catering Industry Association has launched a campaign called 'Use public chopsticks with people you like' (*he xihuan de ren yong gongkuai* 和 喜欢 的 人， 用 公 筷). However, as mentioned previously, slogans are not

enough. The symbolic value of food and its sharing is so strong that it triumphs over any concern for health.

5. The virus and the culture of eating out

As pointed out on several occasions in this paper, food and, more broadly speaking, the act of eating are the symbol of being together and conviviality. Restaurants, fast food restaurants and café are some examples of the places that are conducive for convivial encounters between people. The restrictive measures imposed on the Restaurant & Hospitality Industry, their closure in the first place, have had significant repercussions on the culture of eating out. A survey conducted by Rakuten Ready shows that 20% of respondents will change their habits due to the Coronavirus, avoiding the restaurant and other crowded places, while 40% will not. [28] Therefore, as we can observe, although a small percentage of people will eat out less, restaurants will still play an important role in the post-pandemic future. Diners are experiencing a great lack of these places. What they miss is not the food itself, but the whole restaurant experience, especially the conviviality which is indeed what caused them to close. The European Food Safety Authority (EFSA) in fact says there is no evidence that food is a likely source or vehicle of transmission of the virus. There is no risk of becoming infected through the ingestion and handling of food, the greatest risk exactly lies in the conviviality of the meal. [29] 'Restaurants have a cultural imprint on what it means to be alive. Restaurants are this place of connection and community and excitement and decadence that is very powerful. That was most pronounced in the last decade.' says Dan Barber, the vanguard chef behind Blue Hill at Stone Barns, during an interview for *The Times*. [30] Food is the fuel of community life: through the exchange of goods, gestures, ideas and visits, a community, a collective is built. Food is the first thing humans have exchanged. In the twentieth century sociologists such as Emile Durkheim, William Robertson Smith and George Simmel, along with anthropologists such as Marcel Mauss and Mary Douglas, pointed out the fact that the meal is a social matter, because it is the faithful mirror of all collective dynamics. [31,32] It is no coincidence that the term company derives from the Latin *cum* (with) and *panis* (bread), meaning 'with bread', that is someone you would share your bread with. Even the political lexicon derives from the food practices of the ancients. As John Scheid explained in *When doing something means believing. Sacrificial rites of the Romans*, the concept of 'participation' comes from *partem capere*, literally 'having a part of the sacrificial feast'. The term princeps, that led to 'prince', derives from *primus capere*, that is the one who is served first at the table. [33]
Nowadays, the importance of conviviality has been acknowledged even by the scientific world. It has been explained, data in hand, that eating alone is bad, increases the risk of obesity, favours unbalanced diets and causes poor absorption of nutrients. This means that human contact is the first ingredient of every meal. If that is missing, not only there is no more taste, but there is no health either. Therefore, the heavy restrictions imposed on places such as bars and restaurants have had and will have repercussions on the psycho-physical health of people as they prevent the complete satisfaction of the need for socialization, essential for human well-being as much as the need for nutrition.

6. Conclusions

The importance that food had and continues to have in human history is unequivocal. One of the main values linked to it is that of commensality: sharing food through gestures and exchanges repeated over time establishes the sense of belonging and inclusion in a specific social group, the hierarchy and the type of roles and reciprocal relationships between the diners. The social rituals connected to commensality are universally present, albeit with differences, in all human groups. Eating and drinking together is a form of sharing used to create and maintain social bonds. It takes on a socialization function that establishes relationships between the diners. Food is more than just food. It enhances the value of conviviality as it allows you to recover a social dimension during the moment in which it is consumed. The health emergency from COVID 19 that affected Italy and the rest of the world has had significant repercussions on food, changing the way we approach it. The long staying at home and the reduced social contacts caused by the restrictive preventive measures have led on the one hand to the rediscovery of the values of sociability and the conviviality of food, reduced consumption of junk food and food waste. On the other hand, they have contributed to a significant increase in obesity. The emotional difficulties and stress generated by it have resulted in emotional eating phenomena, pushing many people to take refuge in comfort food to let off steam and console themselves.
The spread of the virus has also affected millennial cultural eating practices such as the introduction of chopsticks and individual portions. Furthermore, the implementation of social distancing policies has been transforming the disease into a social disease, affecting the socialization need.
These are the ways through which the pandemic has impacted on the production and consumption of food, and has transformed its social and cultural meanings. However, the pandemic is far from over and even when it will be, it will continue to cause further long-term changes.

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Evaluation of the geometric reliability in the Scan to BIM process, the case study of Santa Croce monastery

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Abstract
In the Cultural Heritage (CH) domain, the number of innovative approaches for the conservation of historic buildings and their management is increasing. In the last few years, the evolution of the acquisition techniques (laser scanner and photogrammetry) has allowed the acquisition of highly accurate reality-based models. Concurrently, the Historic Building Information Modelling (HBIM) approach has given the possibility to manage the geometric consistency along with the semantic attributes input into 3D parametric objects, through the use of relational databases. The integration of the digital survey techniques with the HBIM approach is known as Scan to BIM process.
However, the creation of three-dimensional As-is Building Information Models (BIMs), that capture the existing conditions of a building, starting from point-cloud data collected by laser scanners or photogrammetry, is mostly performed manually, and errors can occur during the data collection phase, pre-processing, or modelling. Furthermore, given the irregularity and morphological heterogeneity of the architectural elements typical of ancient buildings, the geometric parametrisation always makes modelling in BIM extremely difficult. In the present study, we investigated, through deviation analysis and clash detection, the geometric reliability of the parametrical modelling of the former Santa Croce monastery in Modugno (Bari, Italy).

Keywords: Cultural Heritage, Historic Building Information Modelling, deviation analysis, clash detection, geometry reliability

1. Introduction and state of art
Heritage buildings have a strong cultural, historical and economic value and their preservation, made necessary by the constant degradation caused by weathering, human-induced damage and natural hazards, is an important task. Accurate 3D digitalisation and documentation of ancient structures and objects are essential to plan preservation and restoration activities.
The modelling process conventionally employs highly detailed reality-based 3D models that faithfully capture the existing structural conditions. Nowadays, the demand for three-dimensional models is increasing not only to obtain a faithful reproduction of the building's geometry but also to ease the management procedures.
Building Information Modelling (BIM) is a recent approach continuously implemented for an ongoing management of the buildings, including heritage buildings [1], linked to the representation of physical, functional, semantic and topological information of each architectural element.
Therefore, the research community expressed an interest for the application of BIM to heritage recording, documentation and management [2], [3]. Heritage BIM offers the possibility of performing various complex analyses, such as simulations of construction assessment [4][5], structural analyses [6], data management [7] and diagnostic activities [8].
However, the application of BIM to existing buildings, along with the creation of comprehensive as-built models, continues to be challenging. In fact, some of its applications such as visualisation, documentation or virtual tours, require a visual fidelity and a high geometric accuracy, whereas

applications such as conservation and life-cycle management require a parametric flexibility and a high semantic richness. Generating BIM models from point-cloud data still remains a mostly manual process due to the complexity and uniqueness of architectural elements, such as columns, mouldings, ornaments, sculptures, or domes, and the necessity of representing them in details [9]. Moreover, the construction of an As-is BIM is composed of several steps: data collection, pre-processing, and modelling, and errors can occur in each step of this process, thus affecting the quality of the final result. Different methods can be applied to evaluate the geometric accuracy of a BIM model.
The visual inspection method consists in a visual comparison by overlapping a 3D model to its point cloud. It does not require much computation, but it is subjective and cannot provide a quantitative evaluation. Clash detection compares the positions of the components and detects a clash if some of them are closer than a given threshold or are occupying the same space.
The physical measurement method shows a set of measurements taken on the real building and their virtual correspondence in BIM. The values compared are then statistically analysed to obtain a confidence value. The advantage consists in avoiding the errors caused by scaling the point clouds. However, it also has some limitations since it is not possible to make an overall coverage of all the possible measuring (such for ceiling heights, complex morphologies), and directly identify the sources of error, because the limited number of measurements cannot provide sufficient information to distinguish them in the point clouds or in the BIM model. Furthermore, it is a time-consuming process that requires the collection of a large number of measurements.
Surface deviation analysis is a method born in the manufacturing contest and it is able to evaluate the geometric accuracy and localise modelling errors and their relevance in reference to a model adopted as a ground truth. In the architectural domain, the comparison is generally carried out between a 3D model and a reference point cloud. A fundamental assumption is that the BIM and the reference point cloud should geometrically match in terms of tolerance[10].
Carrying out a deviation analysis requires three main steps. The first consists in the computation of the deviations of the point cloud from the BIM model, in order to find errors. To estimate the correspondences between the points and the BIM, it is possible to use direct or indirect methods based on: i) the calculation of the minimum Euclidean distance to associate data-points with the objects that are in their close proximity; ii). projecting points on tree-dimensional surfaces; iii) tracing rays on the surfaces to find correspondences, or eliminating the matches by certain metrics (e.g., normal direction). The second step is visualising the correspondences through a colour-coded deviation map which is made by colouring each surface according to the different distances. The different errors result in deviation patterns, which can be analysed, so as to identify their sources, their type, and their relevance within the point-cloud data or those derived from the as-is BIMs. Several colouring methods can be used, including binary maps, continuous colouring, or unsigned or signed maps [11] to support the maps' understanding. Finally, the third step consists in analysing the deviation maps to identify the deviation patterns.
The Scan to BIM approach that we are proposing, combines two three-dimensional survey methods (laser scanner and photogrammetry) with the parametric modelling approach to build a BIM model of the former Santa Croce monastery (Modugno, Bari) and investigate the geometric accuracy of parametric modelling trough clash detection and deviation analysis.

2. Case of study: Santa Croce monastery

The former Santa Croce monastery (1618) is located in the old town of Modugno (metropolitan city of Bari). It stands on Piazza del Popolo square, in front of the Mother Church and next to Santa Maria della Croce church, from which its name comes from.
During the years, the building underwent a series of interventions and transformations so as to be adapted to different uses. Indeed, apart from hosting the Olivetan Benedictine nuns for a long time, it also became the seat of the municipal offices, the district court, the local prison and an elementary school.
Its structure is basically made of two bodies that stand around a cloister surrounded by a double order of covered walkways, characterised, on the ground floor, by square pillars with Doric capitals and, on the first floor, by columns with phytomorph decorations (Fig.1). The covered walkway that surrounds the cloister, on the ground floor entirely consists of a system of cross vaults resting on the walls that separate the internal spaces from the external one. The internal spaces are characterised by both barrel and pillar vaults. On the ground floor the smooth tuff facade is covered with ashlar. During the interventions carried out in autumn 2018, in a few rooms of the ground floor, the professionals found some remains belonging to buildings that chronologically preceded the construction of the monastery: hypogea with basoli stone paving, walkways, water drainage channels, a cistern, a spiral staircase, stables, objects in copper and bronze. According to the first evaluations made by the experts, those discoveries date back to the Renaissance period and probably also to earlier periods. On May 30, 1981, the building was recognised

of notable historic-artistic interest pursuant to Law 1089/39, being a testimony of the town's sacred architecture. It currently houses the town hall and since 2018 it has become a cultural pole.



Fig. 1: Internal courtyard of the former Santa Croce monastery in Modugno (Bari)

3. The survey

The survey of former Santa Croce monastery was exploited using two different techniques of digital survey. Laser scanner was used to scan the entire building and photogrammetry for both the capitals of the columns of the second order, that overlook the internal cloister, and the decorations of the entrance portal.

3.1 Laser scanning and elaboration of the point cloud

To survey the whole complex, the laser scanner Faro Focus 3D 120 CAM2 was used, whose technical specifications allow a measurement accuracy of ± 2 mm, a range of 0.6 to 120 meters, a measurement speed of 976,000 points/second and a vertical and horizontal field of view respectively of 305° and 360°. Scan points were decided previously constructing an acquisition plan that was elaborated after a first inspection of the site. The acquisition plan helped to optimise the relationship between the total number of the scans and their resolution, the acquisition time and the achievement of an adequate overlap. Furthermore, it was done for taking into account the average distance of the instrument from the object, so as to obtain a homogeneous precision and avoid shadow areas (Fig.2).
It has been studied each room, the space distribution, the entrances, the morphology of the walls, the ceilings and the materials, in order to understand which survey method would suit the most.

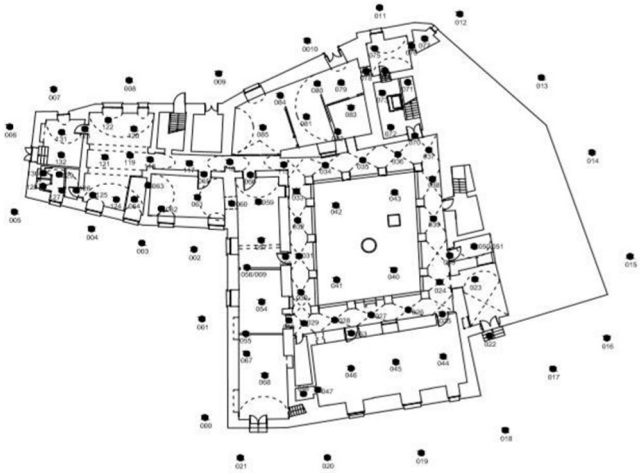

Fig. 2: Acquisition points chose for the ground floor

Given the extension of the complex, 288 scans have been taken at a distance of 10 m, with a resolution variable between 6.0 and 7.5 mm and about 30 Mpt per scan, which guarantee a minimum resolution of 8248x3414 pt and a maximum of 10310x4268 pt.
The scans have been processed using the software Autodesk Recap Pro®. Each point cloud has been checked, cleaned from the superfluous data and aligned manually (Fig. 3).

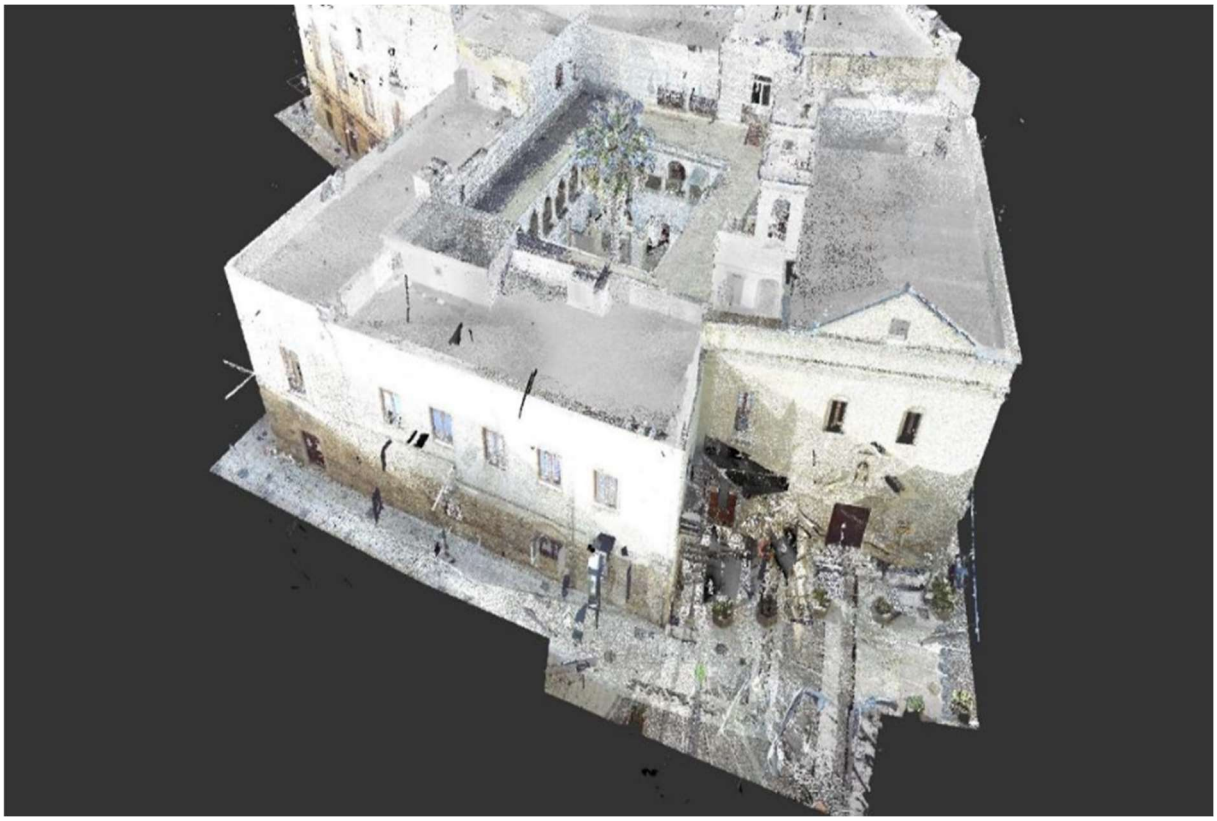

Fig. 3: Point cloud of the former Santa Croce monastery, Modugno, Bari

3.2 Photogrammetric survey and building of the three-dimensional model

For the photogrammetric survey was used a digital camera (a Sony DSC-QX100, with sensor resolution 20,2MP, sensor size 13,2 mm x 8,8 mm, sensor format CMOS Exmor R® da 1", image resolution 5472 x 3648 px) installed on a telescopic rod via a two-axis gimbal. A series of photos have been taken with axes converging at multiple inclinations, so as to guarantee a perfect overlap between the different acquisition points and, at the same time, avoid shadow areas.
After that, all the images acquired have been processed using the software Agisoft Photoscan® and created a point cloud and a textured polygonal mesh for each element (Fig. 4). However, a few corrections have been made on the polygonal mesh, such as: decimation, and removal of outliers and holes.



Fig. 4: Example of elements acquired through photogrammetry and their texturised mesh

4. The building of the BIM model and the evaluation of the geometric reliability

The three-dimensional model of the former Convent has been created starting from point cloud because the aim was obtaining a high level of geometric precision, while respecting the building hierarchies and the semantic relations of the elements represented. Autodesk Revit® was used to model in BIM, since this modelling technique offers the possibility to consider the architectonic elements as different objects from a hierarchic and semantic point of view thanks to “Families”, equipped with “parameters” that can be edited and customised with geometric and information attributes.

Then, the decorative elements have been imported in Revit (section 3.2), and put on the modelled building (Fig.5).



Fig. 5: 3D model of the entrance portal obtained through parametric modelling (mouldings, door, steps) and three-dimensional mesh (phytomorphic decorations and coat of arms)

In order to check the accuracy of the three-dimensional model, firstly a clash detection has been carried out on the three-dimensional model's elements and secondly a surface deviation analysis between the point cloud and the three-dimensional model.
The clash detection was simulated using the software Autodesk Navisworks ®. An initial check highlighted some critical issues attributable to three mistakes that were made in the modelling phase. It also detected some modelling imprecisions on different elements of the model, that led to a configuration that was far from reality, such as an incorrect interpenetration of walls and ceilings. Moreover, it detected some inferences in some BIM objects, belonging to the different parametric families that build up the model. In the present case, interferences between the structural and the architectonic models were detected in the beam-masonry interface.
This check also highlighted that some mistakes were made while inserting the parameters. In particular, it was possibile to notice an interference existing between a stairway and the inferior part of its railing, that was solved by setting an appropriate offset.

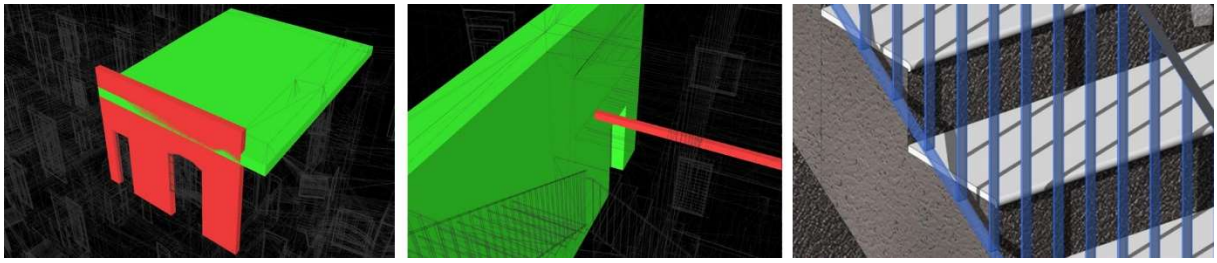

Fig. 6: The interferences between building elements highlighted by the Clash Detection

The deviation analysis was exploited with the software "As-built" ® by FARO technologies. In particular, a threshold deviation value was set in order to compare the minimum Euclidian data-object distance of each architectural component modelled and the point cloud. Smaller threshold values (20-50mm) appear more effective for visualising detailed deviations, such as local geometric errors. For this reason, they were chosen for elements like frames, vaults, and arched openings. Instead, larger threshold values (50mm-300mm) were applied to the walls because the presence of the ashlar could negatively affect the analysis. The color scheme varies from red (the maximum positive value), to green (0mm, neutral), and blue (the minimum negative value). In Figs. 7-8 it is possible to see how the model is consistent with the point cloud. A negative deviation was detected in correspondence of the the highly irregular arches supported by the pillars of the first order of the cloister, and a crack that is not visible in the three-dimensional model.

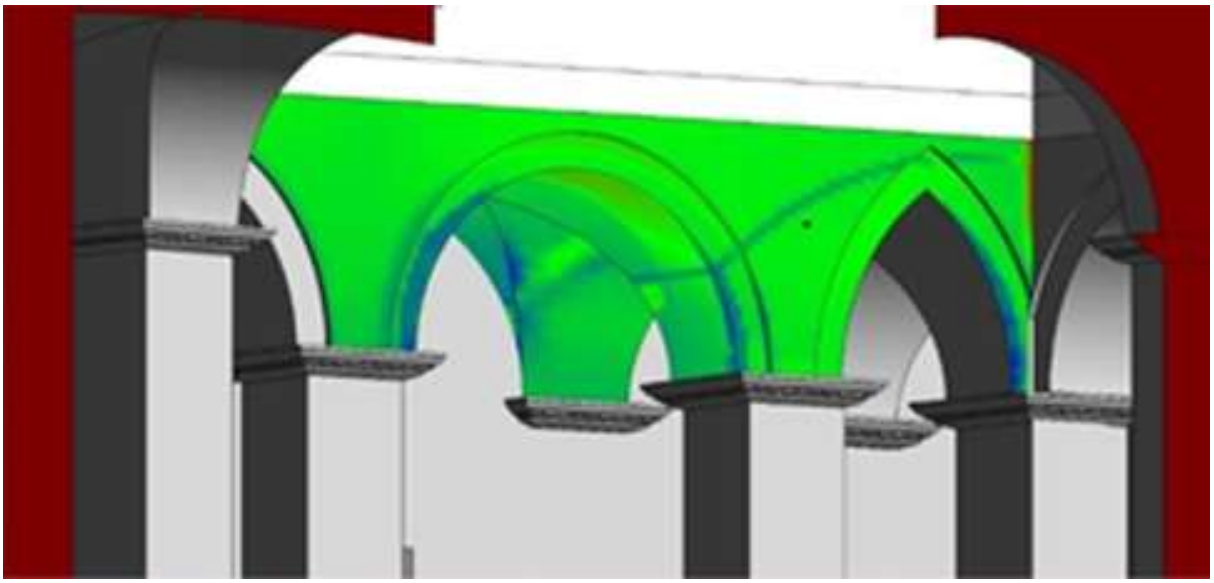

Fig. 7: Deviation analysis between the point cloud and the BIM model of the portico that overlooks the cloister

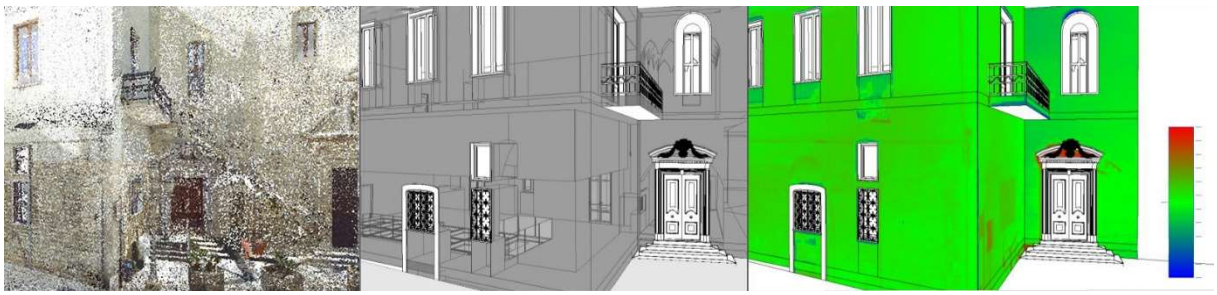

Fig. 8: Deviation analysis between the point cloud and the BIM model of the main facade

After solving the modelling errors revealed by the clash detection and the deviation analysis, a BIM model was obtained characterised by a high geometric accuracy, and later used to elaborate a virtual reality model Fig.9.



Fig. 9: VR Elaboration based on the BIM model

Conclusions

Nowadays, the discovery of new technologies provides a great improvement in the quality and the management of complex 3D building information. This paper proposed an approach to analyse the geometric accuracy of parametric 3D models, resulted from point-cloud data, through two different methods: clash detection and deviation analysis.
We used the first method to check the interferences between the BIM model's components. Having solved the issues raised, we carried out a further analysis by calculating the surface deviations between the point cloud and the 3D model. In this case, we had the possibility to verify and quantify the error through a previously set color map, thus evaluating the size of the inconsistencies and easily finding them in the model.

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Catania upside-down

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Abstract
The several archaeologies, visible in the centre of Catania, are irrelevant objects, fenced in scattered holes without any common idea.
Nevertheless, these treasures are even more valuable for belonging to an extraordinary topographical context, which change not only for the usual physical overlapping of the eras. A place that changes also for the overturning of the spatiotemporal order of the town caused by the action of Etna (it is common to find in Catania the ancient level upper than the current one).
The research group of architects, which we belong to, is conducting a project about Catania, focusing on his archaeological nature. In 1832 the architect Sebastiano Ittar, with his "Pianta Topografica della Città di Catania", in addition to draw the first orthogonal plan in the history of Catania, draws all its archaeologies, affirming their active role in the town construction.
Our purpose is redrawing the city laying the foundation on Ittar's document. Our drawing aims to carry the ideas at the base of the Ittar's Plan to the architectural scale, disclosing the capacity of the ancient invisible town to force the shape of the current visible town.
The core essence of the research is considering the ancient as "active part" in the construction of the town and its little fragments as gems mounted in the urban pattern.

Keywords: City, Architecture, Drawing, Shape, Archaeology

1. Choice: intro
To choose is to renounce. No drawings that aspires to the representation of an idea can reach its aim without choosing what to omit. For this reason, every drawing that intends to achieve this ambition is always an invention (or, if we want to be extreme, a "fake") as it represents another reality that does not exist: who draws does not want to show reality but to give it a meaning. It is not easy because extraneous fascinations of different nature tend to creep into the work; the idea is a narrow way.
It is precisely for these reasons that it is necessary to periodically attempt a synthesis of the thoughts we have had and the results we have achieved in the work we are doing. This contribution is an occasion both to expose the research process undertaken by the Laboratory BOHOB and to have an overview of the progress achieved moreover to reflect again on the same issues with a vital and never satiated spirit.

2. The scenery
«*Catania è posta sopra il lido verso la metà del lato orientale della Sicilia, tra la più alta montagna, e il più grosso fiume; sorge nelle estreme meridionali falde dell'Etna che torreggia a sinistra alla distanza di venti miglia innalzando, e diminuendo progressivamente la sua massa isolata sino alla acuta, e fumante cima che porta nelle regioni delle nuvole*»[1].

Here is described the position of the city of Catania in which emerge with clarity its essential features. As architects our aim, however, is always the relationship between man and nature, the relationship

[1]CORRENTI, Santi, *La città semprerifiorente*, 40 p. (see Bibliographical References)

between the city and the territory that builds, and it is in this perspective that Catania reveals itself with evidence a case unique. Every city is based on this relationship but almost none has a Volcano and cataclysms of various kinds to upset the balance. Catania has the ability to grow according to two different ways, two different ways of moving in time: the first by *linear stratification*, the second by *sudden movement*.

Every city in the world recognizes itself in the first mode.

The city swells by successive layers in time and space and between them in linear proportion: as time increases, the thickness of the city increases. Therefore, a logical space-time correlation follows in the layers of the city: the deeper I get the further back in time I go. An epoch buries the previous one bringing forward the life of the city, this is the slow movement made by every city in the course of time: the ordinary way of growing.

However, what happens when it is not the time that buries itself but the space (the amount of lava) but it is the Nature and not the man to determine a change in the city?

In a few moments a very fast reversal changes the conditions of settlement and geography of a city, just those that ordinarily in almost all the world's cities are original and unchanging conditions of settlement, a state of affairs that persists in the project of the city. The lava flows, earthquakes and tidal waves have drastically changed Catania. These are natural phenomena that act punctually on the construction, triggering only later a slow human activity to cope with the upheavals caused by them. It is extremely rare that the times of Nature, usually "extra-human" (i.e. that go well beyond the life span of an individual), are so much faster than human ones: this is one of the most unacceptable characteristics of Etna, to act according to a speed that is not part of the natural world and even to man himself.

The lava flow that hit Catania in 1669[2] and the earthquake of 1693 are the event that best succeed in giving evidence of the titanic work done by Nature.

Let us consider for a moment the ordinary development of the cities, the "linear stratification" previously explained, and let us try to quantify exactly how much the soil of the cities materially grows every year[3]. Taking as reference the most ancient submerged quotas, we can approximately consider that in 1 year the city grows of 1 mm. The lava front of the 1669's flow was on average 10 m high. What would we get if we consider it according to the "linear stratification"? We would realize that the ground of the city has grown of 10 m suddenly. In a *moment*, *10000 years* have fallen on the city in the form of space (of lava soil). An upsetting not only in the time but also in the space, that flattens a ridge road (from "*via del Vaddazzu*" to "*via Plebiscito*"), fills the high ground on which the city stood, fills a seasonal lake, revolutionizing in fact the plan of the city.

Therefore, it is with the earthquake[4]. The rubble from the earthquake raised the level of the city by 2 metres, and the new city rested on this to be reborn. The rise of a couple of metres in the level of a city in just a few seconds cannot be defined as growth, however sudden, but as an upheaval that is difficult

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[2] «*La montagna squarciò il suo seno presso Nicolosi a 14 miglia da Catania il dì 11 marzo, e cominciò a vomitare un terribile fiume infuocato. I paesi la Guardia, Malpasso, Mompiliere, ed altri che erano nella direzione che prese furono da esso sommersi. […]. Ecco finalmente il fiume di fuoco alle Porte della città. In sei ore coprì tutto il lago di Nicito, e la valle attorno; ed il giorno 16 aprile scappando da quel luogo dopo avere abbattuti gli acquidotti che da lontano portavano l'acqua a Catania, assalì le mura, superò il Bastione degli Infetti, mondò le mura che da esso estendevansi sino alla Porta delli canali, lasciando appena la Porta della decima, ma sommergendo le rovine della Naumachia, e del Circo massimo che erano fuori di essa; coprì i Bastioni di s. Giorgio, e di s. Croce sotto il Castello; riempì i fossati di questo, e circondò le due grandi torri di mezzogiorno; distrusse li 36 canali alla marina, e bisognò murare la Porta delli canali per dove minacciò d'entrare, e dopo avere sparsa l'immagine terribile del Tartaro e della desolazione sopra tutti i deliziosi giardini di quella parte meridionale entrò nel mare con la larghezza di due miglia, e vi si inoltrò quasi un miglio sempre in avanti ingannando la speranza dei catanesi che torcendo da qualche parte dopo il cumulo di tanti mali avesse almeno loro formato un porto nel cospetto della città.*» (FERRARA, Francesco, *Storia di Catania sino alla fine del secolo XVIII con la descrizione degli antichi monumenti ancora esistenti e nello stato presente della città,* 193-195 pp.; see Bibliographical References)

[3] This is quantitatively impossible as each city is unique, but qualitatively it makes sense to try.

[4] «*1693. – A nove gennaro, Venerdì, ore 5 di Notte. Li Coccodrilli Tremuoti col dorso scossero li Valli di Nemore e di Noto. La mattina del Sabato al comparire il gran Pianeta Solare mandava lugubri raggi, l'Aria obnubila. Si vide il fatto sconcerto nelle fabbriche delle Chiese e Monasteri, Conventi e Palazzi, Campanili e Torri, tutte vulnerati, con aperte cicatrici. Giunta l'ora 21 della Domenica 11 Gennaro. Ecco all'improvviso replicò fiero e gagliardo il terremoto, durando per lo spatio d'un De Profundis. Cadde tutta la Città di Catania rovinata e destrutta, divenne un aggregato di pietre.*» (FICHERA, Francesco, *Una città settecentesca*, 3 p.; see Bibliographical References)

to understand. This gap exists today in the difference between the height of the market square and the cathedral square.
For these reasons Catania is one of the rare cities *upside-down*, it is not at all said that a lowering in depth is equivalent to a linear going backwards in time: the *below* does not always correspond to the *before*. In fact, it is usual to find the height of, for example, the '500 above the '700 (Monastery of the Holy Trinity). What in other cities would be impossible and absurd in Catania is extraordinarily usual.

3. The Drawing of the City

All these considerations about the nature of a city and the geographical space to this city have no meaning if not expressed through drawing. Representation is capable of saying all this with force and clarity.

3.1 The Plan by Sebastiano Ittar

In Catania, there is already a drawing of the city that is undoubtedly the most remarkable work ever been done: "La Pianta Topografica della Città di Catania" by Sebastiano Ittar. It is the most important work on the shape of the city of Catania because the plan has been able to produce two notable shifts inherent in its representation.
The first gap consists in the fact that the Plan is the *first scientific drawing* of Catania: Ittar manages to complete in about 25 years a huge effort to restore the measure of the city. The Plan is the first orthogonal projection of Catania; no one had ever seen the city in its entirety and in its exact dimensional relations. In this sense, it is clearly an invention: for the first time the shape of the city appears, is revealed in a drawing.
The second deviation made by Ittar lies in his *idea of the city*. The orthogonal projection of the city would have been sufficient to produce in any case something new and powerful, but Ittar goes further by representing his idea of the city: the close relationship between the contemporary city and its scenery.
He accurately draws the archaeologies buried under the city. He is not at all driven by “antiquarian” reasons but rather by constructive ones, which are perfectly within the discipline he deals with: architecture[5]. Rather than isolated archaeologies, the ones he draws seem more like fragments of a whole that from “below” undermines the shape of what is “above”: there is *another invisible city* that constrains the development of the visible one. This makes still more species if we consider that Ittar designs a young city, with little more than a century of age, almost integrally reconstructed following the earthquake of the Val di Noto of 1693. Therefore, from the Plan, it emerges a city of the XVIII century that only *superficially* appears totally brand-new but that *deeply* sinks the own roots in the fragments of other cities by now become foundations.
The Plan of Ittar was printed in 1832 and appeared to be a work of the nineteenth century, not only for its obvious chronology, but above all for its intellectual position. The city of Ittar is articulated through the juxtaposition of the blocks that compose it: the scale of representation adopted, the technical means at its disposal, the new ideas in the field of urban analysis, all converge towards a *typological representation* of the city. A way of representing placed within a period in which, for the first time, a systematic approach to the form of the city was felt, up to that moment only punctually faced by experiences sometimes extraordinary but not related to the same direction of research.
Our Drawing wants to be the 1832 Plan in the present day, not meaning a mere technical update but a shift of meaning with reference to Ittar itself.

3.2 The Drawing of the City of Catania: idea

To take the model means to betray the model. Going beyond the issues, raised by the reference from which we start, is a duty and the only way to add a necessary piece to the discussion in which we want to act. In our case, we attempt to go beyond Ittar's work.
The limit of the Drawing that the BOHOB laboratory is carrying out is the eighteenth-century city of the post-earthquake reconstruction of 1693. Because it is this measure of city[6] that determines the shape of Catania today. Our drawing shows the same city staged by Ittar in his Plan. However, what does it mean to make that drawing today? Clearly if we really want to make *that* drawing, it is necessary to make a different one. Faithful to the principles and not to the form, BOHOB's Drawing wants to collect Ittar's idea of city and make a drawing even more pushed towards the physical fact of the city: our Drawing aims to be a constructive representation of the city of Catania.
The instruments available today allow us in a credible way to make a leap towards the understanding of the truth underlying the city. Therefore, the scale of the Drawing is 1:500, a powerful scale of

[5] This may seem superfluous, but it is necessary to clear up any misunderstanding from the outset: the drawing of a city is always a matter of architecture and never of town planning.
[6] One can rightly speak of several distinct cities in the case of Catania, since the numerous times it has been destroyed and rebuilt, discrete monolithic blocks somehow superimposed.

representation for a drawing of the city. However, the issue is not superficially an enlargement of Ittar, a way of adding detail that Ittar could not technically have detected. His Plan is powerful precisely because of the lack of many details that would have weakened the "typological" figure of his representation, thus precisely what Ittar *chose to omit*. Not an enlargement but a shift towards the constructive dimension of the city. With the Amphitheatre and the Ancient Theatre, Ittar violently[7] affirms that the city of "below" administers measure and form to that of "above", but the very scope and limitation of his Plan lies in doing so through the typological and not the constructive eye.
We choose the representation in a constructive sense of the city; this choice gives us the right to feel inside Ittar's reasoning more than he did. In this sense, the Plan becomes a controversial archaeological subject capable of providing more suggestions for the future than it did at the time it was conceived. Reversing the reasoning, we affirm that BOHOB's Drawing is more coherent with the main ideas of the Ittar's Plan than the Plan itself.

3.3 The Drawing of the City of Catania: structure

The Drawing of BOHOB is composed of three syntagms: the roofs, the public buildings, the archaeologies. Their relationship gives shape to our idea of the city.
It is not possible to say with absolute certainty which of the three is more decisive in the form of the city but, if we were ever forced to say one, we would undoubtedly say the roofs. *Roofs* build the brute mass of the city, its skeleton, and at the same time give other fundamental information about the city. While they draw the outline, they give an account of the density of the built-up area, of its internal tensions. In the passage from silhouette to density lies all the effort of a year that BOHOB has carried out in the redesign of the roofs of Catania. The shape is a datum expressed both by the drawing of the block and by that of the roofs. Nevertheless, the block is not a constructive unit but a typological one, to be clear: unlike the roofs, *the block is not an element of the construction*. The roof is a requirement and as such is capable of expressing the reasons it contains. The shape of the block is the result of single constructive acts no longer recognizable in that form, the roof instead, in the extreme synthesis of its few lines, expresses all the complexity of the plan, alluding to an invisible but present richness.
The measure of the city passes through the measure of the roofs. The accurate, or rather exact[8], design of the single roof with respect to the whole design finds its place in the hierarchy of the city, accentuating an axis if it is a large roof or giving unity to a small agglomerate if it is a small roof. The drawing of the roofs is able to give back in a representative form the perception of the density felt in the streets, being inside the city. Walking in a part of the city marked by blocks with tiny buildings has nothing to do with the density perceived in another part where a building corresponds to an entire block.
Drawing roofs is a powerful way to bring out specific characters of the city and not only its overall structure. A particularly effective exemplum of these specific characters is the "unreasonable disproportion" between the Benedictine Monastery and the houses of the surrounding neighbourhoods. The ratio between a house in the neighbourhoods and the Monastery is 1:35; an impressive proportion if we consider that usually in a city the ratio between an ordinary and an extraordinary building range from 1:4 to 1:6. The Monastery on the city's hill is one of the largest monastic buildings in the world. This datum, however statistically remarkable, considered in itself is useless to us; it is just one those many suggestions that we must daily evade. *The relative dimension makes the city and not the absolute one*. Around the Complex, develop the most popular quarters of the city, marked by a measure of tiny housing[9]. Face to face, the smaller fabric of the city is compared with the beastly and completely outsized size of the Monastery. This contrast gives shape to one of the strongest pieces of the whole city that in the Drawings the roofs have the ability to render.
Some buildings more than others are able by form, size, settlement issues, to specify the nature of a city. These buildings are what we call *public buildings*. In the Drawing, they are represented in horizontal section and not in plan like the roofs. The choice of this type of representation can be explained by the

[7] Even more so, if we consider that in its time the Amphitheatre was entirely buried by the city, unlike today where part of it has been made visible.
[8] The difference between "accurate" and "exact" is fundamental. The former term may be at odds with the constructive idea of the object to which it refers, while the latter is not, because of its specific feature is to express an idea. A neutral relief is "accurate"; another that forces one aspect and conceals another in favour of a whole clarity is "exact".
[9] This was due to the political choice of the men in charge of guiding the post-earthquake reconstruction to define a real clear demarcation line that established two different land costs in the city. The Benedictine Monastery occupies a large part of this area and its economic and political power enabled it to acquire so much land that the less well-off were concentrated in neighbourhoods around the Monastery. This political choice is explained by the presence in this area of the Jewish ghetto, which became a huge empty area available after the expulsion of the Jews by the Spanish.

fact that we intend the plan of the public buildings as a “future archaeological section”, as if to anticipate a persistence in the future site of the city: representing just what will remain in a future in which they, too, will be archaeological[10]. The term “public” in this context should be meant not in its literal meaning but in its spatial meaning. For example, both churches and palaces of the nobility are drawn as public buildings, and it is clear that they are not literally public either. Rather, we define the latter as public in that they are capable of representing the city, buildings capable of carrying within them the reasons for the city and acting as ordering elements of space.
How an invisible city is able to give form to the one that has emerged?[11] The object of the Drawing is the form of the city and its aim is to represent its construction through the close relationship it has with its *archaeological substrate*. Having a clear sense of the research is fundamental in order to discern what is important to us from what is not. In the case of archaeology, our interest is directed towards those that, over the course of time, have been able to prefigure the form of the city: only those that therefore “belong” to the city since they have actively influenced its structure. In the Drawing, they are represented in horizontal section but, unlike the public buildings, a hatch spells out this time the section since these fragments are *already* archaeology.
It is good to specify that belonging to the city is not a datum that has to do with the visibility of the ruin in the urban space but with being present in a deeper sense. The Drawing takes the responsibility of drawing with the same weight both the visible archaeologies in the city and the submerged ones, if both have contributed to build the city. From the point of view of drawing only what gives shape to the city, the possible invisibility of the pre-existence is completely indifferent.

4. Choice: coda

At first glance, only in the third paragraph have we spoken of the city's Drawing; in truth, in this part only its analytical nature has been explored, the “construction” of its individual parts. Yet the whole contribution deals with the Drawing, only not always explicitly.
All the considerations on the nature and character of Catania expressed in the first two paragraphs are already “drawing”, insofar as they are ideas at the basis of the representation, our idea of the city and therefore the city that the Drawing wants to represent.
It is not possible to draw a city without there being a precise, or rather “limited”, idea at its base, but rather as a necessary condition for achieving a result that moves something.
To set the city as an object as a constructive idea has forced the renunciation of a “typological” representation. The choice of roofs instead of blocks of flats is the most radical and evident choice of the whole research and its intentions. In addition, the presence of an exemplary work such as the Ittar’s Plan would have made an effort in that direction totally useless.
History is one of the most persuasive seducers for those who aim at such a drawing. For the purposes of research, it is not important to know every piece of information about each of the city's antiquities. We do not intend an ancient fragment in the city as philological testimony, as a “text”, but as living matter, that builds the city. We decide to grasp the necessary fact of architecture by seeing construction not as a succession of epochs but as a synchronous fact in which each intervention is essentially a constructive action.
The architect is not a “slacker in the garden of knowledge”, he (and we) must use history to make, to carry on the construction of the city's form.

«*Non tanto di ciò che seduce per primo, di ciò che sembra arrivarci, emanare dal luogo, il fascino, l’aura, il genio, etc. quanto proprio del potere tecnico-pratico che il luogo custodisce, impadronirsi cioè della sua virtualità sul piano tecnico, sul piano costruttivo*»[12].

[10] «*Ad Alberti interessa soprattutto la città com’è, la città attraverso il tempo, della città e della sua storia gli interessa quello che ancora si può toccare con mano, come la città antica arrivata fino a lui, la città e la sua architettura, quella città che attraverso i segni lasciati dal tempo sulla sua forma gli permette appunto di distinguere ciò che è durevole da ciò che è provvisorio, ciò che è importante e perciò permanente da ciò che col tempo si elimina da sé*» (GRASSI, Giorgio, Leon Battista Alberti e l’architettura romana, 15 p.; see Bibliographical References)
[11] As Heraclitus said «The hidden form is more powerful than the manifest form».
[12] GRASSI, Giorgio, in Casabella n°666 (see Bibliographical References)

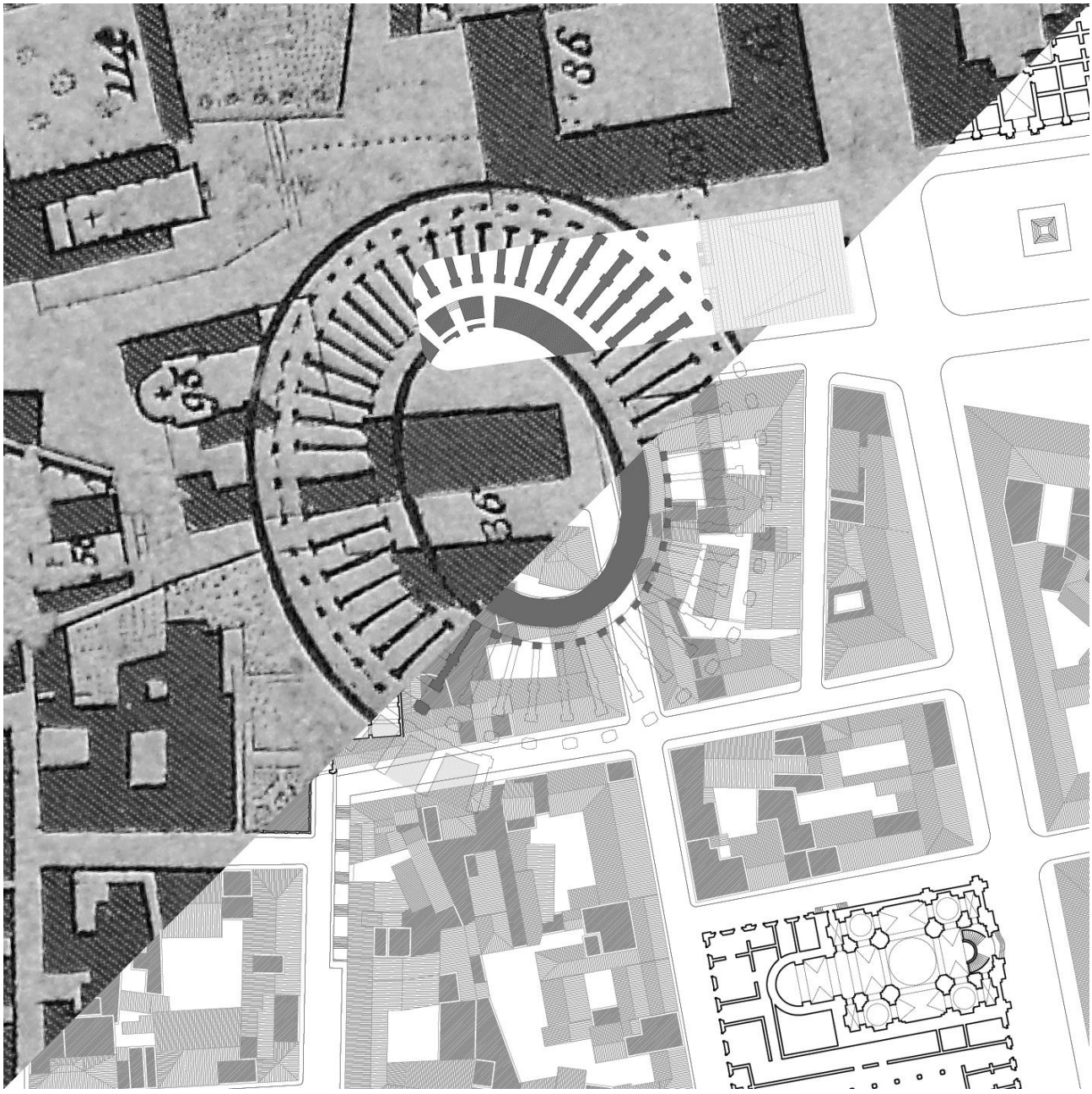

Fig. 1: The Ittar's Plan as an archaeology



Fig. 2: The scenery. The Earthquake of 1693



Fig. 3: The Plan by Sebastiano Ittar, 1832.



Fig. 4: The Drawing of the City of Catania by BOHOB.



Fig. 5a: First syntagm: the roofs. Excerpt scale 1:500.

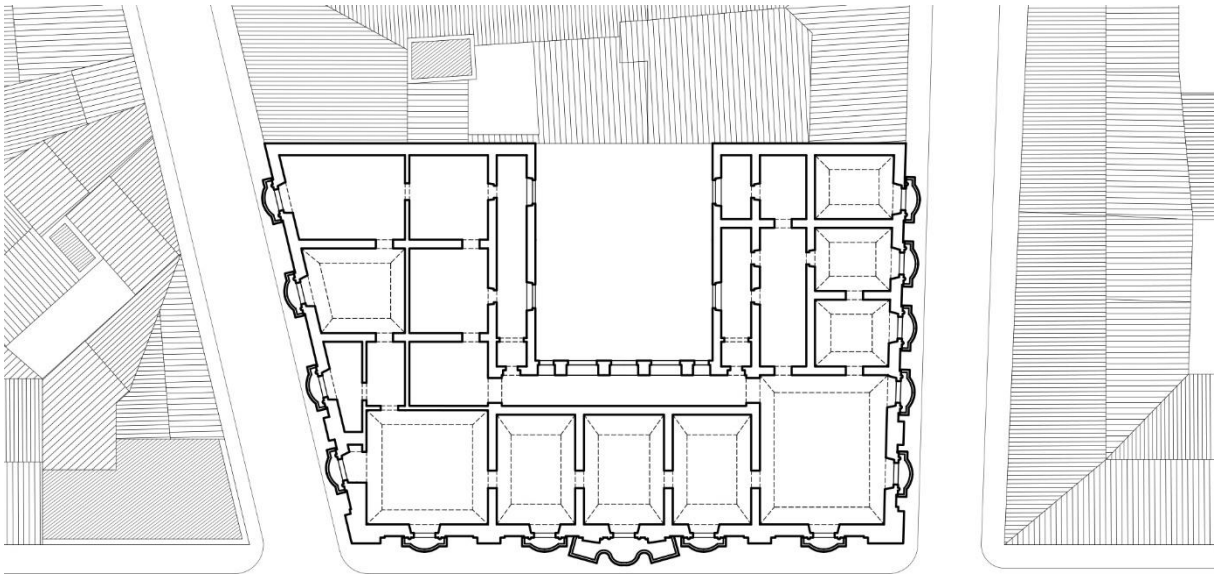

Fig. 5b: Second syntagm: the public buildings. Excerpt scale 1:500.

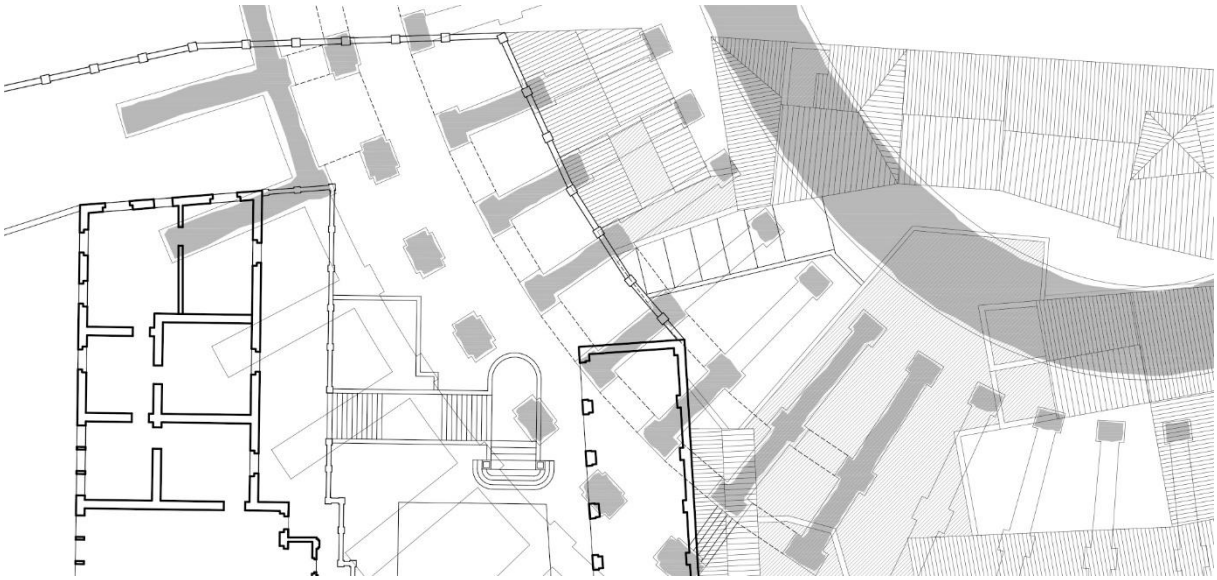

Fig. 5c: Third syntagm: the archaeology. Excerpt scale 1:500.

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Catania: Progetti minimi

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Abstract
Nowadays every restoration work seems headed by the impartiality toward the archaeological ruin and his relationship with the town. The archaeological dig becomes an unresolved matter, halfway between the desire of restoring and the inability of making this desire come true. What they got are isolated urban voids.
The research group of architects, which I belong to, is taking a different path. We are conducting a work about Catania convinced that the way to respect the ruins is taking a stance. An undercurrent town, called "*Catania vecchia*", lies under the current one. It punctually emerges to the "upper town" by the urban voids we referred to before.
The group has conducted a series of "*progetti minimi*", consisting of shrines on a citywide scale in which the ruin is kept. The use of a noble material and the design of a definite geometry let the archaeologies appear as gems and not as a temporary object in the urban pattern. On the other hand, every project stops "on the edge" of the archaeological site: it does not touch the ancient stones materially; it rather intends to underline the gap between the ancient and the current levels, to make emerge evocatively the distance between the two eras. The whole aim is designing spaces dominated by the evocative presence of the ruins.

Keywords: Architecture, Archaeology, City, Design, Representation

1. Background
In Catania, a submerged city episodically shows itself to the emerged city through its ruins fenced in "holes" scattered around the city centre. In contrast to the extraordinary nature of a condition such as this, in which two cities overlap, is the work of those responsible for protection. The archaeological areas are the dramatic expression of the lack of any point of view on what these remains and these places can be for the city.
Choose a place, define a measure, fence in the perimeter. We could summarise their operational practice in this way. Those who have to found a city are faced with the same successive steps, with an abysmal difference, however, contained entirely in the purpose of those gestures: the city is founded to bring life into it, the archaeological area *to exclude it*. In the name of protection *tout court*, the city is deprived of the vital space that until recently belonged to it, being within the relations between its inhabitants. The worst aspect of this appropriation of space is precisely the lack of a subject driven by the need to occupy; in other words, the absence of an "enemy" who reasonably wants to snatch part of their space from the inhabitants.
In the intentions of these subjects, I do not believe there is a clear desire for forced appropriation of space, if only because it would be in clear contradiction with the one principle that seems to guide their actions from time to time: neutrality. From the most clamorous action (such as the location of an area to be excavated) to the smallest (the construction of fences), neutrality is the only minimum common denominator. Other aspects, such as the temporariness and reversibility of the intervention, are linked to neutrality as the only drive qualifying the choices. They always start from the idea that any transformation involving archaeology must be temporary. It is precisely because of this way of

proceeding that the ruins in the city are isolated presences in scattered holes (*object trouvé*). The lack of an assumption in their re-emergence in the city generates a relationship of indifference between the city's inhabitants and the ruins, in which the one is alienated from the other. The extraordinary preciousness of the city below is degraded to the point of being unwanted.
Within an excavation it is highly unlikely to find a project (intended as a transformation sustained by an idea), but instead only interventions. The most common intervention is to make an excavation accessible. The intervention is a fact, the project an *idea*. The project is based on an assumption, on a precise point of view on the world and for this reason it is always "partisan", each time compromising. A project always chooses sides, and we believe that this is what frightens who do not have an idea about the ruins. The project must necessarily be a vital aspiration towards the possibility of a place.
A choice that turns out to be wrong in time is still far better than not making a decision. A wrong project, if it really is an idea before it is right or wrong, will really enter the lives of the inhabitants, not establishing a relationship of indifference with them but rather one of confrontation. "Polis" is the root of "polemic", a city without struggle is a dead city. Citizenship renews its identity above all in the face of an "enemy", in the face of what it recognises as being in contrast with what it feels, it is and what it represents. However, a contrast requires at least two opposing visions. In the face of neutral intervention designed to affirm nothing, the clash is denied, here reigns misunderstanding and indifference, serious dangers for the health of a city. The lack of choice behind archaeological enclosures produces not only spaces that are not frequented by people, but real voids of meaning for the city, wounds inflicted on that "mysterious vaporous sphere" necessary for life.
In the eyes of those in charge of protection, it is not possible not to choose for two fundamental reasons: because it would produce serious damage to the space itself and because in any case any action carried out in the city affects the relationships in place. The paradox is therefore to recognise in those interventions designed with no decisions, drastic and harmful choices precisely because they are not controlled and never reasoned. The "choice" of focusing only on the ruin itself, the "choice" of making it totally visible and on the other hand the "choice" of keeping it closed to human presence, the "choice" of making the hierarchies of a place incomprehensible and destroying its spatiality. We can rightly be convinced that none of these decisions has ever been the object of conscious reflection on the part of those who have had occasion to intervene in archaeological areas. Yet these are precisely the truths that weigh on the city, the characteristics that make archaeological excavations similar to military areas, these accidental "choices".
Only the project can continue the construction of the city because it aims to enter decisively into its structure by re-establishing deep relationships. On the other hand, we do not believe that it is possible to design by looking at the archaeological area as itself and not as part of the city. This sectorial and watertight compartmentalised way of seeing deprives the city of its vital space. The archaeological area is nothing more than another city that has emerged for some reason and with which we can attempt to establish a credible and plausible relationship with the life of the city, reaffirming that the city makes sense if it is a space for relationships.

2. BOHOB: progetti minimi

Progetti minimi are the constructive manifestation of the idea of giving dignity and value to spaces that currently have none. Each project consists of a white stone shrine to house the ruins. Many white cases of various sizes scattered around the city will make the small ruins they contain read like fragments belonging to a unitary whole.
They are not specific responses to the needs and problems of one area with respect to another, but aim to be applications of the same *architectural construct*, variations on a theme, which according to the characteristics of the specific site always take on different forms and aspects. They therefore consist of a single wall unit, which, depending on the archaeological site, may become a pavement, a parapet, a staircase, a sloping plane, etc. Two examples easily illustrate the versatility of a precise construction idea: the Terme Achilleane and the Benedettini's Balneum. In the first, the project is a staircase with a parapet, in the second a paved floor and a volume (an archaeological room) with a considerable size. They are an expression of the same constructive idea.

2.1 Ethically "minimi"

Enough has already been said about the meaning of the word "project", but why "minimi"?
One of the pitfalls of being an architect is grasping the limits of our work, understanding the space of our field of action within which to propose a point of view on the world. You need to be credible by arguing within your discipline and its language if you want to make a truly useful contribution.
Therefore, they are "minimi" because we move within and through the tools of the discipline, hypothetically leaving decisions not related to our profession to others. The possibility of a different way of use, for example, is not the task of an architect, and certainly not of architects who, out of a pure ethical and civic spirit, have chosen to conduct research on this subject. The profound freedom of the BOHOB Laboratory lies precisely in being able to allow itself to reflect on the nature of making

architecture in an absolute sense, without any professional mandate. This is without prejudice to the extremely constructive nature of the projects carried out by the group: let us be clear, *progetti minimi* are feasible and conceived as constructions, regardless of their actual implementation. This is always because it is part of being an architect thinking about transformations always connected to a clear constructive idea; otherwise, we would end up with meaningless speculation that has nothing to do with making architecture.
The projects are defined by the use of the discipline's own tools: geometry, measure, material. The *geometry* in each chosen site is attempted to be always clear; each time the design effort consists in defining an evident geometry that elevates that space with respect to the ordinary city around it. This is the essence of the city's public spaces, their being exceptions to the approximation of the surroundings as defined geometries “closed” within themselves. The *measure* of the project gives substance to the presence of "something" extraordinary. The projects always look at the ruin through the city and never in itself, which is why the extension of the project area concerns the closeness of the ruin and never the ruin itself. The *material* gives part of the character of a place. In Catania the preciousness of a place, its being exceptional in the framework of urban space, has always been rendered with white stone in contrast to black lava stone. That is why *progetti minimi* are made of marble.

2.2 Necessarily “minimi”
However, the word “*minimi*” contains another nuance, intimately linked to the relationship between archaeology and the city. We are well aware that archaeology is “lower” than the level we live on today; the level of ancient settlements must be sought by digging. The only archaeologies at the level of the city plan are in fact those that over time have never ceased to host life within them and perform a function. In this sense, they could not even be completely defined as “archaeologies”, precisely because of the lack of a trauma, a cut-off, that determines a before and an after. The difference of levels in the elevations produces a jump and here, in this gap, is the fundamental problem of *progetti minimi*. The nature of the problem we are talking about is substantial, that is, it must be sought in the profound sense of the relationship that the city has with its substrate (its scenery). The functional problems related to the resolution in terms of accessibility of this leap is not the object of BOHOB's research. These are resolutions that would only come into play in the specific case of a project to be realised, but which are not exemplary for manifesting our idea of the city.
The resolution of the leap has to do with making it measurable, appreciable; as if to say: “this is not an accident like so many others, but a difference in level *built by time* that separates two precise worlds”. Here too the theme is underlining, bringing out a condition that, though hidden, we feel exists. The white stone that follows the gap from the level of the city to the edge of the excavation is a powerful idea that alone gives the measure and weight of an invisible world that exists. Without the use of panels, totems, or any “educational indications”, the extraordinary richness on which every inhabitant of Catania unknowingly walks every day would be made perceptible to everyday use.
Because the only means of restoring the richness and preciousness of a place are those of construction, thanks to which the life of the city could approach areas that are currently marginal and refractory to human presence.
Suddenly, around the ruins, life is given a chance to dwell.

2.3 The method: the Triptych
What is the drawing that can reveal the idea?
Not just communicating technical information but also conveying the sense of the whole work?
The drawing that can say all this is always one, rarely more. As strong as the idea is, as few papers is needed to render it. In our case, it is one drawing made up of three parts: a triptych. Architectural drawing has a mysterious nature whereby it is both a tool and an aim, something for knowing how to do and a complex representation of an idea.
The Triptych consists of large square panels. Each project, depending on the characteristics and dimensions of the specific site, will have its own configuration. Both the shape of the representative module (the drawing) and that of the architectural construct (the building) take on their final form according to the characteristics of the site. It emerges that not only the “form is already given” but also an evident correspondence in the way the project is constructed and the way it is represented.
The Triptych holds three scales together in a single drawing: 1:200, 1:50, 1:10. The power of this representation also lies in the relationship between these scales, so that one is never an enlargement of the other. On the contrary, each scale is necessary to say something that the others cannot. This method of understanding the graphic scale leaves the practice of “territorial context” behind and moves towards a “form of drawing” that is the absolute bearer of an idea.
The plan on a scale of 1:200 shows the *city* to the extent that it shows the position of the project in relation to the urban space. This first part of the Triptych makes it clear that the project belongs to the city around it, remembering the great teaching that "the position is 70% of the success of a project".

The 1:50 scale plan brings to light the relationship between the project and archaeology. Unlike the first part of the Triptych, this is not an elevation from above but a horizontal section. The city around disappears to reveal the *room*, the size of the archaeological room, which, like a shrine, holds the ruins inside. The measure of the ancient and the contemporary measure coexist in a single representation because they are the same matter.
The 1:10 scale section gives body to the *architectural construct*, the constructive idea of the specific project and of every project. Of the three, it is the only vertical section precisely because it is the drawing in which the measure of the relationship between the two levels of the city emerges with greater resolution.

2.4 The representation: the view

In addition to the Triptych, however, another tool necessary for the representation of projects is the view. This image aims to narrate the project by placing a point of view in space (therefore a perspective representation as the centre of projection is at a finite distance). All the images are comparable, since the same three elements are always present in each one: the city, the intervention and the archaeology. What makes each image different from the others is the specific character of the piece of city in which the project is inserted, each time defined by different relationships between the city, the intervention and the archaeology.
The *construction* is to the *city* as the *view* is to our *idea*. Just as the construction is intended to underline the city, the view is intended to underline the idea at the basis of the projects. In fact, the perspective view adds almost nothing more than what is expressed in the Triptych, but it is equally necessary. The view underlines the sense of our work: to stand “on the edge” of the archaeological excavation, shaping the project on the *gap* between the height of the present city and the ancient one. That discontinuity between the excavation and the city, today apparently only accidental, becomes visible thanks to the project in its extraordinary nature: a temporal and not spatial gap that separates and unites two worlds.
The image is the vehicle that intrinsically lends itself best to revealing the idea of the projects, in particular because of its innate predisposition to “falsification”. Unlike the Triptych, which is always more real and exact on the quantitative datum (measurement, proportions, distances, etc.); none of the views corresponds faithfully to the spatial proportions detectable in the city. On the contrary, each of them is a “fake” that distorts the dimensions and alters the relationships from time to time, but never arbitrarily. What holds these choices together is the basic idea to which the representation must always be subordinate: *formal inaccuracy* is necessary to make the idea *unequivocally clear*. In contrast to renderings, the views of projects are not realistic but the result of a critical operation in which everything is on its own plane. For example, in every view, the context is always depicted with a strong abstraction in an approximate way, just enough to make the background of that particular project recognisable. In the graphic treatment of intervention, on the other hand, the technical possibilities of photorealism are pushed to their maximum potential, attempting to give substance to the vibrations of the material that constitutes the project. The realistic view of the project contrasting with the highly abstract context is another “gap”, here however in representative terms, which makes clear the strong expression of detachment from the ruins and the context in general. That placing oneself “on the edge” is rendered through the view with this clear difference in the weight of representation, not at all realistic, in which two worlds appear powerfully facing each other, “head to head”.
The view is therefore the ambition towards the representation of a gap not only in the interpretation of the minimal projects but also precisely in the representation: the possibility of making evident *a gap in thought* by *a gap in representation*.

3. “Magno ornato”

Progetti minimi are not architectural projects, or rather, they *really* are.
An example in the construction history of Catania will clarify the matter. The Baron of Bruca built his palace in one of the four corners of a square porticoed square in Catania, Piazza Mazzini. It was the first of the four palaces to define the size of the portico. Later, the Baron of Gisira built his palace on another corner of the square, but with a different size to the portico of the first palace already built. At this point, Baron of Bruca decided to modify his portico by raising it, thus forcing him to make small windows out of what were previously balconies, and thus causing a mismatch between the height of the interior and that of the terrace. The Baron took the trouble to demolish and rebuild his own portico, which he had built only a short time before. He did all this to make the square, to ensure that it was defined by a unitary and rigorous measure: «*essendo d’accordo all’ornato della città*»[1]. It is not possible to define this intervention as an architectural project in the strict sense, and in any case not as it is understood today, but it is a project that builds the city. It is always the intention that makes a project a good project.

[1] From CALOGERO, Salvatore Maria, *La città di Catania,* 128 p. (see Bibliographical References)

There are no formal rules that guarantee with certainty the success of a change in the city. What counts is the idea of the city vivid in the mind of the one who chooses.
This is what *progetti minimi* are all about. Projects designed to restore dignity to parts of the city supported by a high idea of the city. They are detached from the necessities of use and from responding to “physiological” needs, but no less necessary for that. What is necessary is to perceive that you are in the city when you are in the city, a perception that is completely absent in front of archaeological enclosures where you are not in front of the city but in front of its absence. The city means a space for relationships, a place where human life is manifested, and the projects work precisely on the weaving of relationships to be established, in this case between two cities that do not currently speak to each other but are ready to come into contact by project.
Like enormous mouldings, the projects enhance the value through light, concealing the defect with shadow, overturning the city's relationships, the weights involved. Choosing what is “good” and what is “bad” produces dense spaces, as opposed to the flatness of archaeological areas, due precisely to neutrality.
However, this is how the city has always been built: the idea of *progetti minimi* is an ancient (or eternal) idea. The constructive and intellectual efforts of those who have built the city have always concentrated only on what determines the construction of a space. In Catania in particular, this has been the case both for economic reasons and for reasons inherent in the culture of places and people. When resources do not allow to “build everything”, to treat every part of the project to the maximum degree, it becomes necessary to define what is important in the construction of a space and what is not. This deep character in the construction of Catania has been good for the city, it has brought a powerful “density” to the spaces where what builds the space emerges clearly.
This is why they are *“minimi”*: because they only deal with what contributes to the construction of space, leaving the rest to ordinariness. To do this, however, it is necessary to grasp, to choose which elements and to what extent make up the space. How many centimetres of cantonal build a square?



Fig. 1: fountain in via Crociferi.

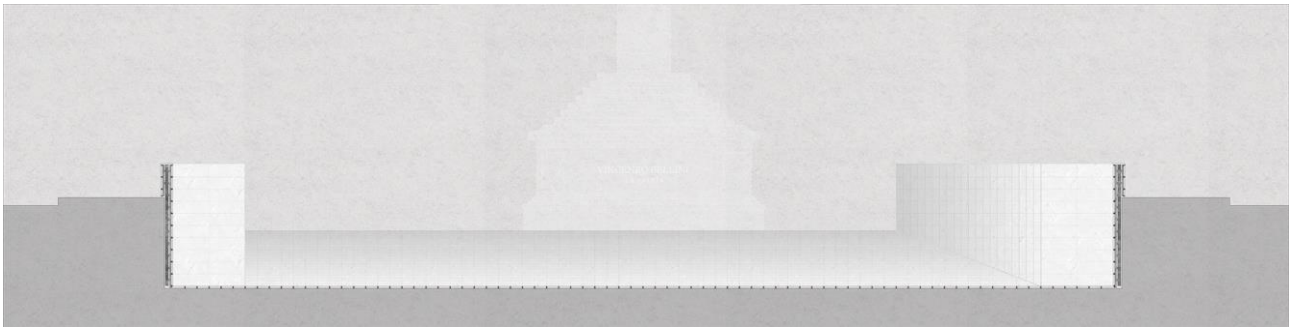

Fig. 2a: the architectural construct (from the Triptych of Piazza Stesicoro).

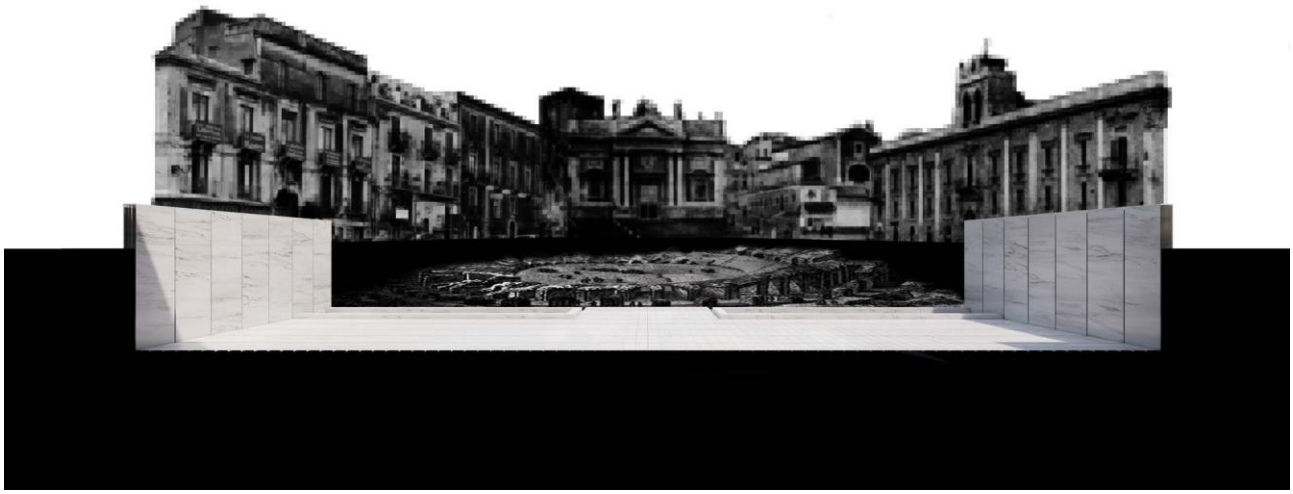

Fig. 2b: the view (from the Triptych of Piazza Stesicoro).

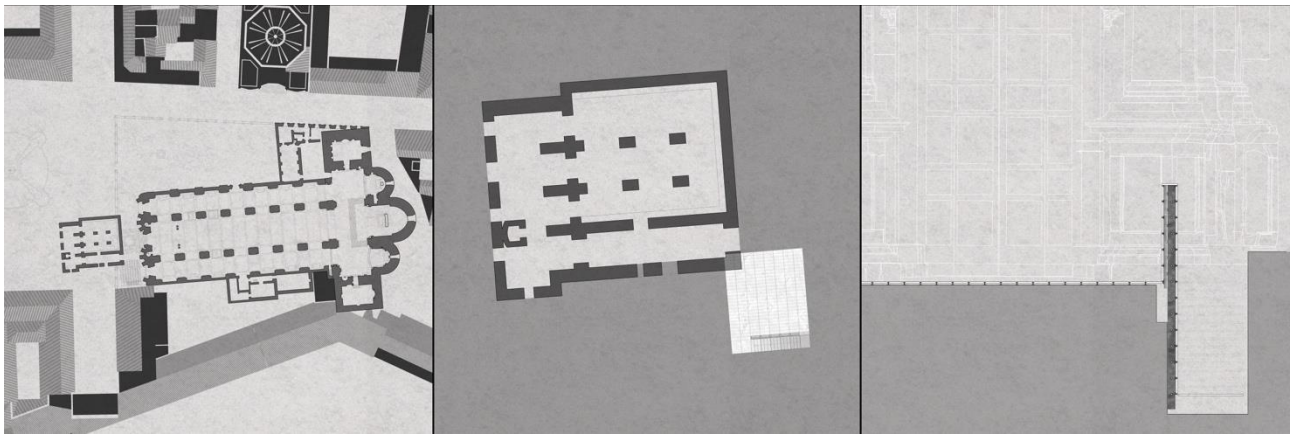

Fig. 3: the triptych (Terme Achillee).

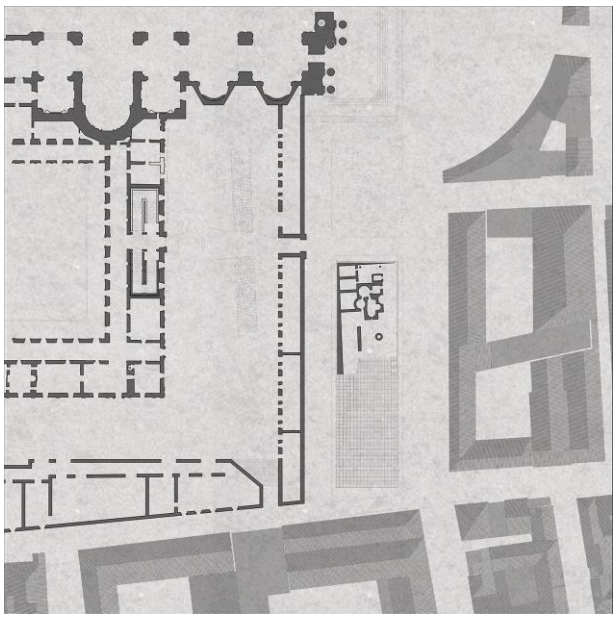

Fig. 4a: the city, 1:200 (from the Triptych of Benedettini's Balneum).

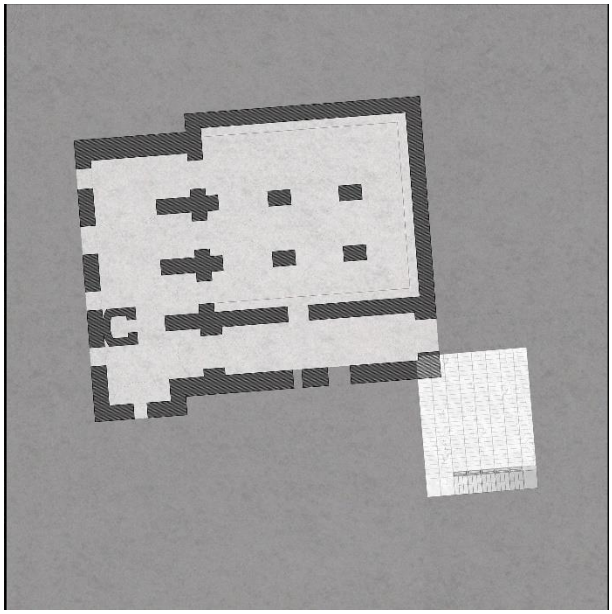

Fig. 4b: the room, 1:50 (from the Triptych of Terme Achillee).

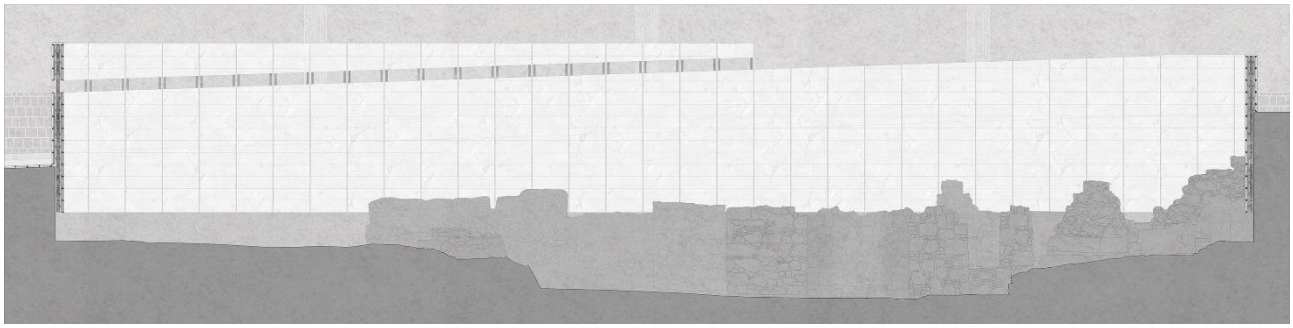

Fig. 4c: the architectonical construct, 1:10 (from the Triptych of Benedettini's Balneum).

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Heritage Resilience as a New Perspective of Sustainable Conservation

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Abstract
This study intends to deal with the architectural resilience strategies in rural heritage as a conservation method. Rural Settlements faces changes of living and everyday practices caused by the pressure new urban life, technology, economy, natural disasters and transition on landscape and natural sources. Rural heritage areas struggle with two problem; abandonment or change on habitus. While these problems can be adoptable for contemporary rural settlements, it can be a serious threat for the rural heritage areas. Changes in habitus can cause transition on everyday life practices and consequently rural morphology and architecture. Due to new needs of users some inappropriate interventions to the vernacular dwellings and settlements occur and risk these cultural heritages. Koramaz Valley of Kayseri in Turkey, which is accepted UNESCO tentative list in 2020, is a rural heritage area with its unique vernacular villages and architectures, landscapes and intangible values. Transition on its rural production, population of valley, usage and user profile and urbanization threat lead to harmful interventions to cultural heritage and natural life. This study aims to investigate rural resilience possibilities as a sustainable conservation approach of rural heritages by the Koramaz Valley case. The research focuses on especially architectural heritage features and their resilience needs of Koramaz Valley villages by using the intervention analyses of the site, related with interpretations of their habitus and daily life. For the sustainable conservation of rural together with local users with protected genius loci, architectural resilience which is in between economical, ecological and cultural resilience of village, can give the opportunity of live in adopted and conserved heritage properties.

Keywords: Rural heritage, Resilience, Vulnerability, Koramaz Valley, Sustainable conservation

1. Introduction
The term resilience has started to use commonly after the Japanese earthquakes in December 1854 [1]. Starting from Holling's [2] researches on ecology systems related to resilience, the term has developed as a characteristic of social systems [3], socio-ecological systems [4], and place [5] in chronological order. While former studies discussed resilience as the ability of a system to absorb shocks and sustain behavior, Folke focused on the development and renewal ability of systems under shocks and added, "In a resilient social-ecological system, disturbance has the potential to create opportunity for doing new things, for innovation and for development." [6]. Due to societies and environments' dynamism, resilient socio-ecological systems need adaptation, renewability, and development attitude for sustainability. Together with contemporary studies about resilience, UNDDR (United Nations Office for Disaster Reduction) developed a definition: "The ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions" [7].
Heritage properties have been an integral part of resilience studies because community and environment relations with cultural heritage participation in the Disaster Risk Reduction Studies have started legally with Hyogo Framework for Action 2005-2015 [8]. Risk preparedness on disasters always

has been a fundamental issue for cultural heritage properties which are particularly vulnerable to natural and human-induced risks, and prediction and being ready for it is crucial for the sustainability of cultural heritage. National and International Organization (ICOMOS, UNESCO, UN, ICROMM) have studied and published about cultural heritage disaster risk management and declared criteria, and ICOMOS and UNESCO indicate every year vulnerable properties Heritage@Risk and World Heritage in Danger Lists [9,10]. Also, protection, safeguarding, and sustaining of World cultural and natural heritage was emphasized at Goal 11, "Make cities and human settlements inclusive, safe, resilient and sustainable" of UN SDGs (The Agenda 2030 for Sustainable Development) [11]. In addition to that, heritage resilience and its contribution to building resilience were highlighted in the Sendai Framework for Disaster Risk Reduction 2015-2030 [12]. Commonly heritage resilience studies have remarked on natural catastrophe, global warming, and war risks, and UNESCO, ICOMOS, ICCROM, and IUCN declared hazards heritage properties vulnerable to meteorological, hydrological, geological, astrophysical, biological, human-induced, and climate change [9]. However, the paper intended to draw attention to a gradual human-induced risk due to habitus and everyday life-changing.

The study aims to determine the risks and vulnerabilities of the rural heritage areas due to the habitus transitions for discussing resilience-based heritage conservation possibilities. The research focuses on spatial resilience as the production of ecological, cultural, and economic issues of the rural systems. Decreasing vulnerabilities with resilience can be possible by predicting the risks and adapting systems to future shocks. Unlike the general nature-induced risk studies on heritage resilience, this study emphasizes the harmful effects of the habitus changes on the vernacular rural architecture and sites. Dwelling is a cultural product of the humans which interact with it as constructing, living, or watching, and they witness the significant part of everyday life activities. Lefebvre indicates that the Industrial Revolution caused the same ordinary and industrialized everyday life in the cities [13]. However, Rural Heritage Areas protected from urbanization and maintain the vernacular life have valuable everyday life practices for creating the genius loci. According to the contemporary approaches, everyday life can shape the world, and Lefebvre adds, "The history of a single day includes the history of the world and civilization" [14]. Consequently, societies have the same daily habits, which shapes the environment while the environment shapes it. Everyday habits transform a space into a dynamic and living organism [15]. Then Collective everyday habits create dynamic and living settlements for these researches they are villages. Even if everyday life is related to modern city life according to contemporary thought, it is the fundamental part of rural life. Different from modern life, rural people's everyday habits take place in the same environment and habitus. Habitus is the more appropriate concept for understanding everyday life and society, and it can be introduced as different lifestyles of social classes according to their backgrounds [16]. Bourdieu says; "… the habitus could be considered as a subjective but not individual system of internalized structures, schemes of perception, conception, and action common to all members of the same group or class and constituting the precondition for all objectification and apperception: and the objective coordination of practices and the sharing of a world-view could be founded on the perfect impersonality and interchangeability of singular practices and views." [16]. Habitus represents societies' collective and permanent dispositions coming from the collective memory, history, and environment. Habitus emerges in social life due to everyday life activities described by Bourdieu as "practices". Societies interact with the natural environment, social space, and architecture according to their everyday practices, and this interaction creates the spirit of these settlements and places and vice versa. Habitus and its practice create vernacular architecture and settlements in the shared natural environment.

As Folke mentioned [6], systems need to be prepared for changes in society and environment, so predicting the transition of the everyday practices of the rural life, preparing the settlements to these slow disturbances, and understand the needs can help the sustainable conservation of these heritages. Adaptation is inevitable for the living heritage areas, and control and management of changes is the issue of the conservation field. Starting from the Venice Charter, many national and international documents determined the frameworks of the heritage interventions. In the ICOMOS 3rd General Assembly, the relation with the contemporary life and heritage relation were discussed, and some criteria are determined [17]. Also, Burra Charter explains adaption, conservation, and maintenance methods and frameworks of heritage and emphasizes the management's importance [7]. The crucial issue of resilience in heritage is management because the main risk is uncontrolled interventions.

This paper evaluates the importance of determining practice change-based risks and vulnerabilities for the rural heritage resilience processes, providing sustainable conservation. For this purpose, Bağpınar Village, Koramaz Valley, which is on the UNESCO World Heritage Tentative List, is chosen as a case study area. After the historical, demographical, social, environmental, and cultural research about the villages, habitus-based vulnerabilities were analyzed by spatial surveys. This spatial research includes demonstrating the new adding, changes, and losses on spatial organizations and building element systems by analyzing the village's southern side dwellings. While archive research represents the historical background and culture of the habitus, site analyzes represent its current needs and everyday

practices. The study covers the evolution of the risk and vulnerability parts of the Bağpınar by these analyses.

2. Koramaz Valley at Risk due to Transition on Everyday Life

Koramaz Valley is one of the three eastern valleys of the Kayseri Province, 20 km away from the city center. It is accepted to UNESCO World Heritage Tentative List in 2020 as an outstanding heritage example of human interaction with the landscape and multifunctional land use [18]. Koramaz is a green and productive valley with 1500-1665m base altitude, surface, underground water sources, gardens, and settlements. Due to its geographical structure, the valley is not visible from the plateau and is protected from the cold wind effects. This environment helps create favorable microclimate conditions with the help of the moisture and greenery brought by the streams and develop the vineyards, fruit gardens, and agricultural lands.

There were approximately 40 villages and underground cities in Ottoman Period, but some were abandoned, destroyed, or merged with the surrounding villages in years [19]. Today there are 7 villages which are Bağpınar (Ispıdın), Vekse, Turan (Dimitre), Ağırnas (Taşören), Küçük Bürüngüz, Subaşı (Üskübi), Büyük Bürüngüz. According to pigeon lofts, columbaria, underground cities, defense structures, cave churches, temples, and mausoleums, valley history dates back to the first millennium [18]. The first settlement around the valley is Kanesh-Kültepe which dates back to Assyrian Trade Colonies (2000-1100 B.C). Valley settlements generally had different demographic structures according to the population of Armenians, Greeks, and Turks. Non-Muslims and Muslims lived equilibrium in Koramaz Valley's settlements until the political reforms [19][20]. Together with Tehcir (Relocation) Law in 1915, Armenians, and with Exchange Law in 1924-1925, Greeks are forced to leave from valleys. These changes caused a dramatic change in habitus and the everyday life of the settlements. As a result of these demographic changes, some houses are abandoned, some crafts, cultural activities, planting, agricultural or husbandry activities had to be changed, and the valley started to become more vulnerable to economic, ecologic, cultural, and spatial ways. After these deviations, valleys started to effect by the rapid urbanization of the Kayseri city center, and today these outstanding rural heritage areas are threatened with loss of their spirit and danger of destruction due to the habitus change or abandonment.



Fig. 1: Bağpınar Village aerial photo

Bağpınar Village is chosen as a case for understanding the settlements and their vulnerabilities due to the changes in habitus and everyday life in detail. Bağpınar, the westernmost village in the Koramaz Valley, is located relatively rocky and steep on the two sides of the Valley. Narrow streets are located on terraces that are parallel with slopes. The social and demographic structure of the village is similar to Koramaz Valley and the city center. According to the population census in the 1500 year, 80% of the population was non-Muslims [20]. However, differently from the other villages and city centers, the demographic structure of the Bağpınar changed dramatically before the Tehcir and Exchange Laws. In 1831 there were 93 and houses for only Muslims [21]. The population census of 1875, 1965, and 2000 shows there were 510, 397, and 301 inhabitants [21]. Traditionally, the village users were involved in painting at the buildings (nakkaşlık), farming, and soldiery. Plenty of men went to İstanbul for the painting

of mansions [21]. Bağpınar had loams at Gömeç Plain for the farming, and horticulture and viticulture were another income source. They grew cehri (a vernacular kind of buckthorn) which is the most popular planting of the valley used for dyes and brings high income, grapes for producing vine and other traditional grape products and fruits in the valley's base. Due to the disappearance of the cehri in the valleys, many bezirhanes, a kind of vernacular workshop used for cehri seed-oil and dye production, are abandoned and demolished. Changes in production and agriculture are threats that can cause abandonment of historical settlements and destroy cultural heritage values.



Fig. 2: Northern geçe view from southern geçe

2.1 Spatial Organization

Spatial analyses of the settlements can help understand the relationship between human, natural, and built environment relations and habitus. The village settled both slopy sites of the valley, named as geçe by the inhabitants, the upper part of the gardens, and the stream. Two geçes are linked to each other with two stone bridges. Similar to environmental settlements, Bağpınar represents dense historic town views due to the orientation of houses. Main streets are located in front of the house row as parallel to the slope; secondary streets generally link the main street in deep strips as a ramp or stairs perpendicular to the slope. Some secondary streets are cul-de-sacs finishing with the rocky yards. There is one public square in front of the mosque, and streets open to other smaller squares in front of the fountains, ovens, mill, and setens (an open workshop for grinding to cereals). While one side of the main street in the southern geçe has a glorious housing facade view, the opposite side has a valley base, gardens, and northern geçe views. Northern geçe is crowded than southern, and depending on the relation between houses and slope, streets could be on the houses or near the flat roofs. Dovecotes located at the upper part of the slope are unique examples of the rural settlements' vernacular production and architecture. These rock carving and masonry mix structures were used for the husbandry of the pigeons. In 1872, 14 dovecotes were listed; however, today, due to the drying out of the water sources in the Gömeç Plain, abandonment, and changing habitus, pigeons went and dovecotes demolished, and the intangible heritage of the rural settlement is disappeared.

Dwellings are significant for understanding the everyday life of the inhabitants. Masonry houses in two storey are built on the rocky yard with vernacular techniques. They have an earthen roof giving them a cubic view. Houses generally settled in narrow and deep parcels perpendicular to the street, and they have limited semi-open or open courtyard and gardens between the caves, which is called "in (carved shelters)" in the village rocky yards, stone houses, and adjacent parcels walls. A significant amount of

the daily practices take place in between house, courtyard, and cave relation. Faroqhi [22] states that the middle-class Ottoman people live in houses with courtyards with related kitchen, barn, toilet, storage, winter room, and Bağpınar vernacular architecture has similar ground floor organization. Courtyards are the most critical space for the inhabitants' practices, and their dimension and shape can change according to the slope and location of the parcel. They are reached by passing through houses, and it is approximately the same level as street and ground level. Due to the dimensions of courtyards, there could be gardens and some traditional food preparation equipment like şırahane/şirane for grape output producing, dorak for producing yogurt, ocak for cooking water well, and foundation. Storage, barn, hayloft, kitchen, or other service spaces are generally located at the cave (in) in the rocky yard. Carving is a unique tradition for the valley from ancient times, and Bağpınar stone houses were built on or in front of these caves. Caves related to the houses are called in, and it can consist of one or several rooms and a secondary storey. Local people indicate that these ins are used for dwelling at early times, and after the construction of the masonry structures, they started to use them as service space. The houses' ground level includes more introvert and everyday use functions of the houses with kitchen, storages, and winter rooms and with garden, courtyard, and caves, it can call service part of the whole building organizations. Houses can be reached directly from the street, and due to the privacy and functions of the spaces at ground level while small windows open to the street, more oversized windows open to the courtyard.



Fig. 3: Photos of ins (cave shelters)

Different from the ground level, the first floor is more extravert. They were designed according to the valley and opposite geçe views. Commonly an open stone staircase in the courtyard leads to the upper level, and then a sofa and an open or closed sofa lead to a balcony. A sofa is a circulation space, but it could use as a living room as well. Balconies that are opened directly to the extraordinary valley view are the village's featured vernacular spaces. Almost every house has a small balcony which is supported with stone buttresses on the façade. The sofa also leads some other living and bedroom especially for summer use and sometimes upper terrace above the courtyard and ins. Spatial organization and service spaces help us understand the everyday habit and architecture of rural houses and interpret human, nature, and geography relations. Inhabitants have been using these courtyards in summer times with the advantages of the appropriate climatic conditions of it, in particular, and have been storing their harvest and producing foods with vernacular techniques for winter.

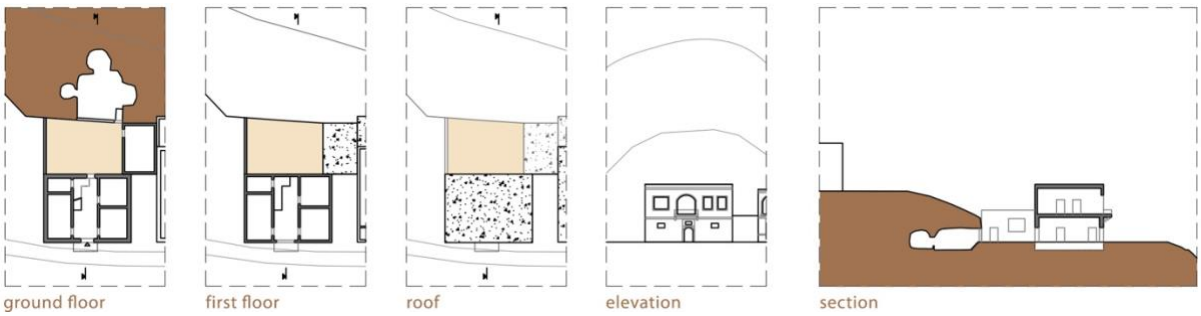

Fig. 4: Plans, section and elevation of a typical traditional housing

One of the most important character effected the spatial organization of dwellings is unique construction technique of the region. Kayseri region is located foothills of the volcanic Argeus (Erciyes) Mountain, whose lava and pozzolana gave unique underground characteristics and prosperous quarries. Depending on the vernacular materials, the rural buildings of Bağpınar started with carving and

continued with stone masonry houses. These buildings are sometimes constructed on an in or on a bedrock directly without foundation. First floor walls are generally built by more smooth cut stones than ground, and some caving ornamentations are added. Floors are supported by timber (juniper) beams and loads transmitted to loadbearing walls and occasionally timber columns or central beams for wider spaces. The cladding of the closed and open spaces' floors is sal stone, a vernacular stone made by tufa. A wooden cat ladder leads to the earthen flat roof, which needs special traditional maintenance and repair.

2.2 Bağpınar in Evolution: Risks and Vulnerabilities

Stockholm Resilience Center explains resilience; "the capacity of a system, be it an individual, a forest, a city or an economy, to deal with change and continue to develop" [23,24]. Understanding the vulnerabilities and estimating the risk on heritage values is essential for the deal with change and turning it into a development. The main aim of the study is to identify the vulnerabilities of the rural heritage due to the transition on habitus for providing resilient and sustainable conservation. The four central aspects of rural resilience, ecological, economic, cultural, and governmental risks, directly affect the rural habitus and everyday life practice as transformation or abandonment, and these changes cause the demolishing of tangible and intangible cultural heritage values. Sustainability is one of the most critical aims of cultural heritage because heritage is related to the future as well as the past. Continuity of vernacular life and heritage can be provided by the local user, who is the critical factor for emerging and safeguarding of spirit of living heritage sites [25].



Fig. 5: Orthophoto of a part of southern geçe

Protecting with inhabitants and vernacular life is the more appropriate way of creating living heritage sites than creating new users for vitalization of abandoned sites. Therefore, understanding the habitus and realizing its change is essential to control the heritage's adaptation and conserve it from inappropriate interpretations and demolishing. Unlike the monuments, living heritage sites are dynamic systems, and they changed over time, are evolving today, and will continue to transform in the future [24]. As ICOMOS Charter on the Built Vernacular Heritage states, "Alterations which legitimately respond to the demands of contemporary use should be effected by the introduction of materials which maintain a consistency of expression, appearance, texture, and form throughout the structure and a consistency of building materials." [26] because of the changing everyday life practices and habitus, adaptation of vernacular rural architectural heritage is inevitable, especially for the maintenance. Determining the risks and vulnerabilities due to the habitus of the rural heritage can be the starting point for developing appropriate adaptation by conserving cultural heritage values.

Starting from the changes in the demographical structure in the 19th century and then increasing rural-urban migration, the village is in transition according to ecological, economic, cultural, and governmental revolutions. On the settlement scale, pigeons have left the valley cause of the decreasing water supply, and dovecotes are abandoned. This abandonment resulted in the disappearance of the intangible pigeon traditional activities heritage and tangible vernacular dovecotes heritages. They are similarly decreasing cehri producing a result with abandonment and demolishing a vernacular industry and industrial bezirhanes. Due to the technological developments and cultural practices changes, some traditional public activities and spaces like baths, owens, setens, and mill are disappeared. In 2012, Bağpınar's village status was changed to neighborhood together with Turkish Act No. 6360 on Metropolitan Areas, and this new status is caused some uncontrolled changes to the historic site [27]. The Southern geçe is chosen by analyzing the interventions on the Bağpınar Village houses to determine life change-based vulnerabilities and risks of the site. As the smallest and human-related unit of settlements, traditional houses are the determined focus of the research. Risks and vulnerabilities on housings could be observable from two main domains; on spatial organization, building element system.

transition on dwelling units of Bağpınar	**on spatial organization**	**on building element system**
changing, adding, loss	plan scheme form function articulation	structural system floor exterior wall vertical circulation wall openings roof ınternal subdivision

Fig. 6: Table shows observed transitions of Bağpınar dwelling units

On Spatial Organization

The rural architectural heritage of the Bağpınar is detected as vulnerable to changes, adding, and losses due to new user requirements. The generic plan scheme of the houses is generally transformed by dividing or adding some partitions of space. Adding balconies, storey, and rooms relevant to the number of users and destroying unused spaces also changes the planning scheme. In addition to these, new roof structures also change the form and façade organization of the building. Since Burra Charter [28] generally refuses demolitions of a place's fabric, these changes in form can be accepted as a dangerous risk. However, the Charter also emphasizes the necessity of the maintenance and adds adaptation, and new adding can be acceptable when it has a minimal and respectful impact on the heritage's cultural fabric [28]. Function alterations can be accepted as minimal interpretation for used dwellings. After Metropolitan Areas Law, according to the new neighborhood status, husbandry is forbidden in the settlement center; therefore, barn and haylofts in the houses are stated to use for new functions like storage, kitchens, and living spaces or demolished like outer toilets. In traditional living, toilets called hela are located in the courtyard, and today, they started to locate inner spaces. Also, modern kitchens and bathrooms are added inner spaces. These transitions of spaces change main daily life circulation habits, usage, and relation of inner and outer space; thus, the articulation of the spaces.

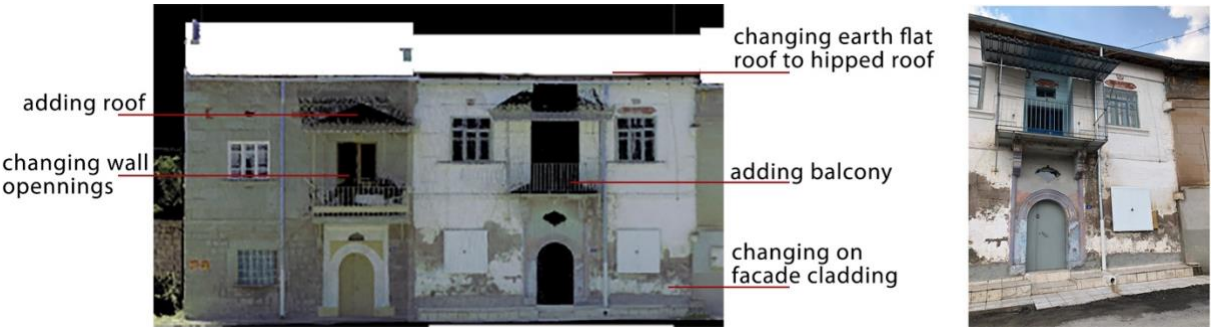

Fig. 7: Changing analyses from façade

On Building Element System

Similarly, with the spatial organization, the traditional building element system is exposed to alterations due to the current habitus and its user requirement. Some masonry structural elements like floor, exterior walls, and internal subdivisions are reconstructed or added as new parts considering new functions and structural strength and stability needs. Reinforced concrete floors are built instead of the masonry ones or thermal problems solved with insulation materials. New floor finishing and ceiling added on the masonry floors for the sense of cleanliness. The most common application on the exterior walls is adding thermal isolation material and covering with cement base plaster. Using uncontrolled cement base materials together with natural stone can be accepted as a severe risk to the authentic fabric of the rural heritage site.



Fig. 8: Changings on floor and roof systems

Stairs and wall openings are changed with contemporary, cheap, and common materials instead of authentic ones, especially for ease of cleanliness. Some windows and doors can be closed or opened according to the new functions or spaces, so the dwellings' façade articulation and general typology can be harmed. Due to the transforming barns to new spaces, its more minor windows changes with the

bigger ones or main doors can be changed according to the new inner circulation of the buildings. Because of the difficulty of maintaining the vernacular earthen roof by increasing the village's age population, houses are vulnerable on the roof structure. Pitched roofs finished with tile or galvanized metal constructed to approximately all houses in use and these changes threats the authentic fabric and cultural significance of the building. Lack of maintenance and repair, and abandonment causes to loss of some part or total of the building element systems.

3. Conclusion Remarks

UNESCO and ICOMOS noted that civilizations' economic, social, and technological developments are one of the most vital destruction and changing threatens on the natural and cultural heritage due to the current needs of society, in the General Conference and Assembly of 1972 [17,29]. As declared by international charters, development and its impacts on habitus and life is inevitable, and the primary responsibility is controlling these alterations. The current study focused on rural areas directly affected by human everyday life practices than cities the reveal the impact of the habitus changings on the cultural heritage properties. Bağpınar Village represents an example of the uncontrolled destructions and adding on vernacular dwelling units and settlements. Immediate risk for the rural heritage is lack of control and management across the users' interpretation that made for the need for new living style. It is crucial for the sustainable conservation and living cultural heritage that instead the trying prevent changing, manage it while preserving the cultural heritage values with rural resilience strategies.

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The Fresco of Saint Leonard in the Episcopio of Ventaroli in Carinola.

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Abstract
This paper relates to a much wider research programme aimed at documenting and studying through survey, analytical methodologies of drawing and archive research, of the conspicuous part of the national architectural heritage which, although lesser known, is characterised by undeniable historical and artistic value. This case study looks at the church of Episcopio di Ventaroli near Carinola, a small village in the territory of Caserta situated close to the line of the via Appia, the "Regina viarum" of the ancient Romans. The building, dating to the 11th century, but probably originating in the 5th century, having undergone enlargements, devastation, reconstructions, long years of abandonment and several phases of restoration, still houses an important cycle of frescoes. The image of San Leonardo, hermit and bishop, stands out among these for the luminosity of its colours and its emotive immediacy, and is the object of our interest.
Among the aims of this paper is to make this church, and all that is preserved inside it, part of a scientific debate through a "still image" intended as the base from which to begin a wider research programme that will come to include the complete pictorial cycle. Research has already begun with a campaign of data collection using digital active sensor instruments – laser scanner -, and passive high-resolution instruments – digital camera and spectrophotometers. The results provided by the processed, analysed, compared and collated data have contributed to the formulation of hypotheses of use for the decoding of the possible "design model", to be intended as a contribution, albeit partial, towards safeguarding and tutelage.

Keywords: Church, episcopio, frescoes, survey, drawing, Ventaroli

'… Ventaroli is even less than a village; you won't even find it on a map. It is a small hamlet on a hill closer to Sparanise than to Gaeta. There are 256 residents, three houses of gentlefolk, a completely white church and an entirely green cemetery. There is a hunchbacked idiot, an old crazy lady, and a hermit with a small cap.' [1]

Matilde Serao

1. Introduction
The pictorial representation of the hermit and abbot Leonard of Noblac forms a part of the series of frescoes, some of which are from the Byzantine-Cassinese school [2], found in the Episcopio [bishop's palace] of Ventaroli in Carinola. This hamlet in the Province of Caserta is located a short distance from the Appian Way and is known to the greater public and mentioned in a very small number of humanist studies because the writer Matilde Serao spent her childhood and part of adolescence here.
This ecclesiastical structure, whose extended name is Santa Maria de Episcopio, is an architectural building constructed in the Roman style in the eleventh century [3] — with origins likely dating to the fifth century — that played an important role for the local community, attesting as it does to the ancient, fervid Christian spirit with its discreet presence. This religious stronghold situated along a Roman consular road, the 'Regina viarum', was also important for the Church of Rome given that, as its name implies, it served as the bishopric, probably from the latter half of the fifth century until the end of the eleventh

century [4], when the diocesan centre was moved to nearby Carinola [5]. This place of Christian worship is also known as Santa Maria in Foro Claudio, a designation deriving from its location, i.e. the area surrounding the Roman city Forum Claudi, built by Claudio Cicero Appio during his time as consul [6].

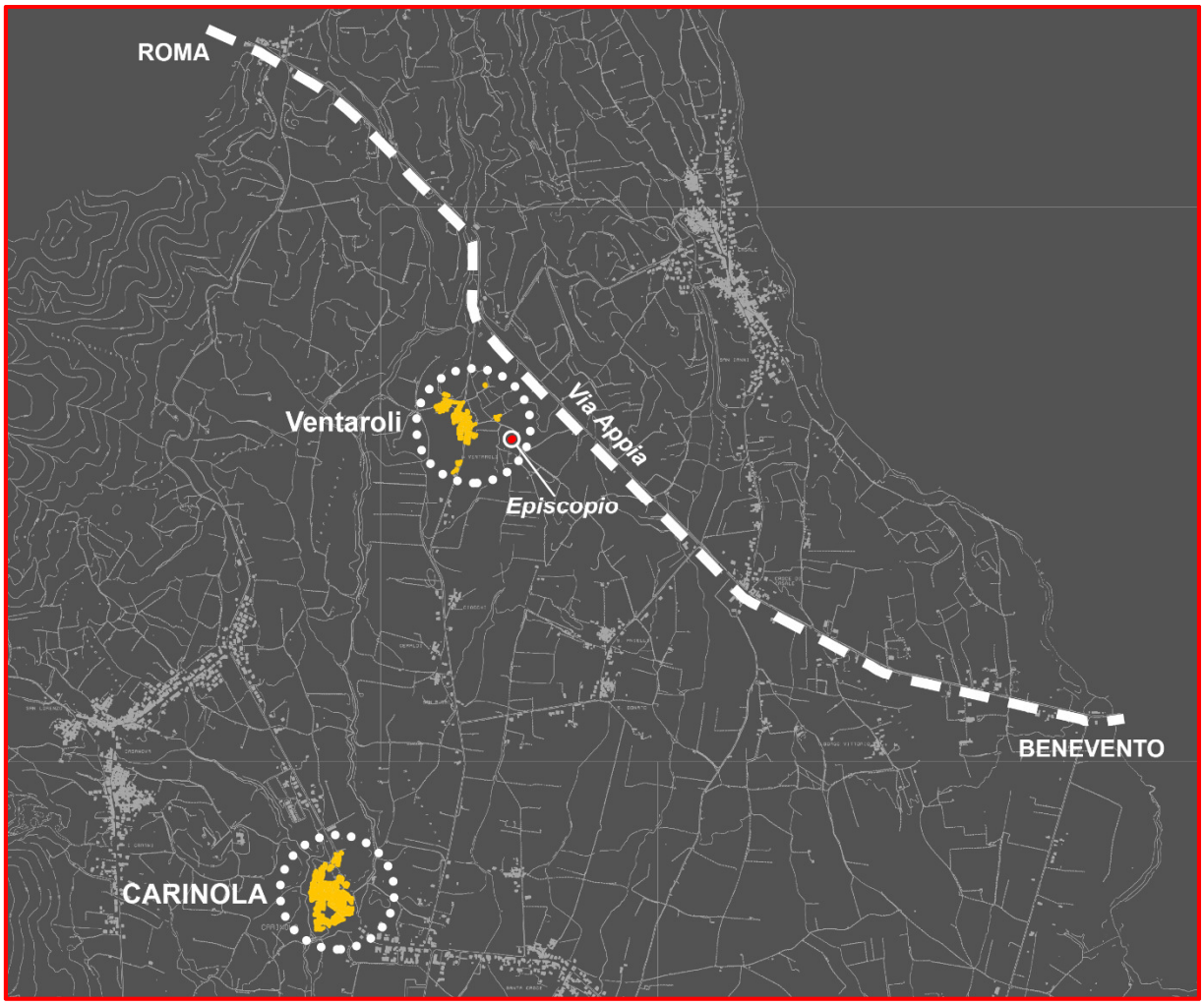


Fig. 1: Map of the Province of Terra di Lavoro. Ventaroli and Carinola area highlighted in yellow, the Episcopio in in red. The underlying map was taken from the Istituto Grafico Militare.

2. Fresco of the hermit and abbot Leonard of Noblac

The church of Ventaroli, consecrated in honour of Maria, is a basilica oriented along the east-west axis, with its only entrance on the eastern façade, which houses an architrave-topped door in a Catalan style. Entering the church, one descends a few steps to reach the floor of the building; between the exterior and church interior there is a notable difference in height. The assembly hall of the church is divided into three parts separated by walls and point-like architectural structures made of spoglio. These support rounded arches which in turn support the upper walls of the central nave, both of which contain a clerestory. Each aisle is covered with a trussed roof and ends at the wall opposite the entrance with a semicircular apse. There is one altar situated along the longitudinal axis of the church on a raised presbytery. The structure has no transept or crypt nor today does it have a pulpit or cathedra (Fig. 2).
As in other contemporary places of worship in Western Christianity, the interior of the Episcopio of Ventaroli was frescoed as prescribed by ancient liturgy, which relied on images to instruct the illiterate populace about the stories in the Old and New Testaments. A quote in this respect has been attributed by many authors to Pope Gregory I: 'Painting serves illiterate people just as writing serves those who can read.' [La pittura può servire all'analfabeta quanto la scrittura a chi sa leggere.] [7]
Today, the study of these mural works is sometimes difficult to undertake due to their degraded state and the absence of precise references in historical archival documentation regarding the building where they are found. Therefore, when the name of the saint is not specified in the painted work, the attention increasingly turns to the terrestrial objects the artist painted with the saints to solve the enigma, a rather 'indirect' means of investigation that may certainly be pursued but which is not free of misunderstanding and/or misinterpretation.

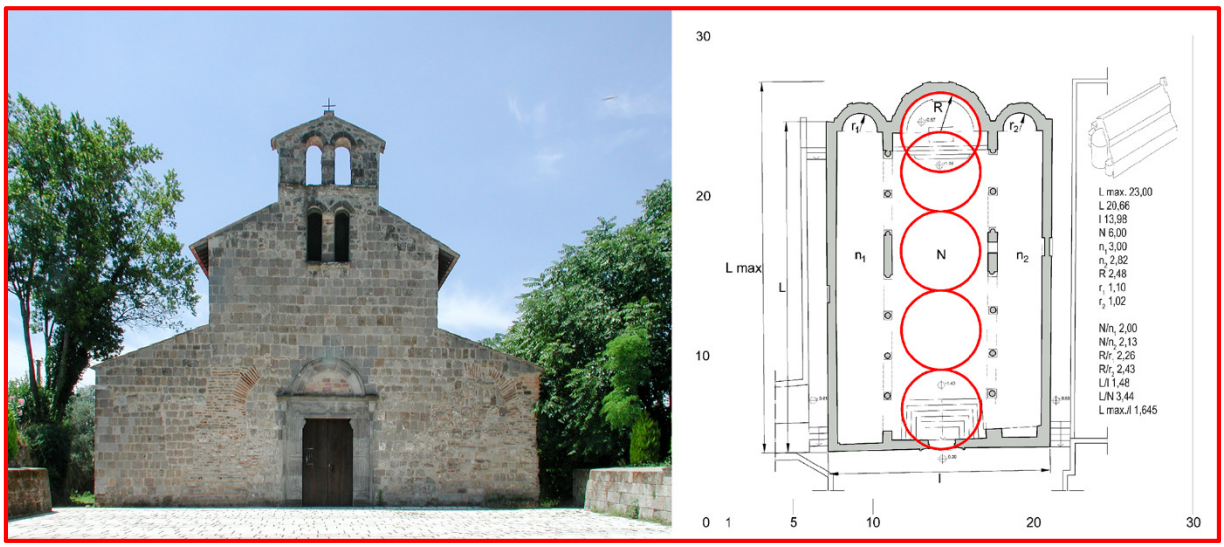


Fig. 2: Photo of the main elevation of the Episcopio of Ventaroli in Carinola, with a geometric analysis of the layout of the walls and proportional relationships.

Despite the difficulty of their interpretation, the study of these artistic expressions is a stimulating intellectual exercise that holds great satisfaction but also sometimes bitterness, an activity that requires time and patience since it is mainly composed of bibliographic research and comparison with iconography in analogous situations. This investigative activity becomes indispensable, however, each time knowledge needs to be deepened about the architectural building that houses the painted work. The devotional history of a Christian community, developing in the shadow of its bell tower, is a key to interpretation that not only enables a reading of antiquity in Christian terms, but also an understanding of the human events in a given geographical area.

In this sense, it is important to point out that the Episcopio of Ventaroli did not pass through time unscathed, due to which only some of its numerous painted scenes, which gave the faithful indications and spiritual direction, have been saved and not all have maintained their expressive integrity. The negligence of humans and the action of atmospheric agents are the main causes of the loss of much of this artistic heritage.

Among the painted scenes clearly perceptible in the liturgical space of this church is one that depicts the hermit and abbot Saint Leonard. According to proposals for its chronological assignment, it dates to the sixteenth century, although the author is still unknown.

This fresco, which often escapes the visitor — always more intent on contemplating the whole rather than the individual episode — features a dual artistic/sociological peculiarity. The work, artistically mature in graphical/decorative and expressive rendering, finds in the effigy of Leonard of Noblac, a saint of French origin, a reference whose veneration we consider not random, but a hint of a state of acute unease long experienced by the people of this territory. The land was called ‘Campania felix’ by the ancient Romans [8] and then renamed ‘Terra di Lavoro’ by Richard II, Duke of Normandy [9] and the imagery is appropriate, given that for the Catholic Church, Saint Leonard is the protector of people in chains.

This distress can be attributed to the military campaigns that took place numerous times in these lands before and after the eleventh century. In particular and in an entirely personal hypotheses, we refer to the incursions of the Saracens that occurred beginning in the ninth century [10] more than to conflicts between rival families, given that the Saracens tended to capture and carry home the young Christians subjugated with arms for enslavement.

Returning to the fresco, we note that the figure of Saint Leonard is located on the counter façade of the church. It is a scene with immediate emotional impact, defined spatially by a frame with the male figure at the centre. The saint is represented upright, frontally, and statically in an almost natural size, immersed in an undefined environmental context, probably to avoid drawing the attention of the faithful away from its sacrosanct goal as suggested by Pope Gregory I [11]. The saint’s arms are bent and placed at chest height. In his hands he holds the typical objects of Christian iconography: a book in his right hand, an explicit reference to the sacred texts, and a chain in his left attached to an archaic device to bind the wrists (Fig. 3).

Observing the work, one is immediately struck by the soft traces of the drawing. The saint appears as a small, timid man resigned to his fate. His gaze points downward as a mark of contrition for the many who suffer due to the state of segregation in which they are found. His slightly elongated face is surrounded by a halo testifying to his holiness. The eyes, nose, and mouth are free of particular expression, while his hair has an accentuated tonsure typical of followers of the monastic orders. In

addition, the body structure is slender and shows accentuated disintegration of the anatomical organicness. With regard to his clothes, the saint wears simple clothes lacking valuable decoration, in memory of his terrestrial life as a hermit.
These consist of a white ankle-length garment, an alb, and a tunic in ochre yellow open at the sides, adorned with brown embroidered bands at the edges. In painting Saint Leonard, the artist conceded nothing to naturalism, given that in the representation he wisely avoided agitating and contorting the folds of the clothing and making use of strong shadows.

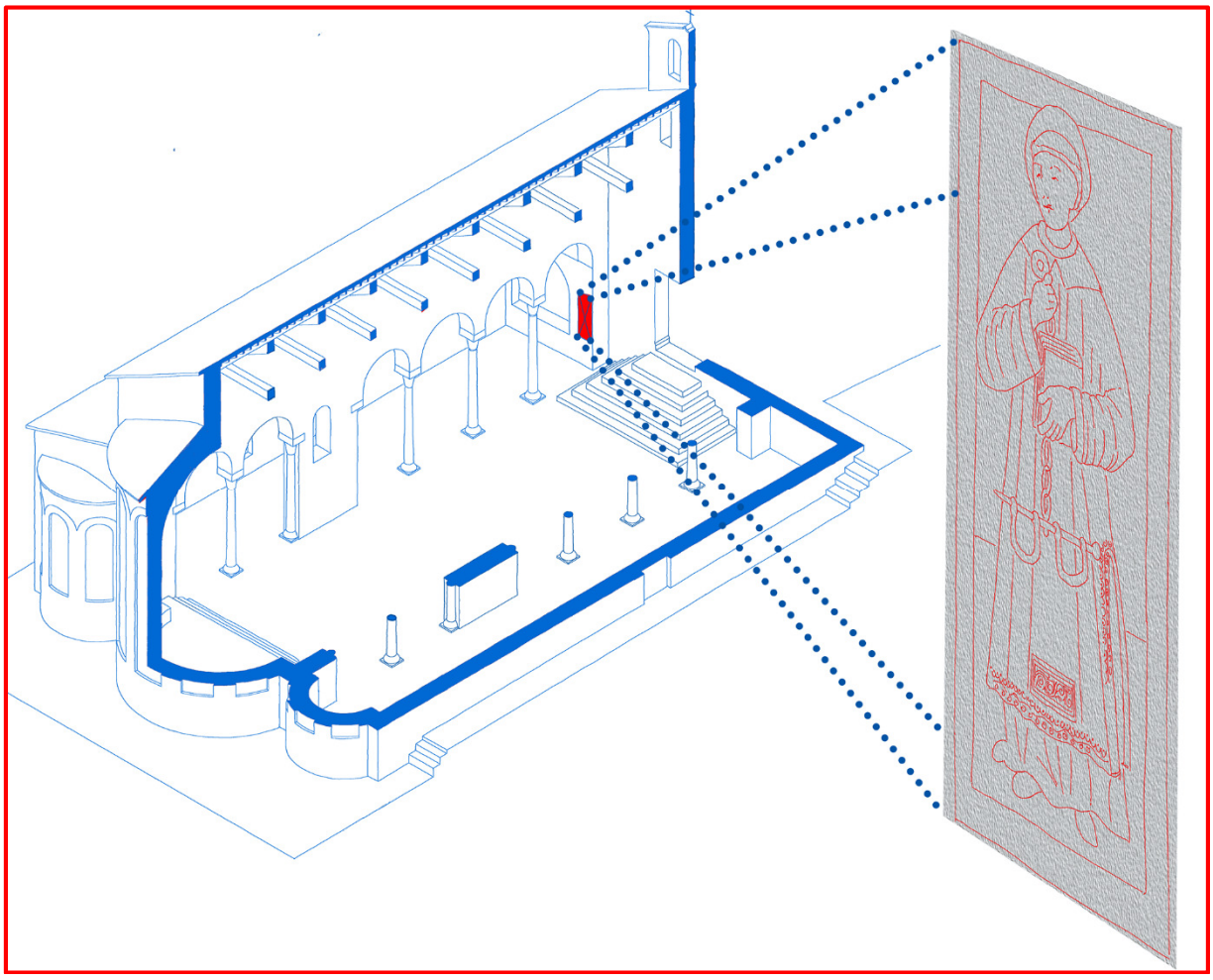


Fig. 3: Axonometric section and spatial location of the fresco of the abbot Leonard of Noblac.

The colour tones in the fresco are bright, yet measured and juxtaposed such that nothing clashes. The colour is harmonized by juxtaposing light and dark colours, so in addition to the yellow of the tunic there are shades of brown used to fill in the garment decorations, the book, and floor, black for the constraints and footwear, white for the 'under' clothes and the background, and finally, soft pink for the flesh. As is usual in paintings by Medieval artists, the colours are applied with decided saturation to underline the expressive power necessary to make the symbolic meaning stand out, in addition to showing the principles of truth, as one of the most sensitive means available [12].

3. The survey of the fresco

The project to survey the painting was organized to integrate different acquisition methods and techniques to expand the operational possibilities and effectiveness of the results. In detail, photographs were taken with a digital reflex camera, a Canon EOS 40D, equipped with an EF-S 15-85mm f/3.5-5.6 IS USM objective lens. For digital measurement acquisitions, the FARO Focus 3D S120 laser scanner was used, while chromatic values of the painting were made with the Minolta CM 508i contact spectrophotometer. From the 12 scans made in the basilica, 4 of the acquisitions were selected as the most suited to defining the wall support relative to the painting and the immediate area. The aggregate set of scans, a combined point cloud processed using JRC 3D Reconstructor® by the software house Gexcel, was then imported into CloudCompare (open-source) to generate meshes using Delauney's algorithm, which generates equiangular triangles, homogenizing their placement on the model [13].



Fig. 4: Transverse section (left side) of the Basilica of Santa Maria in Foro Claudio integrated with the orthophoto of the counterfacade. Cloud-to-mesh distances between the fresco (points cloud) and YZ plane generated by CloudCompare.

The result was essentially a mesh composed of about 138,000 triangles distributed on a pseudo-planar surface of about 0.74 sq. m. The resulting surface is particularly detailed since it derives from the use of medium-resolution clouds ‘cleaned’ only of duplicated and statistically anomalous points (statistical

outlier removal). Once the texture mapping was done using an image calibrated by the software with data from the photographic camera, the processed surface highlighted the conformation of the wall of the fresco (tonachino or velo), leading to further investigations to identify possible morphological indications.



Fig. 5: Fresco of Saint Leonard. Left: the complete point cloud of the fresco with the adjacent wall. Centre: the isolated fresco. Right: the fresco and YZ plane generated by CloudCompare.



Fig. 6: Fresco of Saint Leonard. Three images of the fresco superimposed with raster images of the contour lines with steps of 2, 1, and 0.5 mm, respectively.

To this end, the combined point cloud used to define the surface model was processed in CloudCompare to remove the painted surface of Saint Leonard from the surrounding area to minimize discontinuities in the neighbouring surfaces (Fig. 5). For the fragment considered — a rectangle about 123 cm high and 60 cm wide — a plane generated with the root mean square was adopted using the 'fit plane' function. With a further rotation and translation, the new plane based on the point cloud was established as the plane of reference (YZ), assigning the orthogonal direction X to the heights of the individual points. The cloud with this new orientation was then converted into a 2.5D grid to obtain a raster image that could be used to define the contour lines based on the (X) data. The YZ grid was set with a step of 2 mm, while different tests were made for the altimetric values, X, with steps between 2 mm and 0.4 mm, some of which are illustrated in Figure 6.
As can be seen in the image on the right in Figure 5, the plane generated by the software fully corresponds to the profile of the contour lines reported in the raster images. In fact, Figure 7 shows how these vary chromatically from blue (zones in greatest relief) to green (areas at a lower height) with an overall range of 24 mm.

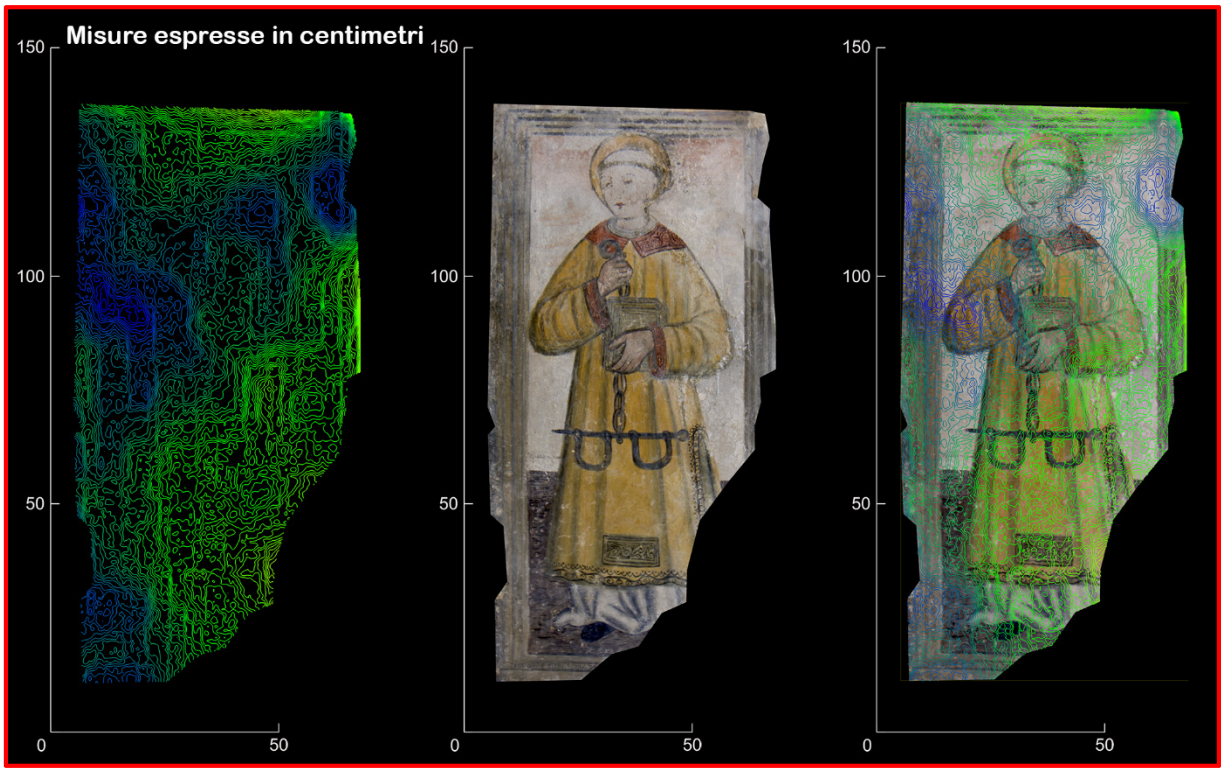
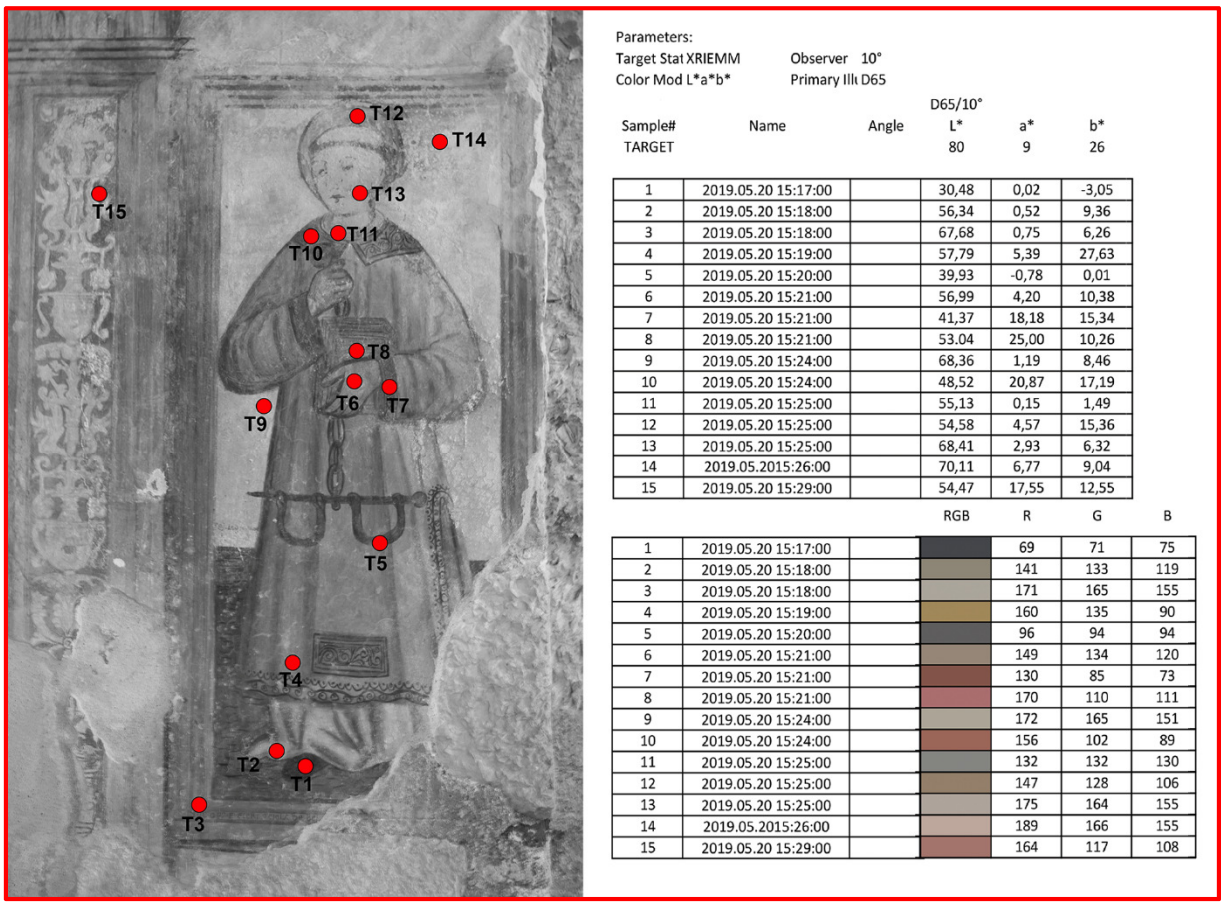


Fig. 7: Fresco of Saint Leonard. Left: contour lines with a step of 0.4 mm. The blue curves represent greater relief, while the green curves represent a lower height difference. Centre: the fresco. Right: superposition of the curves on the painting.

As can be seen, by decreasing the distance between the contours, the morphology of the painted surface tends to adhere to the profile of the saint in some areas as, for example, with the bent left arm echoed by sudden, regular changes in the direction of the contours, which continue down following the drape of the clothes until finally dissolving in the wrist constraints. Among possible hypotheses, we cannot exclude one relating to a possible indicative trace useful for constructing the painting. These considerations obviously cannot be confirmed with certainty, but for the case just mentioned, the particular morphological trend cannot derive, for example, from the underlying construction materials, given the size of the blocks, which are visible to the left in Figure 5. We also maintain that any possible so-called 'scarps' of connection due to extending the velo at different times can be excluded, since it is not very likely that the image could have been painted at two different times given the restricted size of the icon and by observing the figure itself. As already mentioned, however, we cannot but remain in the realm of hypothesis.

4. The spectrographic investigation

In this specific area, our attention is focused on the instrumental acquisition of the chromatic spectrum resulting from a series of samples (14 ID numbers) taken in the above-mentioned coloured areas. Considering the nature of the painting, particular attention was dedicated to identifying the most vivid coloured areas, carefully marking the exact 'sample' points on a suitable photographic eidotype (Fig. 8).



Parameters:
Target Stat XRIEMM Observer 10°
Color Mod L*a*b* Primary Illt D65

Sample#	Name	Angle	D65/10° L*	a*	b*
TARGET			80	9	26
1	2019.05.20 15:17:00		30,48	0,02	-3,05
2	2019.05.20 15:18:00		56,34	0,52	9,36
3	2019.05.20 15:18:00		67,68	0,75	6,26
4	2019.05.20 15:19:00		57,79	5,39	27,63
5	2019.05.20 15:20:00		39,93	-0,78	0,01
6	2019.05.20 15:21:00		56,99	4,20	10,38
7	2019.05.20 15:21:00		41,37	18,18	15,34
8	2019.05.20 15:21:00		53.04	25,00	10,26
9	2019.05.20 15:24:00		68,36	1,19	8,46
10	2019.05.20 15:24:00		48,52	20,87	17,19
11	2019.05.20 15:25:00		55,13	0,15	1,49
12	2019.05.20 15:25:00		54,58	4,57	15,36
13	2019.05.20 15:25:00		68,41	2,93	6,32
14	2019.05.2015:26:00		70,11	6,77	9,04
15	2019.05.20 15:29:00		54,47	17,55	12,55

			RGB	R	G	B
1	2019.05.20 15:17:00			69	71	75
2	2019.05.20 15:18:00			141	133	119
3	2019.05.20 15:18:00			171	165	155
4	2019.05.20 15:19:00			160	135	90
5	2019.05.20 15:20:00			96	94	94
6	2019.05.20 15:21:00			149	134	120
7	2019.05.20 15:21:00			130	85	73
8	2019.05.20 15:21:00			170	110	111
9	2019.05.20 15:24:00			172	165	151
10	2019.05.20 15:24:00			156	102	89
11	2019.05.20 15:25:00			132	132	130
12	2019.05.20 15:25:00			147	128	106
13	2019.05.20 15:25:00			175	164	155
14	2019.05.2015:26:00			189	166	155
15	2019.05.20 15:29:00			164	117	108

Fig. 8: Photographic eidotype of the fresco of the abbot and hermit Leonard of Noblac, with tables of the colorimetric values sampled.

The data were acquired using a Minolta CM 508 contact spectrophotometer, whose characteristics enable its use for non-destructive measurements with the results visualized on a graphical spectrum.
The spectral range covered was 400–700 nm at intervals of 10 nm, activated with standard illumination geometry D65/10° and a standard 2° observer. The results were expressed in the CIE/Lab (L*a*b*) calorimetry model, which is based on a three-dimensional space in which the colour is identified by three components: L* indicates luminosity (percentage), that is, how much the sample measured tends to black (L=0) or white (L=100); and a* and b*, which represent, respectively, how much the colour tends to red or green and yellow or blue.
The values of a* and b* therefore represent the two coordinates that allow a precise hue and saturation to be identified. The LAB space covers the entire visible spectrum and represents it uniformly, allowing the set of visible colours to be described independently of the graphical technology used. The tables in Figure 6 shows the Lab values acquired and the related conversion into RGB, which is useful only for video visualization. From left, the table lists the ID number of the points acquired, data related to the day and time of the sample, and LAB coordinates, followed by the relative correspondence in RGB. The RGB values (range optimized for monitors) and CMYK values (related to printing) — not reported but easy to obtain, for example, through conversion with PhotoShop® — are not used for chromatic identification for possible restoration operations. The goal of the conversion is to obtain video references useful for detecting possible chromatic variations over time.

5. Proportional signs in the fresco of Saint Leonard

Reading a work of art, in this case a painting, is a real moment of critical/cognitive investigation, since the work is revealed only to those who are truly interested; to whose who, with empathic communication, know how to grasp and decipher it. Indeed, in every artistic work, there is a hidden thought that guided its realization. This thought is expressed through signs — sometimes obvious sometimes less so — that is, the dialectic relationship between the drawing of a thought and its figurative expression; a hidden thought that makes each confirmation a valid element for consolidating the method applied to its creation.
In a certain sense, therefore, reading a work of art means mastering it, that is, mastering the laws that oriented and guided its realization. This means interpreting it and understanding it completely. As a

result, the more careful the study, the better it will open to understanding. The greater the depth of interpretation, the better the process of understanding.
As can be seen, an inductive line of research is activated in this cause and effect relationship which is based on a critical/interpretational hypothesis of the work of art. Beginning with observation of the apparent state, it is scrutinized in depth until knowledge about its essence is reached. In all of this, the scholar, as an expert/critic even of representation, holds the most appropriate tool for investigation and understanding — drawing. Due to its exploratory possibilities, this tool is capable of looking into the life of the work itself and its wilfulness. At the same time, with its own synthetic/representation particularities, the drawing translates the scholar's perceptions into interpretational diagrams suitable for extricating the object as it is and not as it appears. In highlighting the law of coherence that organizes the work, the drawings reveal the way in which it was designed and created by the artist. Graphical expressions that are revealing — educational, therefore — in which one recognizes the sense of what is being scrutinized. Therefore, with drawing, one has the capacity to involve the observer in the invention/realization of the artistic work, based on graphical/critical models where the visual transposition of this process is represented by figures in a reciprocal relationship. Discovery of the rules used to construct the work of art therefore allow each phase in its constitution — form before image — to be clarified, but the rules also reveal characteristic aspects of the human and artistic work of a historical community.
In this type of analysis, the square, triangle, and circle serve as the basic elements. Their properties are the unequivocal basis of theorems in Euclidean geometry oriented on the plane. This geometry allows us to understand the reason for the shapes that presented the main means by which architects did architecture and a suitable tool for painters to create works in ratio with the buildings that housed and protected them. In fact, simple figures have always been attributed with religious symbolic meaning, but among Medieval artists, these figures often seem to embrace and hide from laypeople specific references to the craft and the operational approach and this approach leads us to view plane geometry as the common construction key in the Middle Ages.
In this historical context, the use of analytical geometry as an operational tool to size the work began by recalling both whole geometric relationships and the geometric laws contained in plane figures and theorems of reference. By virtue of these theoretical/experimental operations, the Medieval masters designed buildings and painted works with a logic clear only to themselves.
All of this can also be seen in this case study. The view of the rectangle in which the image of Saint Leonard is inscribed and the perception of the interior modular squares makes us suspect that here as well there is a constructive link between the painted decoration and the surrounding architecture.
The uncertainty of reading the dimensions of the fresco does not admit hypotheses about the unit of measurement originally used in the sizing due to the irregularity of the wall surface and the expressive warmth lent by the painted traces laid down freehand. From an up-close analysis of the work, however, it is not difficult to see that the width of the painting is equal to the thickness of the wall that supports the roof of the central nave, even though the fresco is located on the counter façade of the church where there is more space available, and that this value is in a 1:2 ratio with its height. In addition, extrapolating the data from the survey, we can see that the geometric figure that contains the painted icon is a harmonic rectangle; in particular, it is a geometric figure governed by a mathematical ratio that the Greeks called diapason [14].
Continuing the study of the traces, it also emerges that the operational approach adopted by the artist is not confined to the size of the painted work, but also governs the figure of Saint Leonard. In fact, the artist used a submultiple of this mathematical relationship for the canonical intervals of the human body and to position the hands of the saint and symbolic objects, as shown in a rhythmic scan of the painting (Fig. 9).

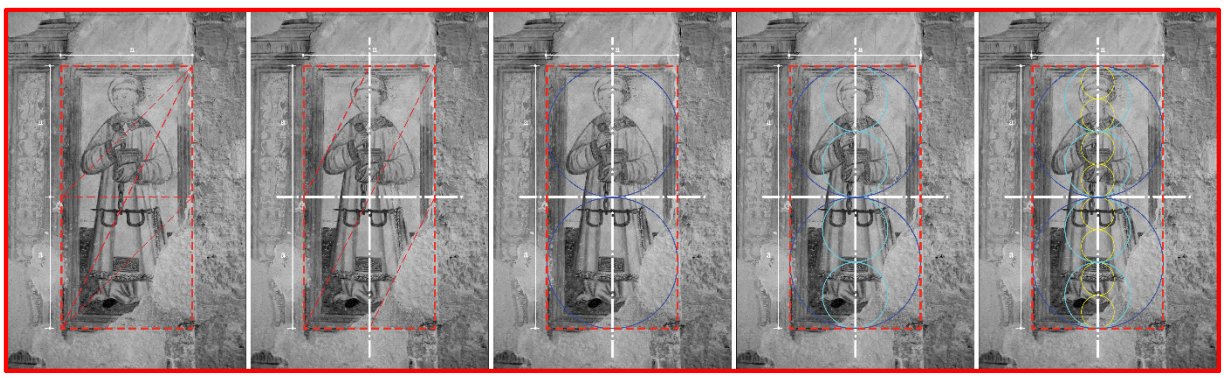


Fig. 9: Geometric analysis of the fresco.

6. Conclusion

For this building, a programme of study was developed to understand, document, and enhance the architectural work as a whole. From the beginning, therefore, our intention was to address the architectural work, considered the sign and symbol of a remote time, as well as the priceless frescoes.
The investigations of the building contemplated the realization of canonical representational triads through an integrated survey as an effective tool, inviting us to follow some paths of knowledge and inspection among the labyrinths of the building [15]. For the series of paintings instead, the investigations entailed a broad, detailed, high-definition photographic campaign and the non-invasive instrumental sampling of the colorimetric data of one of the works: the fresco of the abbot and hermit Leonardo of Noblac. This study was then expanded to include a reading of the proportional traces of the work in question in search of the law of coherence that supports it and expresses it as a harmonic whole, in order to decode the process of formation and spatial organization through logical rigour.
The scope of this work was essentially to identify a 'stop image' representative of the church building to be used in the future as the starting point for a broader monitoring programme. In addition to acquiring the same spatial and colorimetric data identified in the phase just completed, this goal also involves other investigations aimed at identifying the larger system and the microclimate conditions in which the building is found, which are deemed useful in defining the causes that contribute to the process of early ageing and/or degradation.

This contribution comes from the organic collaboration of all authors that, in any event, have agreed to assign paragraphs respectively to: 1. Introduction, Laura Carnevali; 2. Fresco of the hermit and abbot Leonard of Noblac, 3. The survey of the fresco, Fabio Lanfranchi; 4. The spectrographic investigation, 5. Proportional signs in the fresco of Saint Leonard, 6. Conclusion, Piero Barlozzini.

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The Countryside: a big House

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Abstract
Starting from the Palladio's ideas about the city, the research explores the nature of the city and how the Countryside and the City, although historically opposite contexts, diverge just in their outer form. The both constructive reason are the same, what changes is the measure and the use of space: the Countryside is just the City of the agriculture. The cultivating's requests force the rural landscape's organization by the work that every single farmhand carries in his own plot.
The Hyblaean plateau is the clearest synthesis of this construction, for this reason the subject of the ongoing research is outlined. Here the man's work (the farmhands' needs to supplement with own agricultural products the low-wage earned in the latifundium) and the area's character (the duality between the *cugno*'s and *cava*'s landscape due to the rivers digging the calcareous tableland) shaped the territory. The little rural house is the basic cell of this wide construction, an Eden built by poor means clearly defined by some essential elements: a room inside, a plan to sit in front, a tank close to, a farmyard, a pergola, a few trees whose shadow gift a little space.
Understanding the house's reasons is understanding the landscape's ones: a construction in which the detail and the large scale are built at the same time.

Keywords: Countryside, Architecture, Tradition, Landscape, Hyblean

1. "la casa una città picciola"

"*Conciosiache la città non sia altro che una certa casa grande, e per lo contrario la casa una città picciola*"[1].

All the complexity of a city is the same as that of a house. The relationships between the parts know no scale of representation. That is a point of view that forces us to confront the complexity of the awareness that there is no direct proportionality between the actual size of an object and its importance. Rather, it is often the "small" that gives shape to the "big", and this is as true in a city as in a landscape. There are exceptional places where this idea is stronger than elsewhere.
The research in progress moves from these ideas underlying the construction of the landscape and then takes root in an extraordinary territory in which these aspects emerge strongly and clearly: the Hyblaean countryside. This is an extraordinary example of the way in which a territory can be inhabited through the construction of small artefacts belonging to the most exquisite peasant culture. The study aims to understand the settlement and construction logics with which these single artefacts managed to build an "immense city". In order to fully achieve these objectives, the architect must resort to the main tool of his discipline, the one delegated to better clarify the questions rooted in the construction of places that would otherwise be invisible and incomprehensible: drawing. We have chosen to proceed through

[1] Palladio A., *I quattro libri dell'architettura* (see Bibliographical References).

three different scales of representation to show three different degrees of construction: the ground, the use and the domestic. Consistent with an idea that does not see the landscape from large to small in a consequential way, we say that these are not three aspects connected "in series" in which one follows the other as if it were an enlargement; but "in parallel", all three coexist in the world at the same time. But to address them synchronously would be a failed attempt as the inherent complexity would make any understanding impossible. Subdividing, omitting, choosing are necessary operations when the purpose is to penetrate the generative reasons of a constructive fact. This is mainly because, as architects, our aim is always to look, to study, to draw in order *to do*, to bring what we learn into what we do, into our activity.

«*Il dettaglio costruisce il territorio. Per quanto minuta, la geometria di un manufatto si dichiara alla grande scala rendendosi comunque percepibile. L'alterità della sua natura costituisce l'elemento di distinzione ma, all'un tempo, di costruzione del paesaggio secondo una deflagrazione delle scale che tiene insieme la pietra singola e la montagna*»[2]

2. Ground

2.1 Orography

A massive plateau with an average height of between four hundred and five hundred metres, this is the conformation of the Hyblaean plateau. From the centre of the plateau, Mount Lauro, the rivers branch off, carving deep incisions in the limestone: the quarries ("cave", as they are called in Sicilian dialect). The morphology of the plateau is therefore characterised by the presence of the quarries, which interrupt the horizontal course of the plateau, generating sudden jumps in altitude that give rise to a substantial duality of distinct morphological conditions: the *cugno* and the *cava*. The *cugno* occurs within and at the confluences of the quarries. One of the most intrinsic peculiarities of the Hyblean territory is this sort of «geographical constitutive form»[3] capable of dictating and prefiguring man's settlement choices, with the addition of other determining factors.

2.2 Dry-stone walls

The component that most characterises the agrarian landscape of these settlements, the one that is at least most immediately evident, is the dense network of dry-stone walls that geometrically structures the land, dividing it into lots within which the dry-stone walls extend perpendicularly from the perimeter walls, defining with a strong hierarchy the functions within the piece of land pertaining to the house. This is one of the most interesting and complex features of the area: the dense subdivision into smaller areas due to the work requirements linked to the life of man interacting with the land. Every sign traced by the dry stone walls can find an explanation in the agricultural practices carried out by the men who lived here. Perhaps for this reason, the dry-stone wall is not only the most conspicuous and identifiable sign in the landscape, but also the one which, on closer inspection, clearly reveals man's interaction with the land and his ability to make it a place to live in. The specific feature that a piece of the world must have in order to be "domestic", and therefore habitable, is the size. Dry stone walls "tame" the land through the logic and feelings of the human being, in which the practical organisation of relations between individuals, and therefore of the division of the land, corresponds to the necessary perception of living "inside" something.

2.3 Access

The extra-urban connecting roads are the backbone of the settlement. The SP287 and the SP73 are the connection roads between the towns on the Plateau and it is from these ones that the secondary roads branch off with an extraordinary clarity of layout due paradoxically to the absence of a pre-established layout, but precisely to the condition of necessity that has guided the choices of the people who have settled here. The secondary roads branch off from the main roads, and from these the roads directly necessary for access to the house. Access can take place according to two different types: if the building is far from the main or secondary road by means of a *trazzera* that cuts through the property; if, on the other hand, one of the sides of the building borders on the main or secondary road, then access is direct and without a further route.

3. Use

3.1 Garden

[2] PELLEGRINO, Luigi, *Guardò su nel vuoto apparente*, 17 p. (see Bibliographical References).
[3] PELLEGRINO, Luigi, *Guardò su nel vuoto apparente*, 66 p. (see Bibliographical References).

Ever since the Greek era, the Hyblaean landscape has been fragmented by the individual initiative of individual men, making a structure organised according to the element of the 'Mediterranean Garden'. What distinguishes a Mediterranean Garden are water, dry-stone walls and the house. As we can see, there are few elements that succeed in defining such an identifiable spatial idea, and this is due to the clarity with which these objects are put in relation to each other and the practical needs that motivate their settlement choices. A feature of the Mediterranean Garden is the scarce presence of tall trees. This is mainly due to the seasonal nature of the cultures present in the Garden and the sufficient space they require.

«*[…] il Giardino Mediterraneo formato da piccoli apprezzamenti, con i suoi piccoli muretti sui quali corre l'intrico delle viuzze suburbane, incassata tra il biancheggiare dei muri di cinta sormontati dal lucido verde delle fronde degli alberi […]».*

This is Sereni's description of the Mediterranean Garden in his essay "*Storia del paesaggio agrario italiano*". What is worth dwelling on, rather than the various picturesque aspects of the description, which are necessary but not useful for our research, is the ability of Sereni's words to convey the idea of a place where man and nature merge into an artefact. But more than an artefact, we are faced with a real construction, which is in turn part of the general construction of the plot and of the entire agricultural landscape of Hyblaean. What makes a construction "human" is its response to its own rules, while at the same time fitting correctly into another, larger construction, without ever losing its recognisability and autonomy in relation to the whole that it comprises.

3.2 Pertinences

By "pertinences" we mean the different functional subdivisions within the lot that are useful for clearly showing the relationship between the house and the area. We couldn't be further from a logic that sees the house as "full" and the rest of the lot as "empty". Those who built this landscape started from totally different assumptions. The house and the lot could be said to be one and the same thing, since the idea behind it is the same, the house as much as the rest of the lot is part of the living organism, housing those functions that necessarily require the presence of a roof. The house, like no other element, is not the *purpose* of construction efforts, but only one of the *tools* of construction to realise itself. For the rest, the house belongs to the same world as the garden, the wall and all the other elements that make up this *unicum*. When the house is positioned centrally with respect to the plot, the subdivision of the area takes place through the entrance path.

3.3 Settlement

The morphological conditions of the land determine the layout of the house. This is why every small rural house does not seem to be "dropped from above" but rather "come out of the ground". This evident reversal of movements can be seen if we compare a house capable of constructing a landscape, such as those under investigation, with others incapable of expressing a constructive idea simply because they have no basis in it. The Hyblaean houses are counterpoints to the characteristics already in the shape of the land. From this point of view they are "castles", not typologically, but constructively, in their relationship with the land. As architects, we can say with full knowledge of the facts in our discipline that what makes a castle a castle is not the presence of figurative elements relating to its functions (towers, battlements, loopholes, etc.) but its settlement character, its clinging up there, "*nel vuoto apparente*". On the plateau, it is not by chance that most buildings are built on the highest part of the property, in cases where the plot is rugged and the morphology of the land is irregular. On the other hand, when the land is flat, the house chooses to stand on the edge of the road in order to minimise the amount of space taken away from cultivation.

3.4 Geology

In the Hyblaean landscape it is never just one element that determines choices but always a combination of several factors. The position of the house on the lot is in fact also due to the geology of the soil and not only to morphology as we have seen. The geological conformation of the plateau is composed of a large limestone plateau, fortunately not always outcropping, guaranteeing the possibility of cultivation. In the innermost areas, in fact, above the stony layer there is a sufficiently consistent layer of ground to allow some cultivations. However, this condition is not always possible, since in just as many places the planking emerges and does not allow any cultivation due to the lack of ground necessary for life. It may happen that a plot contains both conditions, which is not at all rare. In such cases the wise farmer 'chooses' to build the house on the rock, leaving all the precious space with the ground for arable use. The extraordinariness of this place lies precisely in that "choice" which to us, and rightly so, sounds more like a necessity than an arbitrary decision. In truth, the farmer chooses the position of his house, and the fact that today, when the work is complete, it seems to have come from the earth and not from human hands proves the propriety of his actions. The reasons (and ideas) that guided the farmer were appropriate to the place and honest in relation to his living conditions.

4. Domestic

4.1 Exposure

It is difficult to draw conclusions common to all the houses surveyed when one decides to go into such detail. But the strength of the construction of this landscape lies precisely in its comparability, notwithstanding the obvious differences in each case. Each house has faced its own specific problems, and this is one of the main reasons for the strength of this place: the fact that it is the result of operations that are always precise but at the same time capable of forming a unified whole. A less variable factor from case to case, however, is exposure. The south-east is the exposition solution for small rural houses, but taking into account the shape of the lot and its appurtenances, it was not always possible to expose with this orientation.

4.2 "*Baglio*"

Dialect expression indicating the front part of the house and functionally the access to the house. This space is characterised by dry-stone walls which, according to the layout of the perimeter walls, extend parallel to the elevations of the house. The *baglio* extends the inside of the house to the outside, delimiting an area and providing valuable shade on the hottest days, thanks in part to the work of a few much-needed trees placed along the dry-stone walls.

4.3 Hearth

The small rural house can be seen as the construction of a hearth. It has a predominantly single- or two-cellular size. It is built of limestone (stonecrop) with a sack frame, cantonments and jambs of rough-hewn stone, sometimes squared, and a roof with beams, battens and tiles. All bound with mortar with a low concentration of binder. Nothing more than what is strictly necessary to make a house 'habitable'. This is not an allusion to some form of ante-litteram functionalism, far from it. Habitable does not just mean rationally well laid out with every space in its proper place, but precisely "measurable", a space in which a man can feel good as a human being living in the world. The rural house is in this sense "domestic", and the use of the most highly worked stone in cantonments is enough to clarify the matter and add another fundamental aspect.
The fact that in the cantonments a decision was made to sketch out a geometry, with not inconsiderable effort, is not marginal. Without the cutting stone in the corner of a building it would be as if that corner did not know it was a corner. On the other hand, it is true that staggered stone blocks in the corner make the structure stronger and more solid. This correspondence between the static wellbeing of the building and the perceptive wellbeing of those who live in it is the basis of the construction of the Hyblaean countryside.

5. A new metropolis?

What if this structuring of the territory could be a model for the city of tomorrow?
Every research, each according to its field and goal, should always aim to modify the *status quo*, or at least attempt a transformation that improves it. In short, to produce a considerable gap. What has been said about the characteristics and the ability to construct the landscape of the small rural house allows us to venture, with full knowledge of the facts, a possibility of a different idea of the growth of the city.
Today's metropolises have reached a *super-human* scale, that is, literally going beyond a size and proportion such that the people who live in them can live well. We are not talking here about the organisational issues related to the metropolis' ability to connect its various parts in order to guarantee an adequate service to its inhabitants. Rather, we are talking about the disproportionate size of the space, which makes the metropolis not a place of relations but of "unrecognizability" in that it is not "on a human scale". Aristotle argued that the size of a city had to be such that «each citizen could hear an orator in the *agora*»[4]. At first glance, the thinking of the Greeks may often seem far removed from the world we live in today. In truth, although with the obvious and due differences due to the millennia that have passed, the man of today and the Greek man do not have many differences, at least not in what most profoundly makes us human. The perception of a "domestic" measure is inherent in our being human and has always accompanied us. A "human" measure of dwelling is as central to our way of life as it was to man around two-thousand and three-hundred years ago.
The small rural house built a city that could potentially be more relevant today than when it was physically built. Its ability to give shape and hierarchy to a territory through the use of simple elements, an expression of the best rural culture, authorises us to imagine a new model for the city of the future.

[4] «*I nostri amministratori troveranno il criterio migliore per determinare la dimensione dello stato e la quantità proporzionata del territorio al di là della quale non dovrà espandersi: e consentiranno allo stato di crescere soltanto finché esso può aumentare la propria dimensione senza perdere la propria unità*» (HILBERSEIMER, Ludwig, *la natura delle città,* 34 p.; see Bibliographical References)

A metropolis, this time on a human scale, in which the individual unit is in direct and proportional relationship with the whole, creating a sort of "involuntary classicism" also common to other places built with wisdom, intelligence and few means[5].
The idea of the city built by the small rural house is perhaps even more modern than that of the villages scattered throughout Italy. This modernity lies in the fact that it is a diffuse city that "spreads" on the one hand through deep roots in the shape of the land and on the other thanks to a clear and radical idea of living. It is therefore in stark contrast to what is commonly referred to today as the "diffuse city", or sprawl for short. A phenomenon that does not even deserve the name of "city" because it does not have what makes a city a city: an idea of world-building. Sprawl is just chaos resulting from the juxtaposition of several episodes, each of which is motivated by its own individual logic, in any case always unrelated to a settlement idea. This is useful to say that a diffuse development of the city is never wrong in itself, but it becomes so to the extent that it does not have an idea behind it, when it is not the manifestation of an idea of the world that one wants to build. The small rural house is. The fact that the world of which it was an expression is now buried does not mean that these artefacts cannot still say something today about living. The world to which we are referring is that precise social stratum of labourers who, in order to make up for the meagre earnings on the latifundia, were forced to supplement their daily needs with their own resources to be produced on the land where they built the rural houses. History clearly affirms that an architecture rooted in its own period of construction has a "virtuality", leaving possibilities for future reuse. Paradoxically, therefore, the more a building is linked to its period, the more it is fertile ground for new values, unthinkable at the time of its construction.
Perhaps the growth of *super-human* dimensions will not stop, and metropolises will continue to expand further and further away far from the "domestic" measure. But all the more reason for us to look for other possibilities.
As architects, our point of view is directed towards the relationship between man and the space he inhabits. We have to indicate possible new directions by the use of the tools of our discipline if we want to say something credible that no one else can see.

[5] We are speaking about the little cities diffused along the territory, as the result of several constructive actions capable of building a whole in which the work of the individual element remains evident. (please refer to the paragraph "*Una classicità involontaria - la città*" in the article published by EdA "*Costruire una tradizione: il castello nel paesaggio dei Peloritani*").



Fig. 1: Ground (orography, dry-stone walls, access)

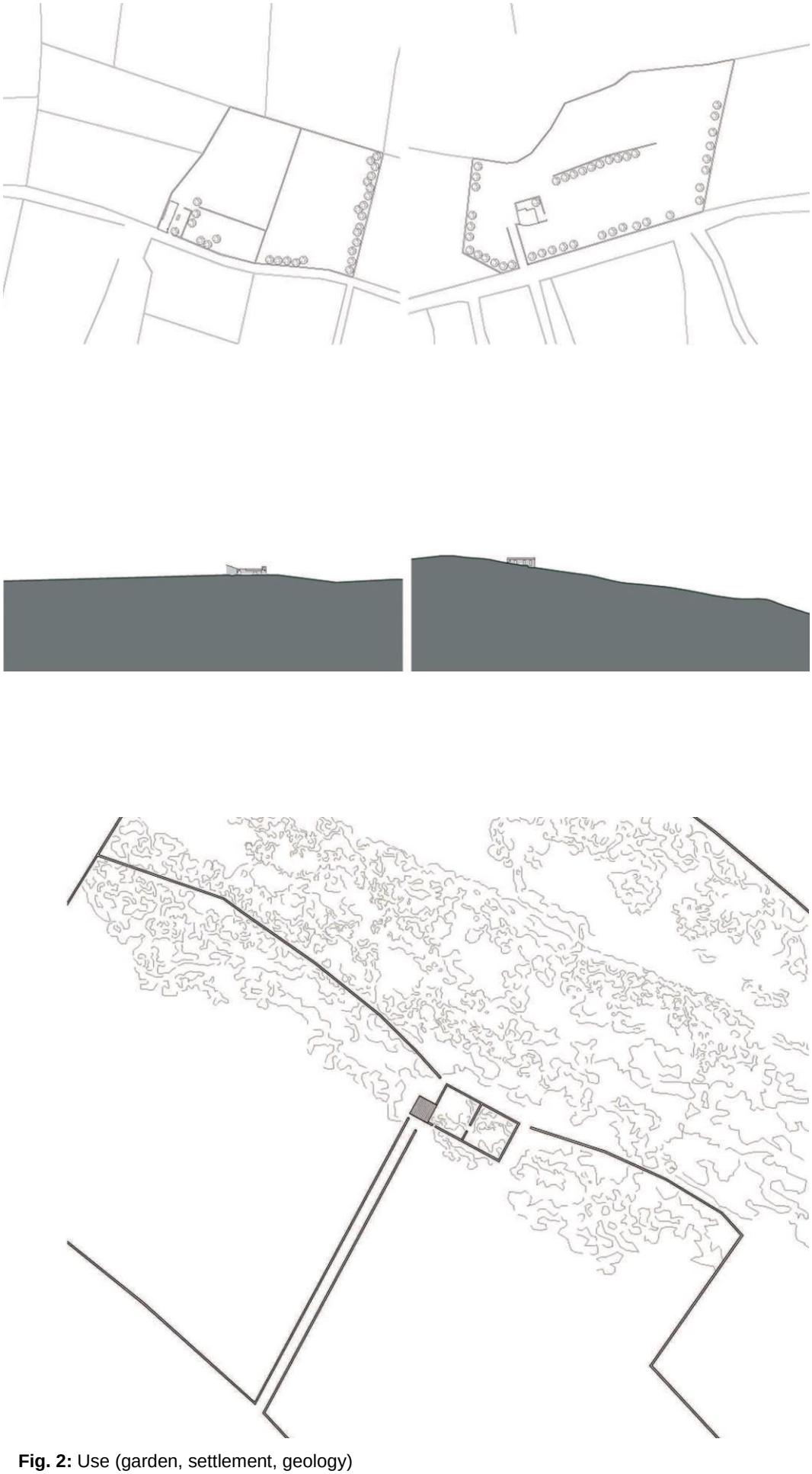

Fig. 2: Use (garden, settlement, geology)

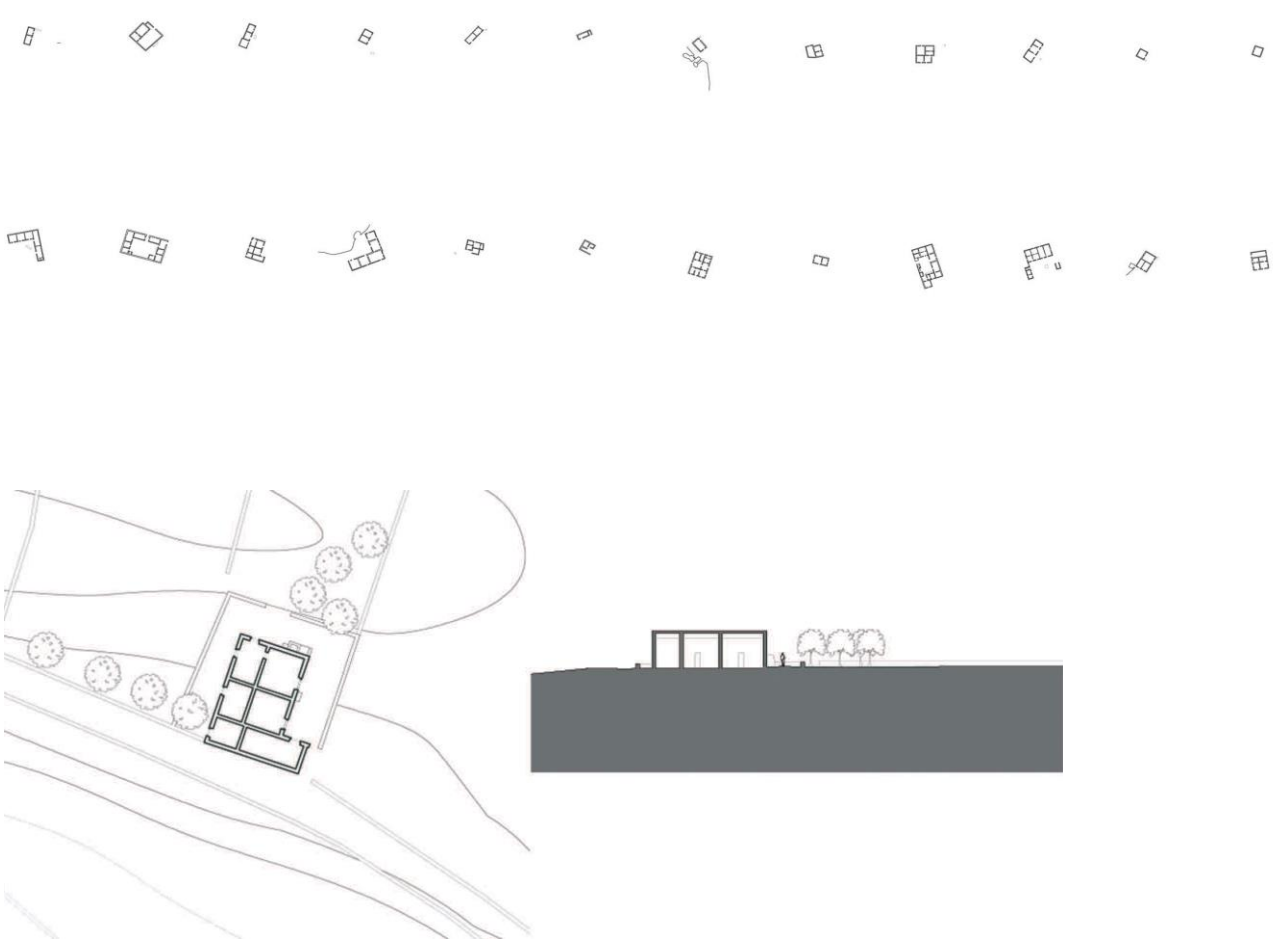

Fig. 3: Domestic (exposure, baglio, hearth)



Fig. 4: the little rural house's elements

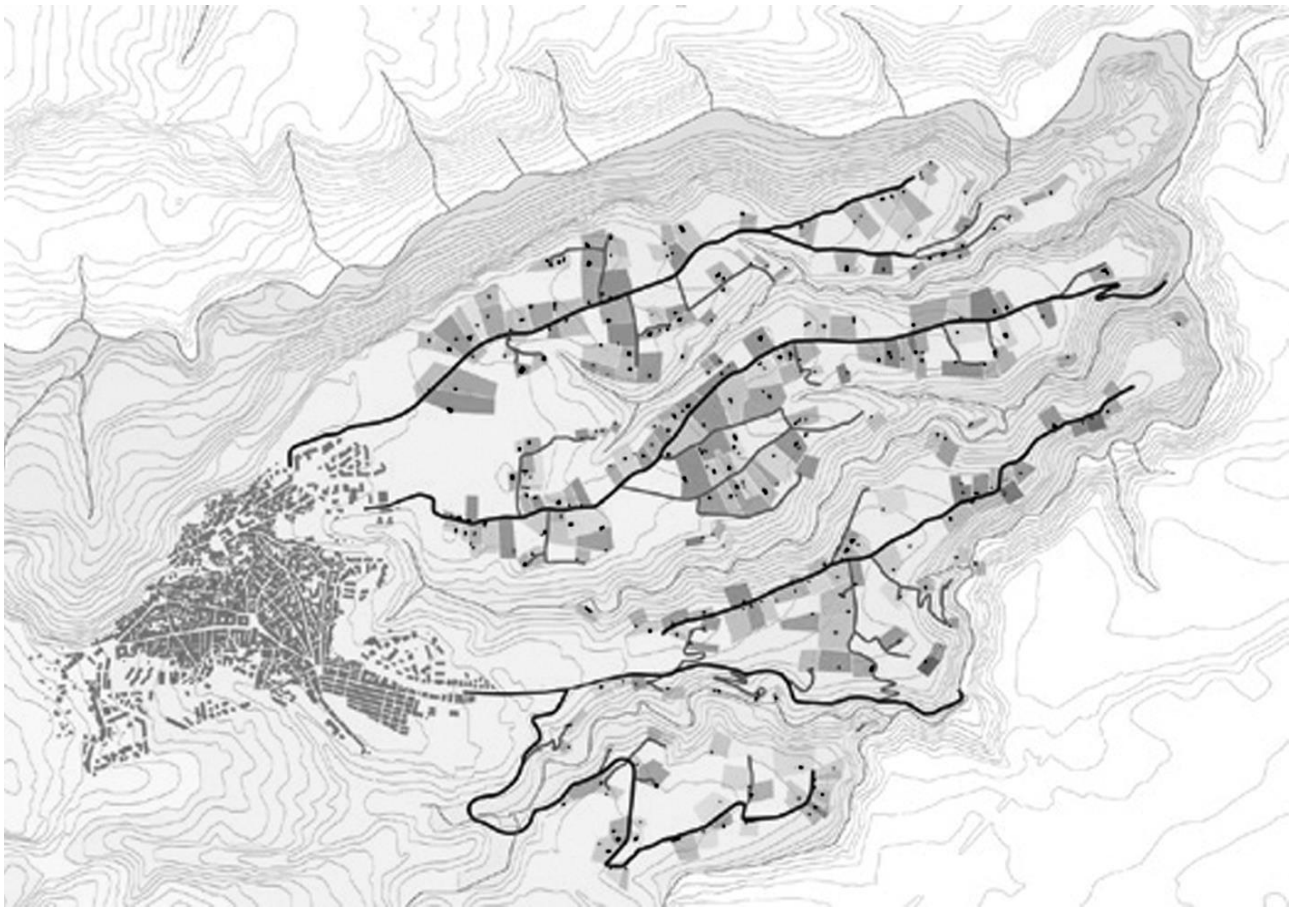

Fig. 5: a new metropolis?

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COASTAL ARCHITECTURE
Characteristics of specificity and identities expression

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Abstract
The artifacts that settle the Italian coast, on the edge of the consolidated city, in correspondence with the conspicuous sites of the coastal geography, stage the vocation of a landscape strongly distinguished by the combination of lands forms and forms of architecture capable of interpreting it, determining places characterized from a strong cultural identity.
The question of the determination of places is a theme that has its roots in the ancient world of Greek culture where precisely the geography of the territories was described by the evidence of the presence of some architectures to mark the conspicuous places; The Peutingerian tabula is an evident example of a geography constructed by "evident points".
Landscape, in this sense, is a form of language, therefore a way of expressing itself - through architecture - of a community that inhabits a certain environment and can be defined as the equivalent of what man is memory.
The Italian coastal landscape is a clear result of the "happy alliance" between forms of the land and forms of architecture that establish the condition of the coastal limit. A concatenation of places characterized by clear specificities that have been recognized over time and therefore have been stratified in a palimpsest of signs in which the inhabitants have left their own testimony in the various eras. The proposed essay intends to recognize the structuring value of architectural evidence in determining the places of the coastal landscape in a series that focuses, in large part, on some evidence of the territory of southern Italy. This reading is proposed as a preparatory tool for the architectural project.

Keywords: Heritage, Stratification, Conspicuous coastal place



Monumento ad un poeta morto

1. The limit between the land and the sea

The artifacts that settle the Italian coast, on the edge of the consolidated city, in correspondence with the conspicuous sites of the coastal geography, stage the vocation of a landscape strongly characterized by the combination of forms of the territory and forms of architecture capable of interpreting it, as well as some places of coastal geography find their representativeness (also from an iconic point of view) thanks to the presence of some architectures capable of interpreting the condition of the limit between the land and the sea.

The research, which in this essay presents partial results, aims to recognize the way to build the settlement form capable of linking territory and limit; From the recognition of the way of building the settlement form comes the idea of identifying forms of construction of the place that are intended as mode to define the space that is constituted including the way in which architecture is to comment on the value of the physical and natural substratum of individual sites, in this sense the formal characteristics of the physical substratum become a sort of hypertext underlying the definition of the place and the architectures that establish it. Therefore, on the one hand, for research it becomes necessary to recognize the formal characteristics that the forms of the physical substrate offer us and on the other hand to recognize how the architectures that insist on it generate relationships.

The emergence of certain conditions underlying the construction of the places that establish the limit of the coast is a question that has its roots in the ancient world. In the first instance we want to define the Palingenesis[1] of certain relationships that have linked the conspicuous places of the coast and specific artifacts.

The emergence of certain conditions that underlie the construction of the places that establish the limit of the coast is a question that has its roots in the ancient world. In the first instance we want to define the Palingenesis of certain relationships that have linked the conspicuous places of the coast and specific artifacts.

Wishing to introduce a reading of certain events (perhaps in some tendentious passages), we will therefore try to reconstruct a genealogy of these relationships between the form of the limit and that of architecture, for what is the point of view of the writer, in order to give incipit to a theory that traces the problem of the "election" of some places of coastal geography in the Greek culture of the ancient world.

The theme of identifying places through the presence of certain architectures in specific points of the coastal geography is a theme that runs through the history of the Mediterranean landscapes and is linked to the techniques of “on sight” navigation. As an example, in the representation of Capo Colonna in a drawing of the Roman Code Carratelli (fig. 1) of the 600 the place is identified as "head of the columns" by matching the toponym with the remains (at the time two columns) of the dedicated temple to Hera Lacinia or in the detail of the mosaic (fig. 2) preserved in Ostia Antica in piazza delle corporazioni where the port of silence (today Capo Palinuro) finds its figurativeness through the presence of the architecture that marks, of that geography, a precise point.

1. The (ancient) world for notable points

The question of the determination of places is a theme that has its roots in the ancient world of Greek and Roman culture where precisely the geography of the territories was described by the evidence of the presence of some architectures to mark the conspicuous places; It is not possible to understand the logic underlying the construction of some places of coastal geography in the ancient world without also referring to the ways in which, in those times, the geographical space must have been perceived, which in essence should not have been a space constructed by coordinates. rather, a space built for significant points, like a subway map (Frejman, A., 2018). Think for example of Anaximander's map that brought Delphi back to the center of the Ancient World (Scott, M., 2015) not because it corresponded to the center of the world but because it was an important crossroads of trade and religious itineraries. In fact, in Delphi, the main temple of ancient Greece had been built, the sanctuary of Athena, and the oracle of Apollo, institutions that somehow unified all Greek cities.

In Anaximander's map (Fig. 3) there is therefore a relationship between the religious center and the geometric center of the world: Delphi was the most important sanctuary at the time, there are the central temples of Apollo and Hestia. In the map, which is perfectly round, all the points, at equal distance from the center (geometric) are also found in a situation of equal distance from the religious center (isonomy).

[1] From the late Latin palingenesĭa which derives from the Greek παλιγγενεσία formed by πάλιν (palin-) that is, "again" and from γένεσις (-génesi) that is "generation, creation, birth". Intended as in its figurative sense and referring to the conspicuous places of the coast as a moment of regeneration, renewal, rebirth, change.



Fig.1 Capo Colonna in a drawing of the Roman Code Carratelli.

Fig.2 Detail of the mosaic in Piazza delle corporazioni, Ostia Antica.

Fig.3 Anaximander's Map. Reconstruction by A. Hermann (1926).

Exactly like in the agora (described in the Odyssey), in which bystanders are placed in a circle at an equal distance from the center (Torricelli G. P., 2006).
Perhaps even more evident example of how the ancients perceived geographic space "by points" is that of the Peutingerian tabula (fig. 4) which, with the intention of describing the tracks of the entire "Roman" world, gave life to what we could today assimilate to a thematic map.

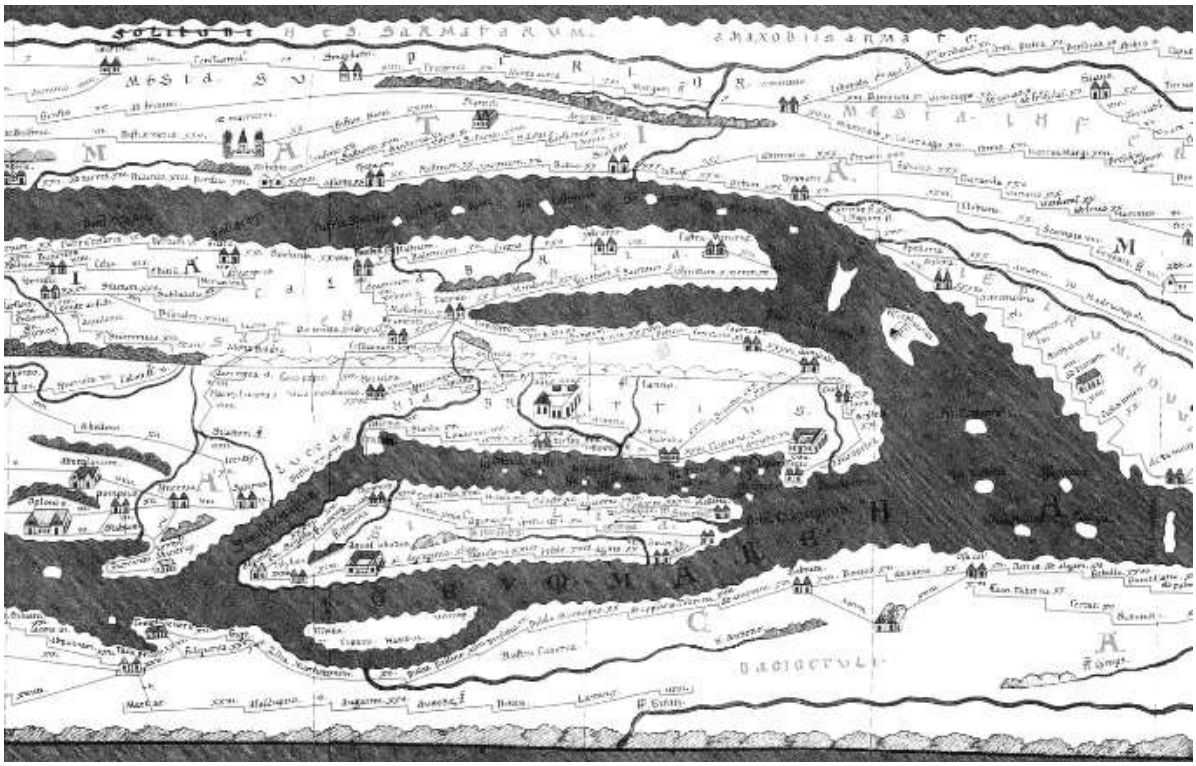

Fig.4 Detail of Puglia in the Tabula Peutingeriana.

1. Ancient paradigms

From the writer's point of view, this way of perceiving geographic space in the ancient world explains why some places in coastal geography, over time, have taken on important meanings and justifies the presence of some iconic architectures to mark precise points.

In Greek culture, the custom was to signal the coast to sailors by means of fires emitted from the top of the temples: think of Capo Sounion, the temple of Venus on the top of Colle Guasco in Ancona (Marche), the temple of the Goddess Cupra in Cupra Marittima (Marche), to that of Athena in Punta Campanella (Campania), to the temple E of Selinunte (Sicily), to the temple of Aphrodite (as has recently been proposed) in Caulonia, to that of Apollo Aleo in Cirò Marina (Calabria) or that of Cape Colonna, just to name a few (Giardina, B., 2017).

We know of Cape Sounion that it was emotionally important for the Athenians as it is the most extroverted point to the south of the Attic peninsula that the Athenian navigators and warriors could see while navigating the Aegean. For this reason, since the archaic period we have evidence of a temple at Cape Sounion and dedicated to Poseidon; Temple was then rebuilt in 440 following its destruction by the Persians.

With respect to the territory, the temple occupies the top (fig. 5) of the promontory (about 60m above sea level) unlike the demo which instead is in the lower part of the head, "in protection" from strong currents. The will of the ancients was precisely to build a landscape that could be recognized also and above all in its perception from the sea.

The story is like to that of Cape Colonna located in south of the city of Crotone.

The promontory of Cape Colonna has the shape of a "hook" that occupies the easternmost part of the entire Calabrian / Lucanian peninsula and the temple dedicated to Hera[2] is arranged on the edge (fig. 6) of the "hook" at the most exposed towards the basin of the Ionian Sea perpendicular to the coast line[3], it is easy to imagine how the imposing sacred building required a regularization of the edge of the promontory on which it had to soar in all its monumentality (Spadea, R., 1993) as if to remember the link with the ancient motherland, but also with that millenary cradle of civilization that is the Mediterranean. The succession and reconstruction of more than one Templar building reinforces the idea that the place designated by the first Greek colonists for the cult of Hera was deliberately the promontory of Capo Colonna. The goddess was the protector of nature, of navigation, and "liberator", as evidenced by some fragments of bronze tables that refer to the liberation of prisoners and slaves. The temple was supposed to be visible to navigators as a place of refuge and freedom, and it is therefore no coincidence that this latter idea is connected with the sea, so the choice fell on that tongue of land which is closely and closely connected with it. visible relationship.

Even if the above examples, and referable to the classical age, show the desire to interpret the forms of the coastal limit, perhaps, from this point of view, an even more emblematic case is that of the sanctuary of Athena in Lindos which characterizes the approach to the island of Rhodes. The Temple dedicated to Athena Lydia, whose dating around 300 is evidenced by an inscription on the lintel of the door between the pronaos and the naos, has an amphiprostyle pattern, with a double facade, one towards the entrance to the sanctuary and one towards the port southern city (Lippolis, E., 1996).

Inside the sanctuary, set on a symmetrical layout, the temple is off-center with respect to the composition to mark the limit and precisely characterize this threshold (Fig. 7). The temple is once again an element that characterizes the landscape from afar and therefore the landing place for the city of Lindo which instead is placed "in protection" with respect to the rock spur. The temple of Athena Lydia was located, not in the center of the available space, but right on the edge of the plateau, demonstrating the remarkable sensitivity for scenographic solutions typical of Hellenistic architecture, which exploits the characteristics of the natural landscape to create suggestive results. The particular orography of the acropolis and the arrangement of the sanctuary on artificial terraces supported by

[2] The origins of the cult of Hera Lacinia and the sacred areas of Capo Colonna can be found in the testimonies that emerged from the excavation carried out between 1987 and 1989, contained in the illustrated booklet: "The treasure of Hera", by the Municipality of Rome and by the Ministry for Cultural Heritage and Activities, edited by Roberto Spadea, ET editions, Milan.

In those years the remains of a rectangular-shaped building of m. 19.70 per m. 9.50, referred to as building "B", considering the well-known sanctuary as building "A". It is located immediately north of the latter. The oldest phase of construction was established within the first twenty-five years of the sixth century BC.

[3] In this regard, it is also right to remember that all the Templar buildings dedicated to Hera were characterized by an East-West orientation.

sturdy retaining walls were used to create suggestive landscape effects, which were emphasized by the skilful use of the arcades (Rocco, G., 2017).

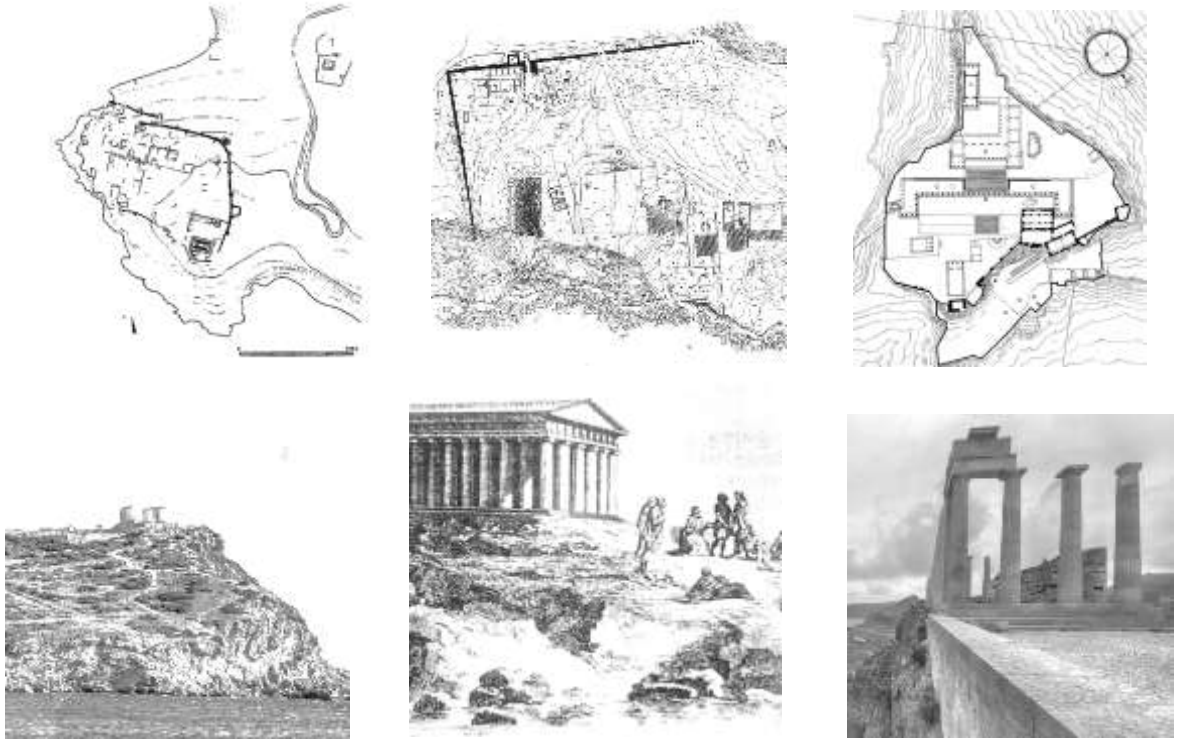

Fig.5 Sanctuary of Poseidon at capo sounion Cape Sounion. Photo and general plan of the demo (Graphic elaboration by Goette. 2001).

Fig.6 Capo Lacinio. Sanctuary of Hera Lacinia, detail of the sacred way with the remains of the hestiatorion and the katagogion Building B and the Temple (Seiler 1996, p. 254).

Fig.7 Lindos, Athenaion. Photo and general plan: A. temple; B. upper terrace; C. stoa with paraskenia; D. colonnaded screen and stair to the upper terrace (elaboration by the A. of a drawing by M. Paolini, from E. Lippolis in Livadiotti, Rocco 1996).

In these examples cited there is the coexistence of the Architectural form and the form of the physical substrate which appears not antinomic, quite differently one form flows into the other, one form adds to the other by not opposing. The two forms, that of the earth and that of Architecture, never get confused. There is no "imitative" mode if its appearance is not imitated, on the contrary the form of architecture develops according to a "language".

2. Stratification of the Architectural form and modification of the coastal landscape

The places settled by the coastal architectures, with particular reference to Italy, represent a heritage characterized by a strong stratification where as in a schedule on which several generations have engraved, corrected, deleted and added signs and elements (Corboz, A., 1985) it is possible to trace the signs of the different cultures that have left a testimony, so some paradigmatic cases express the way in which architecture, by stratifying itself, chooses specific places within the development of the coastline and on a different scale measures a landscape unit; It is therefore possible to identify some categories of form capable of expressing the meaning of the place, or to describe the underlying formal structure considering the way in which the artifacts determine the perception of the landscape and therefore the space through topological and topographical relationships with the site and its natural forms.

Recognizing the specific characteristics of places is a necessary condition as the shapes of the soil define the character of places even before the architecture takes over. Then the architectural forms of some artifacts take on the ability to stage the identity of the landscape. Even the Italian coastal landscape, in some salient features, is strongly marked by the features of this 'happy alliance'; It is in these places that the coastal landscapes and artifacts of civil and industrial archeology return ancient

layers and new levels that overlap, so it is important to recognize the structuring value of the territory, but also to recognize that deposit of places, things, but also of material and immaterial cultures.
A structure, therefore, made up of ecological networks and archaeological networks builds these palimpsests, prefiguring new uses capable of rediscovering the relationships between things and the landscape within a single overall vision that favors a new condition of use of the territory; We are therefore not looking at expansive forms but at forms of territorial coalescence (Calafati, A. G., 2004), destined to combine the old attractive centers with the new points of attraction and with the intermediate center (Gausa Navarro, M., 2002) within the territories themselves. in these cases we understand how the accumulation of signs, of small slips, of modifications[4], has changed the meaning of the places, reconfirming them and adapting them to new uses.

2.1. Accumulation

Within the territorial frame of southern Italy it is very easy to find the presence of some architectures or groups of architectures which, positioning themselves along the coastal limit, mark precise points within the development of the coastline, this is the example of Punta Meliso in Santa Maria di Leuca, or de Finibus Terrae on the southernmost tip of the peninsula where the Lighthouse (1866 on the base of the ancient sixteenth-century tower), the Marian sanctuary (343), the monumental and terminal waterfall of the Apulian aqueduct (1939) and the colony Scarciglia (1920) stands at the same point (Fig. 8); A condition that, due to the question of accumulation and geographical exceptionality, is similar to that of Punta Penna in Vasto, the cornerstone of the Adriatic coastal path[5], where on a telluric plate take place the lighthouse built in 1906, the church of Santa Maria di Penna light of the 400 (rebuilt then in Romanesque style in 1887) the sixteenth-century tower of Punta Penna and the residential district ATER from the early 1900s for public housing (Fig. 9). From the same family of places we can recall once again the case of Cape Colonna where in the current situation remains the column, synecdoche of what was the temple of Hera Lacinia, the Lighthouse, the Christian sanctuary dedicated to the Madonna of Cape Colonna, the Torre Nao (XVIII), and the National Archaeological Museum; All elements that settle that place that was also called "border stone" (Fig. 10) a precise point used to define the navigation limits (this name was in fact already part of the navigation agreements between Rome and Carthage and later, in 282 a.C.).



Fig.8 Punta Meliso, Leuca, Sanctuary of Santa Maria de Finibus Terrae _Signing a point and building an internity.

Fig.9 Punta Penna, Vasto, The Lighthouse, The church of S. Maria di Penna Luce and the Ater district _ Cardodecumanus plant.

Fig.10 Capo Colonna, Crotone, The Lighthouse, The Nao Tower, the Sanctuary, The archaeological area _ the paratactic space.

[4] The theme examined in the years in which Vittorio Gregotti was director of Casabella - comes from a very famous novel by Michel Butor (founder of the noveau roman), La Modification, and alludes to the small shifts in the mood of the protagonist that lead him to radically revise their starting positions. Therefore, referring to the theory of Architecture, we refer to: small slips which, through a series of projects, can lead to reading, interpreting, making it work, giving a role, a meaning to a place that is radically different from the previous one. The other escape of the theme was to confront a sort of mythology of the object, of the architectural object, of the single object, as if in a novel we isolate some words, some phrases and think that it is from Tolstoy of Stendhal or of others, it is valid for that sentence, for that word. The same happens in the city when we solve some things and don't realize that they have meaning within a larger network of relationships with the context. (B. Secchi p.12)

[5] In this regard, on the subject, see also the series the Adriatic Lighthouses Directed by Nicola Martinelli and Giuseppe Carlone.

1.1. Measure

A significant case is also that of the series of artifacts which in their mutual arrangement they are capable of “Measure” a recognizable landscape unit; This is the case of the military architectures on the island of San Pietro and San Paolo which together with the Punta Rondinella, the Lighthouse of San Vito and the Castello Federiciano describe the size of the “Mar Grande” which the city of Taranto faces (Fig. 12) or the towers (Torre del Serpe, Torre sant’Emiliano) which mark the landscape south of Otranto where the lighthouse of Punta Palascia in the easternmost point of the whole Italian peninsula is set on the remains of what was once the Pelagia tower (Fig. 13). Even more interesting from this point of view is the case of the territory of San vito lo Capo where the architectures (Torre del cofano, Torre Isulidda, Faro di San Vito lo Capo, Torre dell'usciere, Torre Impiso) interpret the shape of concavity and convexity of the territory around the Lighthouse (Fig. 11).



Fig.11 San Vito Lo Capo, concavity and convexity.

Fig.12 Taranto, the great sea described by military architecture.

Fig.13 Otranto, the coast marked by a series of coastal towers

3. Conclusions

The transformation of the architectures that build the coastal heritage must be faced considering the way in which the latter determine the place and therefore the space through the topological and topographical relationships with the site and its natural forms. Interpreting and grasping the meaning of the place is already a project that in this sense can be considered as an instrument of knowledge (Rossi, A., 1967) capable of offering the form as a "scientific" verification of the episteme assumed (Farinelli, F., 2007) in its cognitive phase, inductively identifying the elements and constitutive grammars of the coastal architectures that constitute the cornerstones within the landscape, objectively revealing its values and structures.

The project has scientific value as architecture is a practice that produces itself theory: it is not possible to build without producing or referring to a theory. The theory is like the rib for the arch, it disappears when this is built (Martì Aris, C., 2006). The theory in this case arises "as part of concrete action, like the" thought of form "which is in fact the" task of architecture "which therefore does not make use of a theory but generates it, produces it, compares it with other practices to make visible those "fragments of truth" which are in fact the very end that practice and theory propose "(Rella F., 2016).

Architecture, and in this case the architecture that chooses certain specific places of the coastal geography, is form but at the same time it is the form of the world that architecture proposes as a subjective expression; Each formal structure, but also the landscape to which the single structure belongs, is able to tell its story and other stories to those who are able to collect its story: the presence of certain structures in specific places changes as well as landscape of the world also the thought that “thinks” and modifies the world. In this way, the architectures offer themselves throughout their history and open a dialectical confrontation with the “fragments of truth of the present”. The project therefore, for these places, has the mission of identifying and selecting those fragments of the present that can establish relationships of varying degrees with existing architectures, through the use of appropriate

design techniques, declined each time in a coherent and identifying manner with respect to the conditions that the project finds and to the transformations it induces (Gregotti, V., 1984).
In this sense, one of the ways to face the challenge posed by contemporary European territories is to update the concept of modification (Gregotti, V., 1984). The project of modification is a limited transformation of a more general context. Modification is in this sense a useful tool. Like incremental development, it calls for a multitude of discrete operations, far removed from large architectural gestures. At the same time, however, it introduces a gap. The project of modification is inserted between the folds of the context to change or reinterpret its meaning. It is therefore an action that conditions and transforms the incremental logics, placing itself in direct continuity with respect to them.
The anthropogeography of the sites, as a physical way of being in its history, is the only material that, by limiting and proposing, allows us to walk through the stages of the project; In this sense, the design of the space between things is just as important as things themselves; this consideration refers not only to the theme of urban design but also to that of the landscape. The landscape is a physical way of being in history, and therefore the physical presence of architecture (which is not the representation of reality, is reality itself) proposes a new signification of the anthropogeography of the landscape downstream of which the conviction remains that both the anthropogeographic and the natural landscape must be continually built and rebuilt.
This approach is one of the possible approaches and as such tries to assume a posture with respect to the interpretation of coastal architecture that does not focus only on artifacts but extends to what we believe to be a founding element of its meaning, namely nature.
The essay tried to introduce some categories of the form: **isolation, accumulation, measurement**; Each of these can correspond to a form and suitable design techniques to make the "truth" of the real form evident, bring to beauty.
It could be argued that the focus of research on the architectural project shifts from a "foundational" intentionality of the sense of things, to an "interpretative" intentionality of the sense settled in things (Moccia 2018).
With the intention of accepting with greater sensitivity, the "invitation" that the coastal heritage offers us, with the aim of reinforcing the intrinsic sense of "permanent signs" through the transformative action of the project.
The concept of transformation, however, implies recognizing that we always start from something pre-existing, something that transforms itself preserves invariants, elements of continuity. (Marti 'Aris C, 2007)
This does not prevent the project from having the ability to introduce discontinuities into the places of the schedule, fractures which, however, first had the ability to meditate on the meaning of things themselves in an interpretative dimension, opening to new scenarios and renewed possibilities of theoretical research.

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Protection and development of Real Sites: two experiences compared

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Abstract
It dates back to a few months ago the news of the drafting of a memorandum of understanding between the Real Sito of Carditello Foundation, the Coldiretti with Giovani Impresa of Caserta and the San Leucio Textile Network (promoter of the San Leucio Silk brand) for the development of silkworm culture activities through the planting of mulberry trees and the breeding of silkworms in the grounds of the Foundation and around Carditello.
This event, trivially identifiable as an action of valorization of the Real Estate of Carditello, lays the foundations for the creation of a new connection between the two real sites, both created, as part of the complex programme of reorganization of the territory of the Bourbon kingdom, by the pencil of the architect of court Francesco Collecini.
The two sites have in common a fate of light and shadow and complex operations of rebirth.
The rebirth of the site of San Leucio was triggered by the interest shown by the academic world in the social, technological, architectural-urbanistic experiment operated by the Bourbons.
Differently, the rebirth of the Real Sito in Carditello takes place with active involvement of the community, according to a participatory methodology from the bottom up.
The active involvement of the community materializes the new concept of protection introduced by the Council of Europe Framework Convention on the Value of Cultural Heritage for Society, issued on 27 October 2005, ratified by Italy only on 23 September 2020, after a long and troubled path.

Keywords: Real Sites – Resilience- Restauration- Landscape Riqualification

It dates back to a few months ago the news of the drafting of a memorandum of understanding between the Real Sito of Carditello Foundation, the Coldiretti with Giovani Impresa of Caserta and the San Leucio Textile Network (promoter of the San Leucio Silk brand) for the development of silkworm culture activities through the planting of mulberry trees and the breeding of silkworms in the grounds of the Foundation and around Carditello.
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The rebirth of the Real Site of San Leucio is the result of an in-depth cultural discussion, born in the academic field in the early seventies and lasted many years.
In the second post-war period of the twentieth century, when the idea of the ideal city conceived by Ferdinand IV definitively disappeared, the inexorable process of relocation of silk production expanded considerably due to the incompatibility between modern machines and the protection of historic buildings, up to the dismantling of the Belvedere plants, which inexorably fell into a state of complete abandonment.
This condition remained until the early seventies, when, after decates of oblivion, a new interest in the Real Site of San Leucio, laid the foundations for a policy of protection and enhancement of the complex.

The new interest was born from the diffusion in Italy of the studies carried out in the 50s by two professors of the University of Birmingham: Donald Dudley and Michael Rix, considered the founding fathers of industrial archaeology and the official recognition by the Anglo-Saxon authorities of the cultural importance of the industrial decommissioned complexes, the day after the protests fot the demolition of the Euston Station, one of the oldest railway stations in London.
The attribution of cultural interest to certain categories of industrial complexes, gave origin also in Italy pioneering studies and real archeological campaigns like those conducted by Eugenio Battisti, Franco Borsi, Rossana Bossaglia (workers' village Crespi d'Adda), Antonello and Massimo Negri.
In the early seventies, Eugenio Battisti, professor of Art History at Pennsylvania State University, led by Raniero Corbelletti, identified in the Belvedere complex and in the workers' houses, an exemplary case study on which to concentrate his research.
Research merged, then, into the international conference held at the Rotonda della Besana in Milan in July 1977 on occasion of the exhibition "San Leucio. Archaelogy, history, project", considered the first important moment of Italian debate on the topic of industrial archaeology.
The research started in 1971 by Battisti with the involvement of students from Pennsylvania State University and the Department of Architecture of the Polytechnic of Milan were based on methodological concepts of the "anthropology of the built form", used by Richard Plunz in the social and urban project of renovation of Mantua, a surburb of Philadelphia. Studies, which ended only in 1973, allowed for the first time an accurate study of documentary and literary sources, the architectural relief of the site and the drafting of project plans for its restoration and functional recovery.
The studies of Eugenio Battisti, that had an international echo, fuelled the study conference "San Leucio: assessment of two centuries of cultural history activity. Prospects for relaunching.", organized in 1981 by the Municipality of Caserta with the patronage of the Council of Ministers, in which discussed the proposals advanced for the restoration of the Belvedere.
The physical remains of the ferdinandeo experiment attracted in 1984 the interest of two important industrial groups, FIAT and BENETTON, interested in promoting the restoration of historic factories aimed at functional reuse rather than a process of sterile museification.
The two groups financed with 300 million lire studies and projects for the renovation of the Bourbon site, involving six excellent names of architecture: Alvaro Siza Vieira, Léon Krier, Francesco Venezia, Richard Plunz, Franco Purini e Laura Thermes.
The five project proposals, elaborated for San Leucio, the Royal Palace of Caserta and the Carolino aqueduct, were published in the September issue of Casabella[1], with introductory writings of Carlo Magnani, Paolo Di Caterina, Cettina Lenza, Pier Giulio Montano.
Alvaro Siza, starting from the sketches made on territory, proposed to integrate Bourbon factories with the recent settlement system with the residential expansion of the area south-west of the Belvedere, around an evocative semicircular space of the central square of Ferdinandopoli. The abandoned quarry becomes instead a pretext for the construction of an amphitheater, reintroducing the idea of an east-west axis. The building of an indoor pool, a lake and a solarium, on the other hand, constitute the north-south axis of the Plan.
Leon Krier's project involved, in contrast to industrial urban expansion, cause of the degradation of the *Ager Campanus* area, an urban and agricultural reconstruction based on a radical urban contraction, through the demolition of the already existing large industrial and commercial complexes and their reconstruction in small units integrated with housing.
The cities of Caserta, San Nicola la Strada and Maddaloni, are transformed into a group of city federations, each of 33 hectares consists of four districts.
The urban agglomerations of San Leucio, Briano, Sala, are also divided into three small indipendent towns, while for the Real site of Carditello is previewed the constitution of a small indipendent city
Through the methodology of classic restoration, Krier proposed to complete the Vanvitellian project of the the Royal Palace of Caserta, destinated to house the "European Academy for the Reconstruction of Crafts and Fine Arts", building the four towers and the central dome according to the Vanvitellian project.
The Belvedere building, intended to the seat of the "Silk Academy", was restored to its seventeenth-century appearance by eliminating the bodies added in the Bourbon period and building in their place two separate pavilions.
Francesco Venezia's project planned the renovation of the Bourbon palace and the construction of an underground swimming pool in the courtyard of the Belvedere, supported by a giant order of arches, the creation of the "Hydraulic Museum", in the northern hall of the palace and a long hanging path connecting with the waterfall of the Royal Palace of Caserta. The Belvedere building was thus transformed into the natural point of arrival and accumalation of the Carolino Aqueduct.
Franco Purini and Laura Thermes propose the restoration of the Belvedere buildings and their partial duplication, the reforestation of Monte San Leucio, the realization of a linear residential system in the

[1] Casabella n.505, Year XLVIII, September 1984, pp. 4-25

valley Civicorno. The proposed architectural model houses both the residential and the productive functions, recalling the housing model of the working class-district designed by Collenici.
Richard Plunz, who had already deepend his knowledge of the Real Colonia of San Leucio, proposed design solutions starting from the intrisic characteristics of Bourbon architecture. The plan previewed the requalification of the elliptical square and the central axis in front of the Royal Palace of Caserta by burying the railway line and the enhancement of the path of the Carolino Aqueduct with the construction of a garden in an area close to the Ponti della Valle. For San Leucio provided for the creation of a delimitation of Piazza della Seta through the construction of residential buildings and the restoration of the Belvedere Palace and the Filanda dei Cipressi, used as museums.
The Vaccheria area would be completed with terraced gardens downstream of the Casino Vecchio and with new residential buildings near the entrance arch.
These project proposals together with the studies, research and surveys carried out by the students of the Department of Architecture of the Polytechnic of Milan provided the basis for the restoration work financed by the Fund F.I.O (Investment and Employment Found) created in 1982 to realize the interventions immediately implementable in the fields of infrastructure, environment and cultural heritage, capable of increasing employment and boosting the national economy.
The economic studies conducted on the potential of the restoration of San Leucio estimated that every tourist, visiting the Royal Palace of Caserta, to visit the site would have increased his time in the city and spent on board, lodging, souvenirs and various consumptions, a sum of about 30.000 lire.
The analysis allowed the approval of the Ministry of the Budget that, during the period 1985/1988, granted to the Municipality of Caserta a financing, (divided into three lots), of aproximately 34,196 billion, that allowed the implementation of the restoration.
The executive project for the restauration of the Belvedere complex drawn up by Infrasud Progetti, with the advice of Romeo Ballardini, was approved by the Ministry of Cultural and Environmental Heritage with note n.3114 III B1 of 17 April 1987, by which the Director General gave a favorable opinion on the static consolidation methodology envisaged by the project, considering suitable the use of traditional construction techniques.
With the same note the Ministry agreed with the destinations of use of the project and asked for a greater clarification of the functions.

Whether the rebirth of the Bourbon complex of San Leucio was triggered by the interest shown by the academic world in social, technological, architectural-urban experiment, that of the Real Site in Carditello is characterized by a participatory methodology bottom up with the active involvement of the community.
Also for this site, the Unification of Italy marks the beginning of a long period of abandonment and decline.
By Law n. 1792 of 3 October 1919, the King Vittorio Emanuele donated the Estate of Carditello for the distribution of land between peasants and war veterans to the Napitonal Opera Combattenti, that is a Social Welfare Institution built up during the First World War.
On 2 October 1948 the National Opera Combattenti donated the Real Site to the Consorzio Generale di Bonifica of the Lower Basin of the Lower Volturno.
The woods were cut down and all that had been greatness place remained a memory.
The first consolidation and restoration works started in 1968, allowed ten years later, the establishment of the Southern Agriculture Museum, by the National Institute of Rural Sociology, realized with the contribution of the Cassa per il Mezzogiorno, especially from the Cattedre Ambulanti, that They had the objective not only of teaching techniques and advances of the cultivations but also to collect the testimonies of the peasant culture existing in the southern Italy.
The lack of a function that would allow the site to get the right attention, led the Region to approve on 21 february 1989, after countless debates, meetings, conferences, the project drafted by Lucio Morrica, professor at the Faculty of Architecture of the University of Naples, for the restoration of the Bourbon residence with the aim of making it the seat of the faculties Agriculture and Veterinary. However, the designed project never began.
Between 1998 and 2001 a financing of 2.582.284 euros from the Game of Lotto, allowed the Superintendence of Caserta to complete a restoration work of the central building and some stables.
However, the isolation of the site in an area prey to criminal and degenerative designs fot the domination of territory, allowed continuous thefts, which deprived the Bourbon residence of precious architectural and decorative elements[2].
Meanwhile, the waste emengency, had prompted the Campania Region to identify in the area of Marizzella, inside the Bourbon estate, the site for the creation of a landfull of municipal solid waste, to which they have been joined in the time clandestine dumps, often object of dangerous burnings.

[2] Over the years travertine benches, doors, gates, fireplaces, pieces of frescoes, an entire staircase, floors, columns, stucco have been stolen

In 2003 the Real Sito, already put on sale, was foreclosed due to too many debts accumulated over the years by the Consorzio di Bonifica of the Lower Volturno.
The great state of degradation and neglect affected the attentionof the community and of different cultural associations that, in the attempt of a social, cultural and economic redemption, gave birth to a movement of opposition and contrast to speculative projects.
The acquisition operation to the State assets, which ended with the purchase at auction of 8 January 2014, and the creation of the Real Site Foundation of Carditello[3], are, in fact, the result not only of the interest of local and state institutions but also of the active participation of citizens.
Citizens, individuals or groups of associations, who have been the authors of an important public awareness campaign as in the case of collecting signatures against the sale of the Real Site at auction, but also authors of concrete actions such as the extraordinary opening to the public of the Site, the realization of works of arrangement (such as mowing the lawn), the creation of a voluntary supervisory service.
The rebirth of the Real Site in Carditello thus becomes the objective of numerous initiatives of civil engagement and volunteering by subjects and associations that over the years have fought for the recovery of the good, its history and its potential ("Associazione Agenda 21 per Carditello e i Regi Lagni", "Associazione per i Siti Reali e le Residenze Borboniche", "Orange Revolution", Piazze del Sapere).
Initiatives that synthesize and materialize the new concept of protection introduced by the Council of Europe Framework Convention on the Value of Culturale Heritage for society, also known as the Faro Convention.
Italy, which has an important legal tradition and great skills in the field of protection, as early as 1947 with Article 9 of the Constitution had tried to create a close link between the protection and '*development of cultural and scientific and technical research*', assigning the task of 'landscape protection and historical and artistic heritage of the Nation' not only to a specific Ministry but also to the Republic, that is to the entire *res pubblica*, understood as community of citizens.
The Faro Convention, issued on 27 October 2005 and retified by Italy only on 23 September 2020, after a long and troubled path, goes further entrusting a leading role, until now unthinkable, to the so-colled "heritage community", defined in Article 2 as "*peolpe who value specific aspects of cultural heritage which they wish, within the framework of public action, to sustain and transmit to future generations*".
The active participation of citizens has accompained and supported the action of protection and institutional enhancement, reforced by the declaration of cultural interest of the architectural complex pursuant to Article 10 of the Code of Cultural Heritage with the Ministerial Decree n.270 of 24 February 2004 and the declaration of landscape interest with D.D.R. n.1863 of 2 October 2013 of the entire area corresponding to the former "Real Tenuta di Carditello", which originally covered an area of about 2.100 hectares.
The decree of landscape constraint subdives the entire area, considered of exceptional artistic and documentary historic value, in four areas where possible and prohibited interventions are identified:
Zone 1: Agricultural landscape of historical interest
Zone 2: Forest landscape
Zone 3: River landscape
Zone 4: Changing agricultural landscape
This last zone coincides, paradoxically, with the most critical area both from a landscape and environmental point of view of the entire territory of the Province of Caserta, in which the Campania Region, in 2008, in the midst of waste emergency, has implemented the landfill sites of Maruzzella 1-2 and 3, distant about 2 kilometres from the Bourbon residence.
For such area the protection rules preview the realization of plans of environmental restoration and, pending the complete relocation of activities in contrast with the requirements of protection (landfill sites, cement plants, etc.) require the implementation of measures to mitigate the impact of the landscape (vegetative barries, remedial misures).
From 2014 until today, unfortunatelly, nothing has been done to mitigate the impact of landfill on the protected landscape, but the approval in the service conference session of 19 February 2021 of the Landfill mining project on Marruzzella 1-2 landfill sites allows to suggest the beginning, in a short time, of an extensive landscape redevelopment, which will affect an area of about 282.200 square meters between the municipalities of San Tammaro and Santa Maria La Fossa.
The idea of implementing the technique of Landfill Mining was born, respecting the principles of the circular economy, after the sentence inflicted by the European Court to Italy to pay a penality of 120.000 euros for each day of delay in the correct implementation of the European directive on waste disposal in the territory of Campania.

[3] Declaration of landscape interest pursuant to art. 136 paragraph 1 letter. c) of the legislative decree 22 January 2004, n. 42 with D.D.R n.1863 of 02.10.2013 published in the Official Bulletin of the Campania Region n.57of 21.10.2013

The project aims to recover new useful volumes by removing from landfill sites the recoverable waste fraction (a volume equal to 1.650.000 mc), provides, at the same time, the greening of landfill areas, planting of shrubby essences to create visual barries and dust filter areas along landfill boundaries, the transformation of the ten plots into reinforced concrete with climbing evergreen vegetation,the creation of flowerbeds with fragrant tree essences such as Lavender, Broom and Rosemary.
In line with the principles and objectives of the European Landscape Convention, the intervention could create a social and participatory dimension of a heavily degraded landscape through the creation of cycle-pedestrian paths and equipped areas allowing their integration in a valuable rural context full of cultural values.

Summary considerations and conclusions

The Belvedere is the only case in Italy of production complex within a royal residence and has been recognizied, together with the Royal Palace and the Carolino Aqueduct, a UNESCO World Heritage Site. To date the museum destination has greatly reduced the link between the silk industries even though the bond is still alive in the community.
In this case it is a cultural asset that preserves an intangible cultural heritage: the art of silk that has made San Leucio known internationally.
To an analysis also superficiali it appears obvious as the potentialities of the Belvedere, as a centre of silk production and social experiment are not yet adequately valued despite the restoration and reuse of the site, which lasted fifteen years for a total of 55 billion lire, has already concluded several years.
The situation of the Belvedere does not appear different from that of the 90s, except for the worsening of the conditions of maintenance of the asset and also the hypothesis of integration with the Royal Palace, UNESCO site, is still only an intent.
For the site of Carditello, where restoration work is underway, another serious problem which affects the possible enhancement concerns environmental pollution resulting from the presence of State landfills and numerous illegal landfill sites, where toxic waste of all kinds is discarged, thus contributing to increase the state of abandonment of the area and the level of insecurity.
The rebirth of the Real Site in Carditello therefore plays a fundamental role not only in the enhancement of the site and the entire network of real sites but becomes a garrison of a battered territory and moment of redemption of a community.



Fig. 1: Sketch for San Leucio by Alvaro Siza Vieira (Casabella, n. 505, anno XLVIII, september 1984).

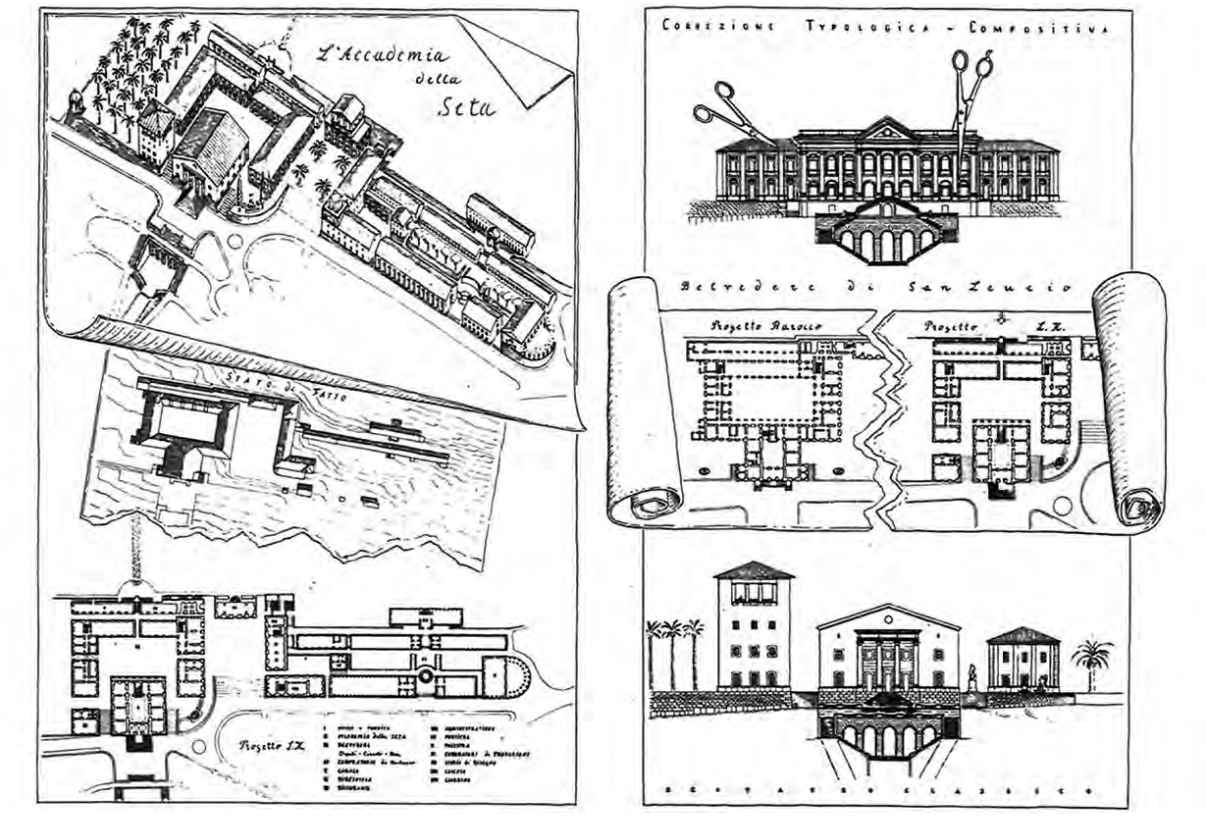

Fig. 2: Leon Krier project : the Silk Academy at San Leucio and the stylistic intervention on the Belvedere

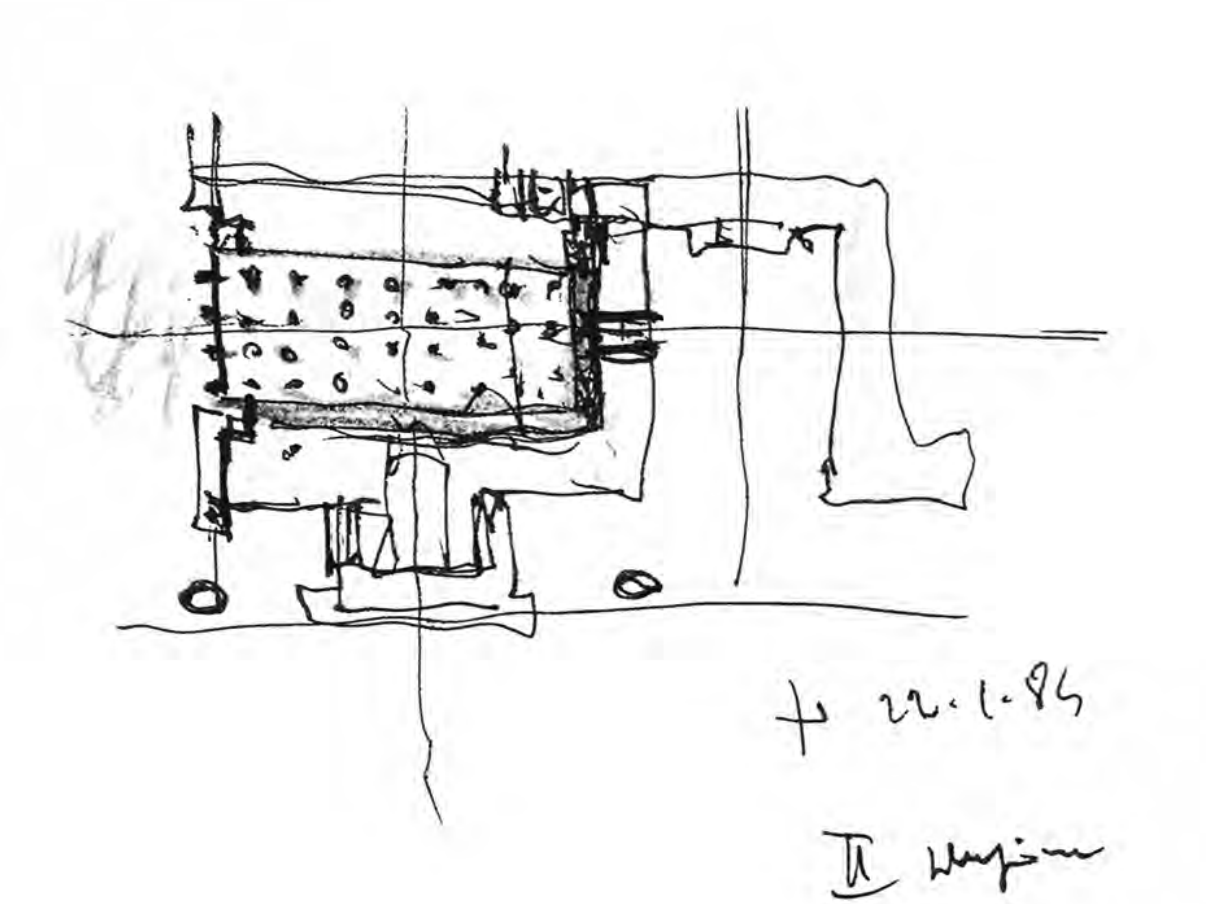

Fig. 4: Francesco Venezia project: the hypostyle pool (Casabella, n. 505, anno XLVIII, september 1984).

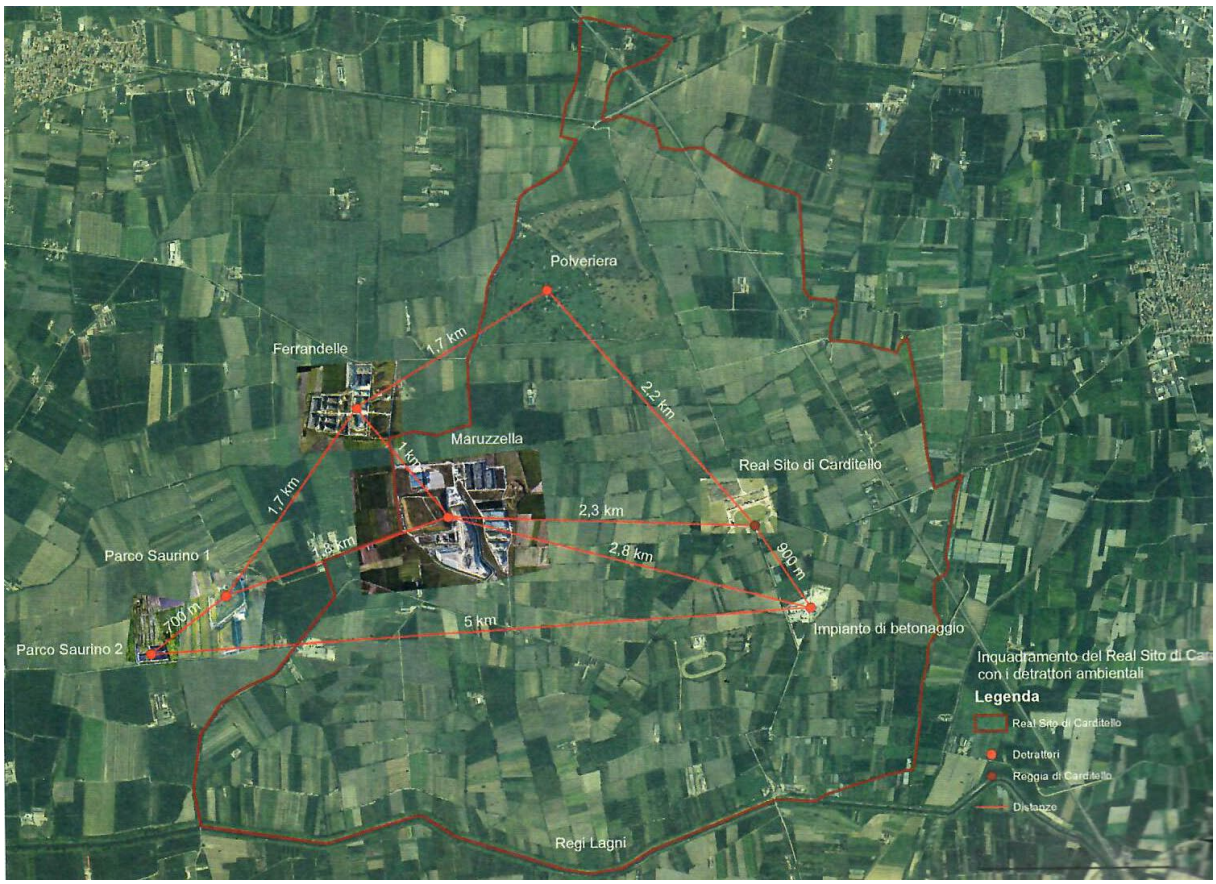

Fig. 9: Plan of the Royal Site (photo taken from *Abitare la Terra n.46-47/2018*).

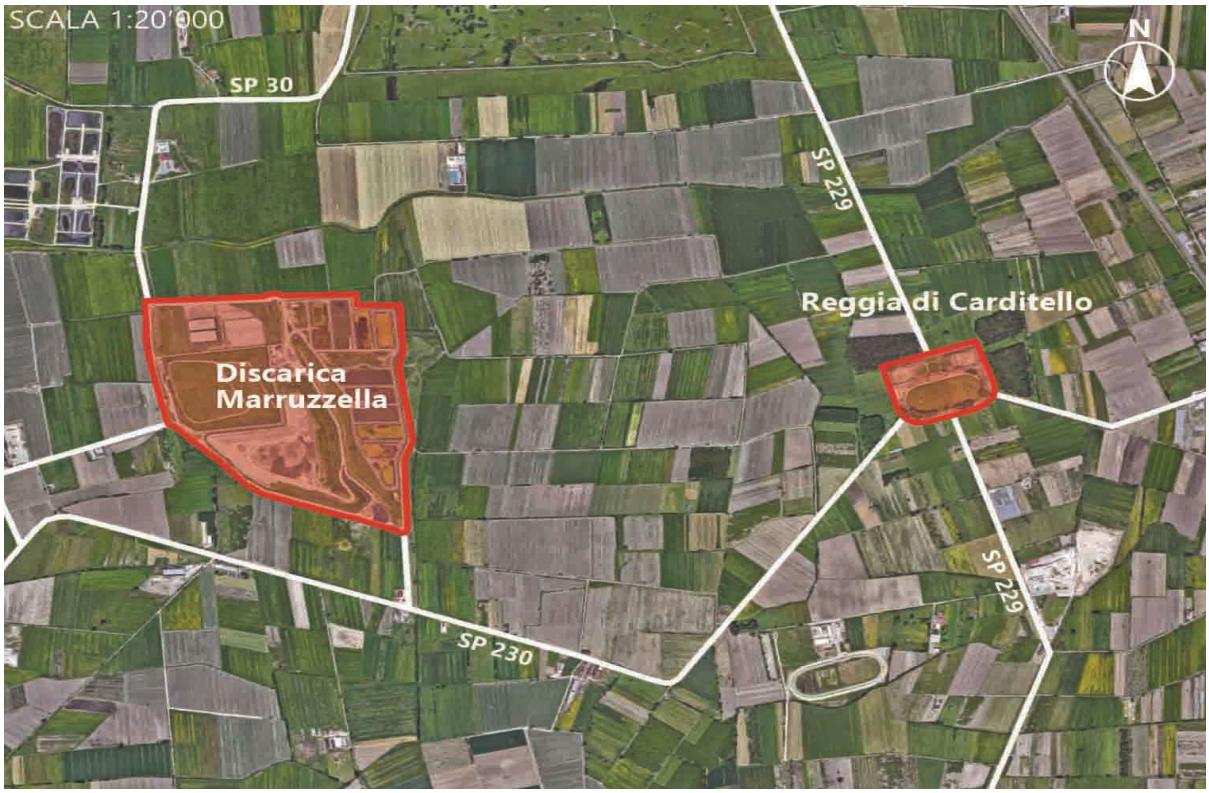

Fig. 10: Distance from the Royal Site of Carditello to the Maruzzella landfill.



Fig. 11: Photo from the top of the landfill



Fig. 12: Photo of the landfill, current state.



Fig. 13: Proposal by Landfill Mining (project by Provincia di Caserta, Settore Pianificazione Territoriale, Ambiente ed Ecologia)



Fig. 14: Photorendering of the project of cycling-walking path.

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Nurturing cities: pathways towards a circular urban agriculture

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Abstract
The recent Covid-19 pandemic has shown how world crises manifest themselves in a more disruptive way in urban communities. Urban areas were hit harder by the virus, and the images of empty shelves and endless queues in front of the supermarkets are the emblems of a western society that started to fear for its food security. Today, soils are under a lot of pressure to feed an increasingly urban population (80% of food will be consumed in cities by 2050), and if a future pandemic would hit grain or wheat or soy seeds instead of humans, there is a good chance that our food-system would be disrupted. In this scenario cities are the epicenter of the new challenges for the future, having the means, the technologies, and the assets to spark the transition towards a circular economy of food that replicates natural systems of regeneration, eliminating wastes, using them as inputs for the next production cycles. Hence, farming the cities emerged as a possible solution to feed an increasingly urbanized world, reducing the impact of our food system on agricultural soils, while providing citizens with local, freshly-produced food. This paper aims to illustrate how circular urban agriculture can be achieved by finding new farming spaces in cities, removing the constraints of the soil, and thus integrating off-soil production systems within buildings and urban districts, developing new synergies between the built environment and agriculture practices.

Keywords: Urban Agriculture; Circular Economy; Sustainable Cities; Hydroponics; Food Production

1. Introduction
The recent Co-vid19 pandemic crisis has shown some of the contradictions of the way we live in urban areas. On a global scale, cities use about 3% of the land area [1], and yet, 90% of all Covid cases happened in cities [2]. This is because cities have rapidly become our 'natural habitat, with the first urbanization processes taking place no more than 200 years ago [3]. Today, the majority of the world's population already live in cities and the urbanization trends confirm the increasing curve over the next 30 years with about 85% of people expected to live in European urban areas by the year 2050. However, due to their dimensions, cities are not able to be self-sufficient. Indeed, they rely on large and complex global supply chains and have large ecological footprints, drawing on 'distant elsewhere' for food, fuel, and carbon sinks. In this sense, the urge for new planning policies to make cities more sustainable is justified by the recent reports of the Intergovernmental Panel for Climate Change (IPCC), which have estimated that urban areas account for 67-76 percent of global energy use and 71-76 percent of global energy-related carbon dioxide (CO2) emissions [3]. Furthermore, a 2017 report from UNFCCC [4], reported that 20% of the worldwide anthropogenic GHG emissions come from urban infrastructure such as buildings and transportation (of which buildings and construction account for about 70% and transportation for about 30%). In this scenario, the rapid expansion of the urban population equals mass expansions of urban infrastructure. This will increase the dependence of very large concentrations of urban populations on long international supply chains for food, fuels, and consumer goods, making cities vulnerable to disasters in locations that supply these or buy their products, as well as to rising fuel prices [5]. A taste of what such a crisis may look like was provided during the first months of the pandemic crisis: the severe international lockdowns and the fear for what it could have come next, disconnected for a short while cities from their supply chains. In this context, supermarkets were assaulted by fearing crowds that left nothing but empty shelves and few non-

survival-related needs like it already happened during the wartime crisis. The images of endless queues in front of the supermarkets are the emblems of a western society that started to fear for its food security and stopped taking its food for granted. In this scenario, it emerged clearly that cities will have to consider the issue of food security, including strategies on how to develop more localized food production systems. European cities make great efforts to feed themselves, and the environmental costs of food systems are becoming more and more unsustainable. If we take London as an example, it has been calculated that it needs around 150 times its footprint just to feed itself [6]. Unfortunately, our food system, from which cities so much depend, is put in crisis by the same urbanization and increase in global population. Today, there is a deep paradox in our industrialized agro-system, where nurturing us means consuming the earth. Thanks to the technological advancements and their widespread use in agriculture, agricultural production has more than tripled between 1960 and 2015 [7]. This caused a significant expansion in the use of land, water, and other natural resources for agricultural purposes [7], followed by the constant lengthening of the food supply chain, which dramatically increased the physical distance from farm to plate. Thus, the expansion of the food production system and its consecutive economic growth have had a heavy impact on the natural environment: almost one-half of the forests that once covered the Earth are gone leaving the place to monocultural agriculture fields; groundwater sources are being depleted rapidly; biodiversity has been deeply eroded; agriculture CO2 emissions rose year after year, contributing to global warming and climate change [7]. The way we produce food now is an actual threat to our possibility of producing enough food in the future for a growing population. Indeed, even small changes in the climate such as shifts in annual rainfall or seasonal precipitation patterns can severely affect productivity. Hence, with an overcrowded future at the clear sight and the renovated fear of new pandemics bursting out of nowhere, the core question is how modern industrialized agriculture can meet the needs of a global population that is projected to reach more than 9 billion by mid-century and may peak at more than 11 billion by the end of the century [7]. The depletion of soils together with the scarcity of land and a reduced capacity of freshwater reservoirs mark the necessity for a transition towards more sustainable and fair production systems. If it is a consensus opinion that the modern agro-business will be able to produce enough food for a growing population (it already produced food for 10 billion inhabitants [8]), it is also acknowledged that it won't be able to do so inclusively and sustainably [7]. In this scenario, several solutions have emerged that promote a shift towards more sustainable food production practices, often complementary to each other. Strategies vary from investing in a renovated organic agriculture [9], going from commercial monocultural farms to diversified farming, to proposing the transitions towards plant-based foods as the main source of proteins, to dramatically reduce the meat's consumption [10]. In this context, a strategy that is catching on is to implement food production systems within cities and large urban environments [11]. The recent fortune of this practice, known as Urban Agriculture (UA), is connected to its capacity to target both urban and agricultural issues, proposing solutions that promote both the sustainable transition of urban food systems and new healthy urban lifestyles. Thus, UA should not be considered just as a food-related practice, but instead, as a tool for planners and practitioners to boost cities' sustainable development by implementing new urban green infrastructures, as well as new sustainable solutions for food productions. In this context, horizontal and vertical surfaces in the city, such as rooftops, facades, squares, and interior spaces, as well as urban vacant and residual spaces, can host a large-scale urban food production, taking off pressure from agricultural land [12]. Cities have resources like infrastructures, labor, energy, water, and a ready-made market for food production [13], therefore, it makes sense to produce in urban areas where citizens are not only the final users but also the producers.

1.2 Brief history of food production inside the city

Historically there has always been a link between the development of organized agriculture and the process of urbanization [6]. Indeed, cultivating crops in urban areas is an old practice, dating back to the beginning of civilization. In Palestine, archeologists found the remains of what was probably one of the very first settlements in human history: Jericho. Founded around the 9.500 b.C., excavations showed that by the early 8.000 b.C. Jericho was hosting around 2-3 thousand inhabitants, organized into a proper community able to build walls and produce art. In 1.500 years, that very small settlement became a town, which could grow and develop for another 5000 years, thanks to the development of the very first agricultural techniques: complex irrigation systems and trace of grains and wheat were found in the archeological site. Eventually, even Jericho had to fall, the increasing population, greed, needs, war, drought, and famine finally destroyed it after six thousand years of existence [14].

Throughout history, cities have been in a codependent relationship with their countryside, and their survival strictly depended on the capacity of the land to produce food: food transportation was extremely complicated and that limited the capacity for cities to expand. The very basic laws of geometry can explain that as the larger the city grew, the smaller the size of its hinterland became with the inevitable consequence that the latter could no longer feed the former. For instance, in the 15th century, Bologna was one of the biggest cities of its time with a population of 75.000 people, famine was most certainly much known by its inhabitants until the black plague decimated its population partially resulting in easier food access for those that survived [14]. The cultivation of plants and crops

in villages and towns was an established practice during middle age in the form of *hortus* [15]. The *hortus* pattern recurred through gardens that complete the village's general geometry and feed the local community [15]. They were usually positioned at the borders of towns, adjacent to the defensive walls, enabling food security in times of siege (Fig. 1). During the same time, horticulture was also developed in monasteries where food production and processing were established under the Rule of Saint Benedict [15]. Until the 19th-century food had strongly determined where and how cities were built. However, during the industrial revolution, the appearance of new infrastructures that were able to connect cities at high speed suddenly changed this paradigm: once the first railways started to be built in Europe it was clear that they represented an unprecedented opportunity to distribute food all around cities and countries. The boundaries of the urban environment and rural hinterland started to fade and the city sprawl was then unstoppable. Still, some forms of urban agriculture persisted: during the industrial revolution gardens were found within the fringes of industrial towns, contributing to the food security of the migrant workers, and during the two great world wars of the 20th-century war or "victory" gardens were promoted by governments to feed the urban population [16]. It is right in this period, at the beginning of the 20th century, that the first form of modern UA was developed by an English architect with regard to urban planning. Just over a century ago in England occurred the first significant phenomena of great urbanization, with massive migrations from the countryside to the industrial city. During the Second Industrial Revolution, for the first time, a book called Garden Cities of Tomorrow (1902) by Ebenezer Howard theorized the return to a city in harmony with nature. According to Howard, one of the biggest mistakes of the time was considering industry and agriculture as two different elements separated by a clear demarcation line. Unfortunately, albeit fascinating, Ebenezer Howard's theories did not have good success in practice. Some New Towns were built but never became really self-sufficient, on the contrary, since they were dependent on the main cities, they ended up merging with them, determining one of the first phenomena of urban sprawl [17]. With respect to these experiences, today, it is legitimate to wonder whether it is appropriate to overturn the paradigm of the city moving into nature, maybe it should be nature itself to colonize the city in a salvific way with green spaces and agricultural areas. Today, this is possible thanks to the technical advancements in the construction sector and in the food production technologies. Indeed, new off-soil, hydroponic technologies provide have high yields in very narrow spaces, opening to new frontiers on how to integrate these systems within the urban environment. In this scenario, modern Urban Agriculture can be considered a relatively new approach by which planners, engineers, architects, and agronomists are trying to shape the cities of the future enhancing circularity, promoting more resilient urban spaces.

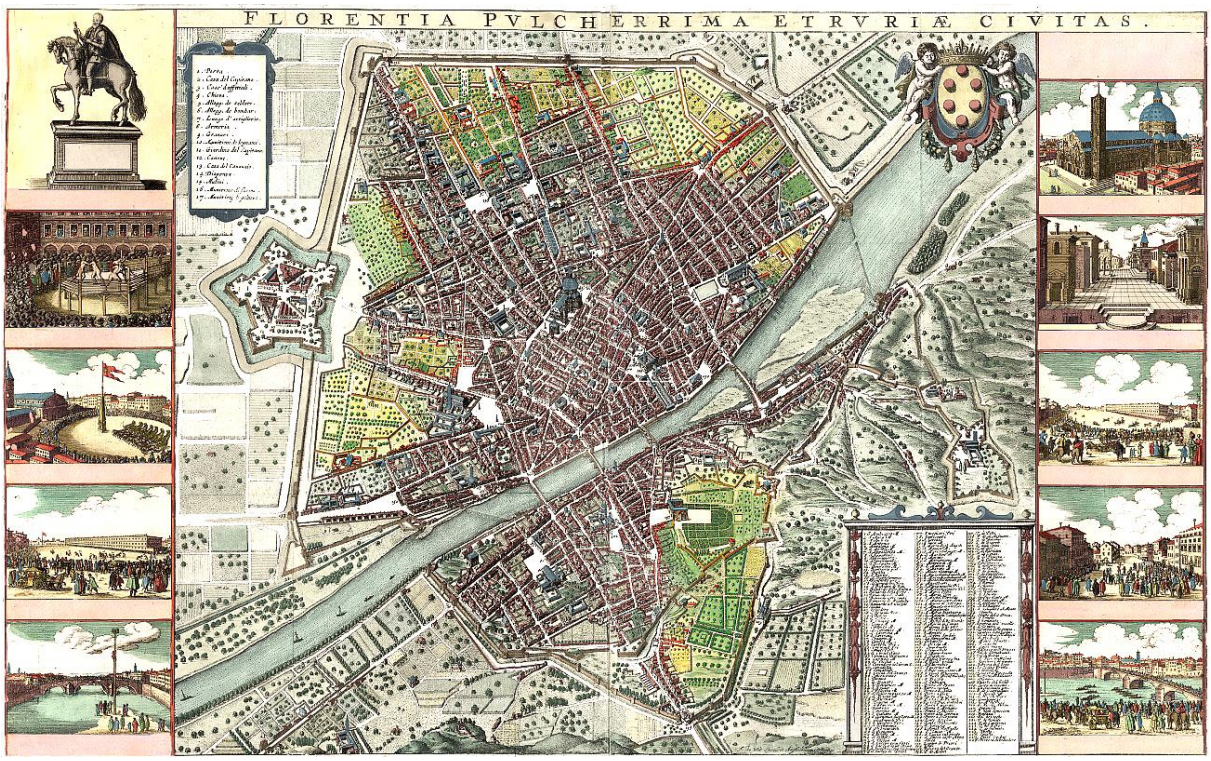

Fig. 1: Historic map of Florence. P. Van der Aa, 1728
Credits: *SANDERUS, antique maps and books*
Urban hortus and gardens are clearly visible in this map and willingly highlighted with a higher saturation. From this historic map, it is possible to appreciate the location of the urban hortus, right next to the borders walls

2. UA fields of application

Urban Agriculture can be defined as the activity of planting food and breeding animals within and around cities. In the past 20 years, the evolution of urban agriculture resulted in different definitions and conceptual developments. The United Nations Development Program (UNPD) adopted the definition of Smit et al. (1996) [18] which defines urban agriculture as an industry that produces, processes, and markets food, largely in response to the daily demand of consumers within a town, city, or metropolis, on land and water dispersed throughout urban and peri-urban areas. Mougeot (2000) [19] submitted a revised definition, where urban agriculture is defined as an industry located within (intraurban) or on the fringe (periurban) of a town, city, or metropolis, which grows or raises, processes, and distributes a diversity of food and non-food products, (re-)using largely human and material resources, products, and services found in and around that urban area. Nonetheless, the board applications of UA on different scales and with different focus make it harder to adopt a commonly agreed definition [20]. For this reason, it is important to understand UA aims, location, and cultural/climatic context before approaching new UA activities. The variety of UA forms can be classified in various ways, depending on its actors, purpose, land use, scale, location, property, technology, and production system [21]. The concept refers to the production of food crops within cities and around them. It includes commercial and non-commercial activities and covers food processing as well as other activities in the food value chain. That makes UA a multi-dimensional concept that can deeply vary from project to project. An analysis made by Tujil et al. [20] identified several applications of UA projects and categorized them into nine macro typologies depending on the location, the dimension, and the strategic focus (Fig. 2): i) Community Garden; ii) Institutional Garden; iii) Guerrilla gardening; iv) Urban Farms; v) Vertical Farming; vi) Plant Factories with artificial lighting (PFAL); vii) Zero-Acreage Farming (ZFarming); viii) Agropark; ix) Agro-tourism.

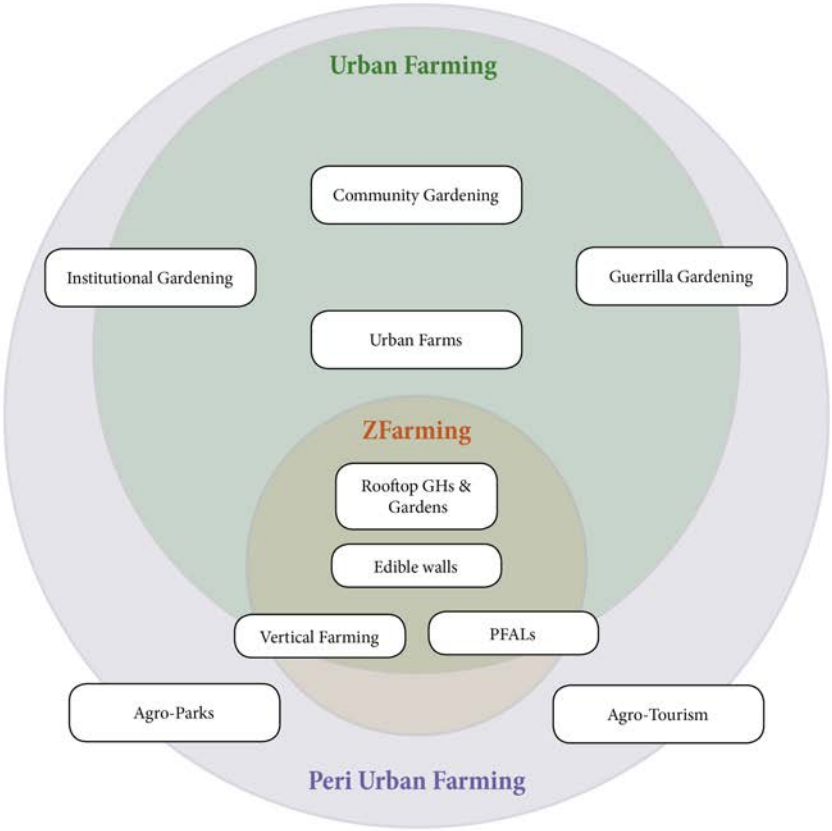

Fig. 2: Broad applications of UA and PUA
Source: *Own work*

Not every type of UA fits in a single category and overlaps between the types exist and are easily found in UA projects. Often, different categories can complement each other, for instance, rooftop gardens can be community gardens and also fall into the category of ZFarming. However, a great difference between those categories can be identified linked to two macro-dimensions of food production: use of land and food technologies. Whereas the common purpose is to shift towards sustainable intensification of urban crop production [22], in highly constructed urban areas land availability is a great limit for production. Therefore, in densely built-up areas, where the availability of

space often limits the size of the production unit, the use of soil-less technologies represents new opportunities to increase urban crop yields [23]. In this regard, ZFarming (including Vertical Farming ad PFAL concepts) is the best solution to achieve high yields in very limited urban spaces [23].

2.2 Farming in and on buildings: potential impact

To integrate agricultural activities within buildings in a highly dense urban environment, ZFarming offers the best solution to achieve intense production while minimizing the use of land. The term was introduced to describe all types of urban agriculture characterized by the non-use of farmland or open space, thereby differentiating building-related forms of urban agriculture from those in parks, gardens, and urban wastelands [23]. Hence, ZFarming differs from ground-based UA, of which it can be considered as a subtype. It can be considered as a complementary practice of ground-based UF, that offers opportunities for resource-efficiency synergies between buildings and farming [24]. Implementing ZFarming models within cities requires new regulation frameworks and advanced technical knowledge of ZFarmers, which have limited today the expansion of these types of UF in respect to ground-based practices. The strategic objectives of ZFarming projects, as well as its peculiar characteristics of producing food without using land space, make this special subtype of UF particularly interesting for professionals involved in sustainable urban construction and planning. Architects, planners, and engineers recently developed an increasing interest in ZFarming methods to implement green buildings design, trying to connect aesthetic, functional, and ecological principles. The need to reduce cities' resource consumption, create sustainable infrastructure and plan more inclusive cities while reducing the food chain make ZFarming a powerful tool to implement new green urban designs. This might be particularly true for Building-Integrated Agriculture (BIA), a specific subtype of ZFarming which is defined as the practice of locating high-performance off-soil greenhouse systems, such as hydroponic, aeroponic, and aquaponic, on and in mixed-use buildings to exploit the synergies between the building environment and agriculture-like energy and nutrient flows [23]. BIA is considered to be highly compatible with sustainable bioclimatic design principles [25]. However, today the synergies between buildings and farming are yet not fully exploited. Nonetheless, ZFarming and BIA are powerful tools for the retrofitting of abandoned buildings and old industrial sites. Integrating food production in vacant urban plots is an opportunity to bring back to life post-modern ruins, creating new mixed-use buildings that can generate revenues and implement local living quality improving the urban landscape [26]. Therefore, ZFarming and Building-Integrated Agriculture should be considered as new design tools to foster cities' sustainable development. In this regard, new planning strategies, as well as new legislation and regulations must be adopted to facilitate the retrofitting and the new construction of mixed-use buildings where food production and other living and social activities are interconnected.

2.3 Off-soil production and cities' development

Finding new spaces for agriculture in urban environments drove scientists and researchers to develop new technologies that can maximize yields in limited spaces removing the constraints of the soil using other media to grow plants. In this scenario, ZFarming experiences rose as a subtype of already existing urban farming concepts taking advantage of vertical spaces in cities to increase urban food production. The advantages of ZFarming projects and the integration of agricultural systems within buildings are not only connected to the possibility of producing food without occupying urban grounds, but also in the way they could implement synergies between buildings and agriculture [23]. In this regard, the application of advanced farming systems within the constructed environment represents a new opportunity for planners, architects, and engineers to use integrated UF projects to implement circular flows of resources in cities. Cities are in-fact the hubs where circular strategies can be experimented and implemented: here, the confluence of government actors, business, and citizens "[…] creates live innovation labs for addressing the complex challenges of linear economic models" [27]. Furthermore, local municipalities can act faster than national governments, making it more agile for cities to transition towards circular policies [28]. Transitioning to a circular economy requires rethinking market strategies and models that encourage the responsible consumption of natural resources, educating consumers, proposing new sustainable behaviors [27].
In this context, implementing ZFarming and BIA projects is coherent with cities' circular development goals where closed-loop agricultural ecosystems can treat waste as a resource. In metabolic synergies between buildings and farming, the waste of one part of the system can become the nutrients for the other. Thus, a closed-loop system recycles and reuses nearly every element of the farming process, from dirty water to nutrients. Furthermore, food waste can also be converted into organic matter and used either as compost for other agricultural practices or as burning bio-fuel in bio-gas plants. Ideally, in closed-loop systems, everything remains in the system, leading to a zero-waste outcome.

3. Circular Urban Agriculture for circular cities

Implementing newly sustainable, environmental and people-friendly urban food production is directly connected to the transition towards a circular food economy. This is because when an urban food system goes circular it supports more resource-efficient and regenerative agricultural practices like

precision and organic farming, and low and high tech protected cultivations. Here, the use of all by-products and waste streams along the whole food supply chain is recirculated and wastes and inputs collide, limiting the use and exhaustion of resources like soil, energy and fertilizer. Furthermore, in ZFarming projects, circular food strategies are connected with the built environment and the principles of circular construction, thus promoting sustainable design principles such as modular construction and the use of building materials within high value closed loops for efficient assembly/disassembly techniques. Hence, adopting circular urban horticulture within the built environment is seen ad an opportunity to connect different spheres of urban living, implementing the sustainable growth of the modern metropolises. In this regard, cities may shape their vision of the city of the future in the connection of circular construction and circular horticulture, defining circular economy as an economic system that replaces the 'end-of-life' concept with restoration [29], shifting towards renewable energies, and eliminating waste. In this context, circular horticulture is intended as a circular economy of food that consciously emulates natural systems of regeneration so that waste does not exist, but instead works as input for another cycle [30]. Today, thanks to soil-less protected cultivation techniques, it is possible to fully integrate greenhouses and plant factories in buildings, generating new synergistic relationships between the two entities. The target in protected cultivation systems should always be to save resources and energy and to develop zero emission. Nonetheless, the degree of circularity and sustainability depends on the quality of the inputs [29]. For instance, in off-soil production, the quality and quantity of water flowing through the system is fundamental to determine and design the circular production system. In this scenario, recovering resources from buildings is, in fact, at the core of the circular development of integrating food in buildings (Fig. 3a & 3b).



Fig. 3a: Circular processes in ZFarming
Source: *Own work*



Fig. 3b: Example of integrated rooftop greenhouse
Credits: *Michele D'Ostuni, UrbanFarmers in Den Haag*

Buildings are, in fact, hot spots for nutrients and water recovery, fundamental resources to produce food in urban areas. Soilless cultivation systems and especially closed or re-circulating hydroponic systems can significantly reduce fertilizer runoff but not eliminate it [29], for this reason integrating them in buildings can benefit both entities developing water and nutrients closed-loops, eliminating dangerous runoffs. Nonetheless, even though high-tech greenhouses may present a high level of circularity, they need high investment cost, greater installation and running costs, and a high degree of automation and technical skill [29], which limit their applications in those areas in Europe where technologies and know-how are already known. In this sense, municipalities play a crucial role in the development of ZFarming and building-integrated agriculture. Today, cities have the opportunity to spark a transformation towards a circular economy for food, given that most of all food is expected to be consumed in cities by 2050. Cities have the assets, the technology, and a dense networks of highly skilled workers that represent the ideal conditions for innovation in the food system. Citizens, retailers, and service providers are all in close proximity, making new types of business models possible where producers are directly connected with the consumers [30]. This combination of factors means that governments and municipalities have the means to implement a circular economy for food.

Connecting high tech production systems with the construction sectors, providing incentives also to developers and constructors, will foster a diffuse planning of ZFarming projects in cities, weakening the limitations represented by the initial investment costs and creating the business conditions for new urban food enterprises to thrive. Cities have, in fact, tremendous demand power as a great volume of food is eaten within them [30]. Furthermore, cities accumulate a large amount of food by-products and waste, that can be re-used directly in urban areas. In this context, new technologies and innovations in the food production sectors may be the key factors to minimize resource consumption while producing enough food to contribute in feeding growing urban communities. For this reason, the production systems that will be integrated in city planning must have nearly zero environmental impact [29]. In circular protected horticulture plants grow in closed systems, where water and nutrients are recirculated and reused. These systems, like hydroponic or aquaponic greenhouses and indoor plant factories, require adequate management, and a deep knowledge of irrigation and fertigation techniques. For this reason, investment in research programs and in the education of the operators are crucial in urban areas to achieve high yields with maximum efficiency of the use of natural resources.

3.1 Strategies for the integration of off-soil systems within buildings

It is possible to see different approaches of integrating agriculture within architectural buildings, ranging from passive systems, such as container growing, to technological systems such as rooftop greenhouses, vertical facades and various types of indoor growing facilities. Each system has its way to implement the overall sustainability of the building, from mitigating roofs heat absorption, to adding extra green insulating layers to existing facades. In particular, high-tech greenhouses and plant factories are the most used systems in building-integrated agriculture, as they present the great advantage of maximizing production yields, making them more suitable for the integration in mixed-use buildings, allowing them to host multiple functions other than just food production. The main difference between these two systems is the way they interact with the exterior climate. One one hand, greenhouses are transparent structures that interact with the exterior climates and let the solar radiation pass through the enclosure surface allowing plants to start the photosynthetic process. On the other hand, plant factories are air-tight structures that don't interact with the exterior climates and exclusively rely on artificial light and indoor climate control devices to cultivate plants. Thus, the integration of these two systems in buildings highly depend on the location of each ZFarming/BIA initiative. In this regard, rooftops and south facing facades are the most commonly used spaces for active building integration with high-tech greenhouses. Here, these greenhouses operate resource efficient methods, using closed hydroponic systems, recovering rainwater, and exchanging heat with the building. For instance, the heat absorbed by the building and transferred to the greenhouse is an efficient way to lower the production's energy demand, resulting in a win-win symbiotic relationship between the two systems.. All this considering, it is possible to determine strategic design solutions to optimize the integration of high-tech greenhouses in buildings. Thanks to new growing methods and technologies it is possible to see the production spaces as new components of the architectural project. In this regard, it is possible to recognize three main integration concepts (Fig. 4):

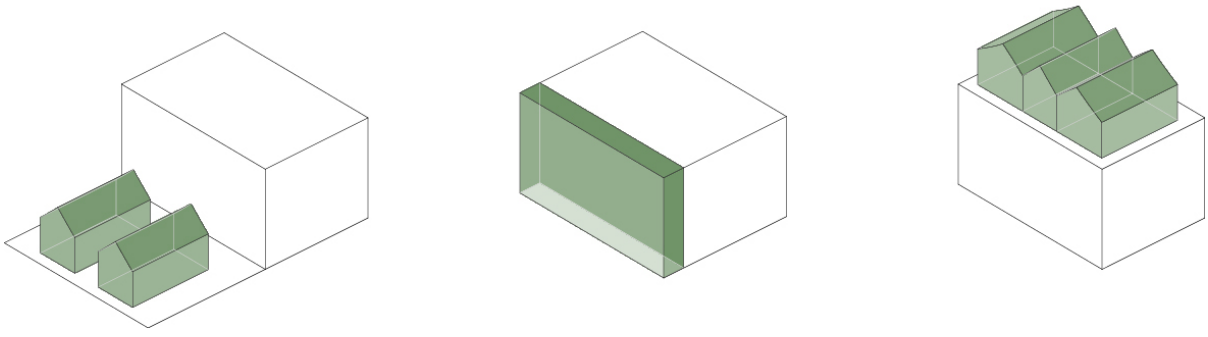

Fig. 4: High-tech Greenhouse integration in buildings
Source: *Own work*

While integrating high-tech greenhouses in architectural projects must take into consideration the exterior conditions, maximizing their exposure to solar radiations, indoor growing spaces rely exclusively on artificial light for plant production, opening a whole new other world of possibilities for their integration in buildings. Indoor growing spaces must have better insulation than greenhouses using different opaque envelope materials. As reported by Graamans et al. (2018) [31] this typology is

better suited to extreme climates, where temperature swings are of larger concern than lighting (Graamans et al. 2018). However, these systems are also suitable for the integration of this typology into the darkest spaces of buildings, creating new design opportunities. Taking this in mind, it is possible to define three main integration concepts in buildings. (Fig. 5)

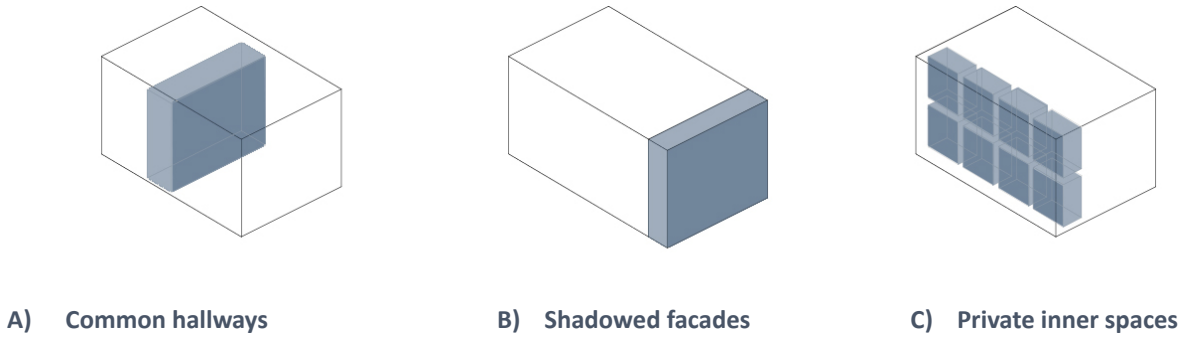

Fig. 5: Indoor farming integration in buildings
Source: Own work

3.2 Limitations to the development of circular agriculture in cities

Including urban agriculture in the city's spacial planning is a key strategy for the transition towards a diverse and resilient food system, reconnecting people with food, and delivering a range of societal and environmental benefits [30]. To do so, it is important to acknowledge that single, spot UF initiatives cannot contribute significantly to satisfy urban food demand and needs, especially in cities where population growth is constant. However, even indoor urban farming methods won't be able to cover all the food needs within cities, and also when coupled with open-field Urban Agriculture, it is unlikely that they could provide for more than one third (by weight) of all the food needed for urban consumption [30]. Furthermore, planning strategies are effective only if they can overcome three main challenges of UF:

1. **Competition for land:** to be effective UF initiatives must be diffused over a territory. Finding farming spaces within the city can prove challenging due to zoning laws, technical feasibility and competition for other revenue-generating uses. Of course ZFarming help avoiding the need of physical land, but it must face local regulations and the skepticism of local developers and farmers to invest in such projects. Single virtuous initiatives cannot be the answer to deeply routed problems in current urban food system, and the implementation of advanced building-integrated agriculture requires vision, planning and fundings both from the private and the public sectors.
2. **Limited crops type:** Crops that are typically produced in indoor greenhouses and vertical farms are sill limited to leafy greens, herbs, other vegetables, and selected fruit, such as strawberries and tomatoes. Even if a city produced all the required volumes of these food types in indoor urban farms, it would still depend on food from peri-urban and rural areas for other food types. Nonetheless, the advancements in greenhouse design and production technologies are increasing the number of crops that can be produced indoor with high yields. Tests and experimentations are leading the way for a growing offer of food crops that can be sold in urban areas. However, local regulations might limit the commercialization of this newly indoor produced crops, limiting for the moment their commercial development. In this scenario, research and development is fundamental to achieve maximum variety in urban crops production, as both costs and production data are needed to assess the economic feasibility of cultivating more variety of crops within the urban boundaries.
3. **Difficulties in becoming circular:** Finally, indoor urban farm types (multi-story soil-less hydroponic or aeroponic, greenhouse, aquaponics greenhouse, and hydroponic greenhouse) face challenges to becoming entirely circular. High-tech soil-less farming methods require tailored nutrient solutions, where water pH and mineral nutrients concentration is manually or automatically controlled. Nutrients used in high-tech hydroponic greenhouses are mostly nitrogen, phosphorus, and potassium coming from unsustainable sources, and, if not recirculated into the production system, they may cause environmentally dangerous runoffs. Furthermore, reaching high yields in indoor facilities require high energy inputs for lighting and heating/cooling, which at the moment are generally reliant on fossil fuels [31]. However, technological innovation, as well as infrastructure planning strategies can help overcome these challenges as high-tech closed production systems have high potential in becoming completely circular.

4. Final discussion

In conclusion, the expressed potential for circularity in integrated high-tech protected agriculture in urban areas highly depends on the technical knowledge of the production systems. More technology and more control may lead to improved circular performances, but that requires high investments and a specific set of expertise that may not be easy to find in urban areas and in certain countries. Furthermore, optimal solutions for circularity have not been developed for all regions in Europe or the Mediterranean [33]. For instance, the closed or semi-closed greenhouse concept, fundamental for the circularity of the indoor food system, has been developed and is already applied by some Dutch greenhouses and cannot be directly transferred to the Mediterranean regions. That's because closed and semi-closed greenhouses in the Mediterranean climates require a lot of energy for cooling. Reconnecting people with food, educating them to healthy diets, bringing production visible and tangible within the city boundaries, is considered crucial if cities want to change the way citizens see food, creating a ripple effect that may partially or drastically change modern food system. In this context, marketing strategies are fundamental for the acceptance of a new type of food grown without the constraints of the soil and integrated in buildings. In particular, ZFarming initiatives can involve the participation of a great part of population, as they operate right there where people live and work. They can shape new architectural forms, and urban look, making food visible and livable for every citizen. Furthermore, in comparison with soil-based urban farming, ZFarming projects can directly connect food and architecture, exploring and developing those interconnected relationships where the two entities can exchange food, knowledge and resources. In this sense, integrating food production in urban areas, especially in buildings where people live or work could increase the perception of food security in period of crisis. Furthermore, like our ancestors, we just re-discovered how important can be to have reserves of food in time of sieges. The recent Covid pandemic has forced us in our homes, and we are barely seeing the end of it. In this scenario, taking care of our food, reconnecting with it, can be an important coping mechanism to face the future urban challenges of contemporary overcrowded cities.

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The rise and obsolescence of Brazilian Leper Colonies

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Abstract
This paper discusses the leper colonies as part of the prophylactic policy of compulsory exclusion for people affected with leprosy in Brazil from 1921 to 1986. The goal is to understand the scientific and political discourse that generated them, how they were spatially organized and how they quickly became obsolete. Leprosy, now known as Hansen's disease, was identified as contagious in 1873. This triggered an international discussion on the isolation of the patients as the primary mean for the disease's prophylaxis. The leper colonies were small towns apart from society that met all patients' needs since a positive diagnosis meant a sentence of lifelong seclusion. In the late 1940s, while Brazil was still building colonies, a new treatment was developed. Once initiated this treatment the patients stopped being contagious, hence there was no need to isolate them. By 1958 the international discussion already considered segregation a huge mistake in the disease's prophylaxis. Based on this mistake, Brazil built one of the largest leper colonies' networks in the world, with more than thirty colonies. In 1986 the isolation was finally abolished as a prophylactic measure in the country. For a long time, the colonies, the patients, and their history were forgotten and only recently a few initiatives looked to these as places of memory.

Keywords: leprosy prophylaxis; leper colony; social segregation; memory.

1. Introduction
The beginning of the 20th century witnessed a worldwide effort to fight Hansen's Disease, formerly called leprosy. That was a consequence of a breakthrough in the scientific knowledge about leprosy: the disease that was believed to have a hereditary transmission had been proven to be contagious, but the cure was still unknown. Leprosy has a slow development and lasts for many years. During this time, it causes several modifications to the structure and functioning of the body. Initially, the deformities and disabilities are mild and reversible, and with time it becomes serious and permanent. That is why regarding the isolation of patients at hospitals, at that time some physician advocated the creation of leprosaria, or leper colonies:

> "The essentially chronic character of leprosy prevents the isolation measures at generic isolation hospitals. The leper might, for many years, devote himself to work; so their sequestration of society must be made, not in a hospital but in suitable institutions, 'leper colonies', where, besides the essential treatment, the leper will find necessary elements for the realization of activities, still very usable" [1][1].

In addition to the medical discourse, the Brazilian desire for development at that time led the country to face the leprosy issue as one of the most important within public health. From 1921 to 1949, thirty-three leper colonies were built in the country. By the time the constructions were finished, the leprosy understanding had recently faced another breakthrough: a new medicine was able to cease the contagiousness of those infected with the bacillus. From this on, the treatment started to shift to ambulatory settings. This huge public effort seems to have been in vain. Besides, the strategy of isolating people affected with leprosy in colonies has impacted the lives of thousands of people, many of whom still face the consequences today.

[1] All translations are my own.

Studying and remembering this past is crucial to put an end to the stigmatization of the disease. This paper aims to contribute to this matter by discussing the Brazilian leper colonies both in the past and in the present. It is divided into two main parts. The first part focuses on the rise of these facilities. It explores the scientific and political discourse that generated them and how they were spatially organized to answer to this demand. The second part concentrates on its obsolescence. It discusses both the change in the leprosy treatment and the consequences for the patients and the physical structures of the colonies.

2. The rise: from the international discussion to the Brazilian leprosy fight plan

It was by the end of the 19th century when Norwegian physician Armauer Hansen identified the bacillus that causes the disease, that it was confirmed to be contagious. Hansen's discovery led to a worldwide effort to eradicate the infection [2, 3]. In Norway, a few years after this discovery, the isolation of leprosy patients was adopted as a prophylactic measure. The number of leprosy cases decreased significantly in the following years. Although it was unknown at the time if isolating these patients was effective, the segregation was approved on the argument that it was, at least, a reminder of the disease's contagiousness. This alone was thought to encourage preventive measures by the community [3–5].

Hansen's discover was the centre of the First International Leprosy Conference convened in Berlin in 1897. One main point of discussion at the conference was the establishment of an international plan to control the spread of the disease. Based on the Norwegian model, the social segregation of those affected with leprosy was pointed out as the primary mean of prevention [2, 6]. Suggesting the isolation, the conference tempted to transfer the European model of public health to other countries, mostly which were indifferent to leprosy in their territories. With a higher incidence rate of infection (Fig. 1), these countries were blamed for the resurgence of leprosy in the 19th century and hence were considered responsible for its future control [6, 7].

In this context, leprosy was incorporated into the list of tropical diseases, an emerging field within medicine. This field of medicine was closely related to Europe's imperial mission and "intended to combat the virulent forms of disease often encountered in colonial settings" that "also conceptualized the difference between Europe and its others in ways that underwrote expansion of empires" [2 p. 118]. So, even though leprosy was not a tropical disease *per se* – considered that it could easily be found in cold climates – it was made to fit into this category [2]. Patrick Manson, in the book *Tropical Diseases: a manual of the disease of warm climates*, underlines that the incidence of leprosy in the tropics is related not to climate but with social issues:

> "this caprice of distribution does not seem to depend on climate, geological formation, or suchlike physical conditions; leprosy is found in (…) all varieties of climate, and on all kinds of geological strata. Social conditions, it would seem, have most do to in determining distribution; its endemic prevalence appearing to be bound up in some way with uncleanly habits, squalor, dirt, and poverty – not, be it noted, directly caused by these things, but associated with them" [8 p. 387].

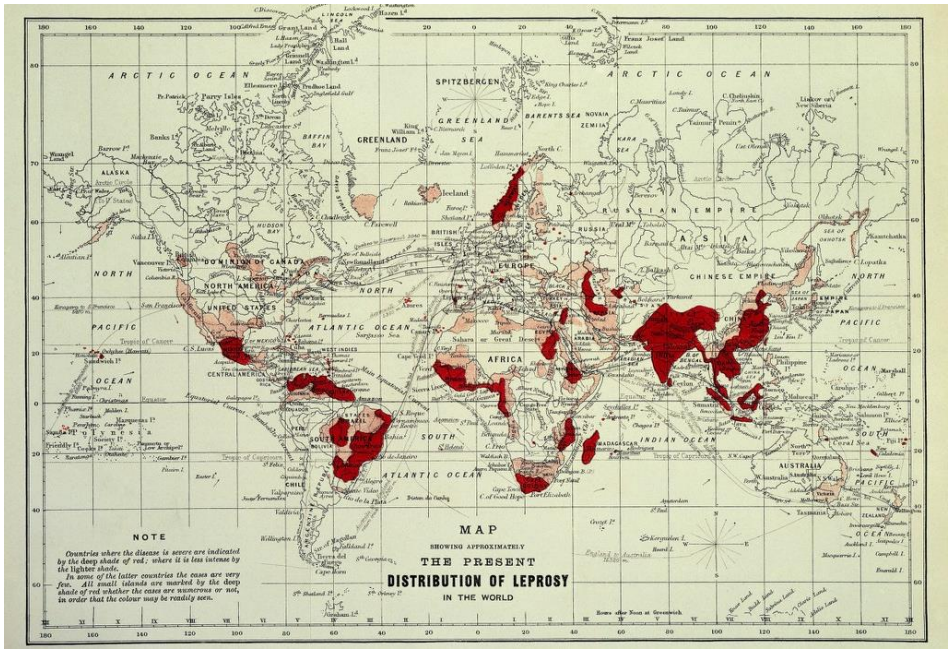

Fig. 1: Map showing the distribution of Leprosy around the world in 1891. Extracted from Leprosy by George Thin, 1891. Credit: Wellcome Collection. Available at https://wellcomecollection.org/works/rshe6qsw

Following the international debate, the discussion about isolating people affected with leprosy in Brazil started already in the late 19th Century but only in 1920 patient isolation was considered an official prophylactic measure against the infection [9]. By that time, the idea of isolating leper patients was a disputed position in the international context. Some specialists, such as Sir Leonard Rogers and Ernest Muir, defended treatment based on the patient's voluntariness to seek treatment. On the opposite side, Brazilian leprologist Heráclides de Souza-Araújo was one of the most defendants of compulsory segregation as the only effective measure to contain the disease. Vollset underlines that these opposite positions were based on the different appropriation of the medical knowledge available at that time. For instance, the Norwegian case was interpreted by Souza-Araújo as proof that severe segregation was necessary to prevent leprosy while Muir and Rogers saw the same case as a successful example of a humanitarian approach and, hence, defended that persons affected with leprosy should be treated voluntarily [3].

Although some Brazilian physicians did not agree with compulsory confinement of the patients, the segregationist was the most prominent view in the country. This might have to do not only with medical reasons but also with social and political ones. The leper colonies construction was closely related to the development goals that the country had in the first decades of the 20th century. Leprosy has had acquired the status of a disease of uncivilized countries. Brazil, aiming at its modernization, should fight to eradicate this problem, as explained by physician Belissário Pena in 1926:

> "Leprosy, Mr President, it is not a disease nor of civilized countries nor the savages. Among the savages, there is no leprosy. It is a characteristic and symbol of countries in a semi-civilization stage. Now, Brazil wants to be a civilized country … It needs, hence, to shows that it really is. In reality, Brazil is revealing to be a semi-civilized country with this impressive stain right there … It is not possible to keep like this; it is necessary to put a barrier to this avalanche that is dominating the whole country" [10 p. 417].

Brazilian medical discussion focus was not on whether those affected with leprosy should be segregated or not, but on how to isolate them. At the 1st Paulista Medical Congress in 1916 Souza-Araújo defended the installation of leprosaria in islands because "evasion would be more difficult" and "the patients will enjoy there ample freedom"[9 p. 191]. At the same congress, physician Emilio Ribas recommended a more "scientific and human" prophylaxis, highlighting that "the society that removes the freedom from those people has the imperative duty of assuring their material wellbeing and everything that might mitigate the cruelty of their destiny" [11 p. 191]. For the physician, anything that gave the idea of exile would be contraindicated, pointing out the importance of easy access to the leprosarium and the consent of visits. Those measures would contribute to the voluntary isolation of the patient. Years later, noting the difficulty in building the colonies, Belissário Penna even recommended the construction of one or two cities to shelter all those affected with leprosy in Brazil, instead of small colonies throughout the country. For the physician, this was a more feasible and quick solution [10]. However, prevailed the idea of smaller colonies based on the same ease of access argument present by Ribas before [12].

The leper colonies were officially defined as a prophylactic measure in 1920. Nevertheless, this could not be put into practice on a national scale at that time since few states could afford to construct the facilities. The first colony built in Brazil was *Lazarópolis do Prata*, at the State of Pará, which start receiving patients in 1924. This colony, designed by Souza-Araújo himself[2], was established using the structure of an education centre for indigenous children. The existing structures housed the administrative activities. Around it, he proposed an orthogonal urban layout where residence pavilions and other services and amusement facilities were built [13]. The State of São Paulo, one of the most affected with the disease at the time, was a pioneer in developing a leprosy prophylaxis plan. In 1917 the state and a catholic congregation, *Santa Casa de Misericórdia,* sealed a partnership. While the state was responsible for building the colonies, the congregation would be responsible for managing and maintaining them. With this plan, by 1933 São Paulo had already inaugurated all its five colonies. The first one, the *Colônia de Santo Angêlo,* opened in 1928 [14].

The leprosy prophylaxis gained a new impulse when Getúlio Vargas assumed the presidency of Brazil in 1930 and the leprosy issue was considered a national matter. Vargas' political project had as a premise the implementation of a development program through the establishment of federal control over the entire Brazilian territory. The main goal was to overcome the backwardness of the country, placing Brazil among the great nations of the time. To achieve this, Vargas considered it necessary to assure healthy and strong citizens able to contribute both physically and intellectually to the progress of the new time. Within this nation project, leprosy was faced as an obstacle [15].

In 1933 the Conference for the Uniformization of Leprosy Campaign was held in Rio de Janeiro. This conference defined the base for the development of the 1935 National Leprosy Fight Plan. In addition to the colonies, two other facilities were considered essential to effective prophylaxis: the preventorium and the dispensary. While leper colonies were meant to sick people, those facilities had a preventive

[2] Souza-Araújo does not mention the cooperation of an architect or engineer in designing this colony.

goal. The prevetorium were orphanages specially conceived for health children from sick parents. Since leprosy is not transmitted from the mother to the child during pregnancy, the child was taken away right after birth. At the preventorium, the state was responsible for the care and education of these children until adulthood. The dispensary was a health post to monitor relatives and other people who had contact with a person affected with leprosy until the moment of their isolation. By 1930 Souza-Araújo considers the dispensary as important as the leprosarium for the disease's prophylaxis:

> For me, the dispensary is the base, [...] the mater cell of a modern antileprotic campaign. It is in the dispensary that the leper is discovered; it is there that the leper is conquered by means of humane treatment and a well-oriented therapeutic treatment; it is there where leper is classified for the rigour isolation or simple home surveillance. Finally, it is through the frequency of the dispensary that the leper gains confidence in the physician and the belief that the government is really interested in him. It is on this trust and belief that the secret of prophylactic success depends [9 p. 579].

The national plan also defined a building construction program. It assessed the need to isolate almost 22,5 thousand people in colonies in the country. From that moment on, many leprosaria, dispensaries and preventoria were built throughout the country (Fig. 2 and Table 1).

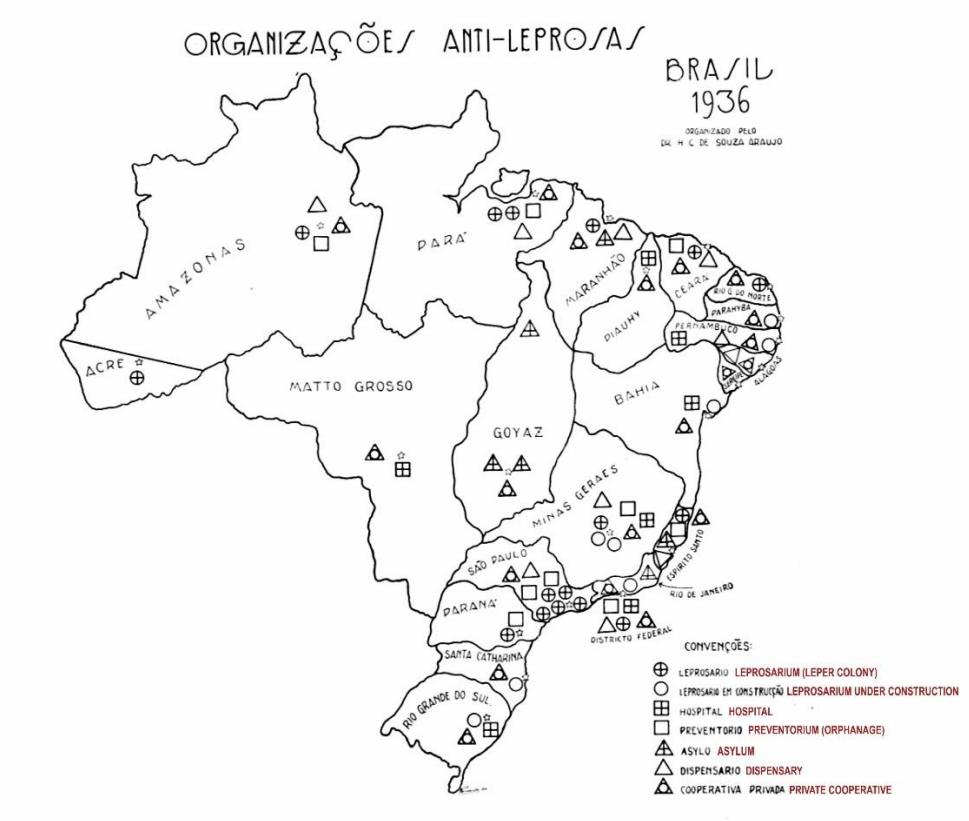

Fig. 2: Anti-leprosy institutions in Brazil – 1936. Extracted from *A lepra e as organizações anti-leprosas do Brasil em 1936* by Heráclides de Souza-Araújo, 1937. Edited by the author.

OPENING	CONSTRUCTION	LOCATION [STATE]	LEPER COLONY
1924	1921-1924	Pará	Lazarópolis do Prata
1926	1922-1926	Paraná	Leprosário São Roque
1928	?	Acre	Lazareto Ernani Agrícola
1928	1919-1928	São Paulo	Colônia Santo Ângelo
1928	1922-1928	Distrito Federal	Colônia de Curupaity
1928	1927-1928	Ceará	Antônio Diogo
1929	1926-1929	Rio Grande do Norte	Colônia S. Francisco de Assis
1930	?	Acre	Lazareto Souza-Araújo
1930	?	Amazonas	Leprosário Belissário Pena
1931	?-1931	São Paulo	Sanatório Padre Bento
1931	1921-1931	Minas Gerais	Colônia Santa Isabel
1931	1931-1935	São Paulo	Colônia Pirapitingui
1932	1929-1932	São Paulo	Colônia Cocais
1933	1928-1933	São Paulo	Colônia Aimorés
1937	1932-1937	Maranhão	Colônia do Bonfim
1937	1933-1937	Espírito Santo	Colônia Itanhenga
1938	1937-1938	Rio de Janeiro	Colônia Tavares de Macedo

OPENING	CONSTRUCTION	LOCATION [STATE]	LEPER COLONY
1940	1936-1940	Santa Catarina	Colônia Santa Teresa
1940	1937-1940	Alagoas	Eduardo Rabelo
1940	1936-1940	Rio Grande do Sul	Hospital Colônia Itapoã
1941	1935-1941	Paraíba	Colônia Getúlio Vargas
1941	1936-1941	Pernambuco	Leprosário da Mirueira
1941	1937-1941	Ceará	Antônio Justa
1941	1937-1941	Mato Grosso	Colônia São Julião
1942	1937-1942	Amazonas	Colônia Antonio Aleixo
1942	1937-1942	Minas Gerais	Colônia Santa Fé
1942	1937-1942	Pará	Colônia Marituba
1943	1936-1943	Minas Gerais	Colônia S. Francisco de Assis
1943	1937-1943	Goiás	Santa Marta
1944	1939-1944	Minas Gerais	Sanatório Roça Grande
1945	1937-1945	Minas Gerais	Colônia Padre Damião
1945	1937-1945	Sergipe	Lourenço Magalhães
1949	1936-1949	Bahia	Colônia Águas Claras

Table 1: Leper Colonies built in Brazil in the 20th century.

The number and size of the colonies had been defined accordingly to the necessity in each state. São Paulo and Minas Gerais, which had a larger number of infected people, had more than one colony. The *Colônia Pirapintigui*, in São Paulo, the largest colony built, could house 3 thousand patients at once. On the other hand, states like Sergipe and Alagoas, with a lower number of cases, had colonies with very reduced capacity: just 50 and 60 patients, respectively [12].

Although the physical structures of the colonies had minor variations according to the size or local characteristics, they were all organized following the same principles[3]. Besides offering medical treatment and research for the disease's greater understanding, those institutions were designed as small towns, isolated from society, as recommended. The leprosarium would meet all patients' needs, including a hospital, residences, workshops, areas for agriculture and livestock and leisure facilities (Fig. 3). Although its main function was to isolate the patient from society, this should be achieved without any aspect of hospital or prison [12]. Usually, a portico marked the entrance of the institution, but no walls were raised (Fig. 4). On the other hand, it was recommended the creation of an environment where patients could enjoy apparent freedom. At those colonies, the patients were expected to create a parallel society, as Arhur Neiva explained in 1919: "a shelter of kindness and faith in better days appeared, where at least the sense of society, conviviality, placidity, peace of mind and finally its own intimate haven, may be created, giving them the ultimate and fortunate illusion that the world no longer repels them and that the right to life was found again" [16].

The colonies were organized in three distinct sectors: one intended for health and another one for sick people, connected through a neutral sector. The health sector contained the residences of the staff and administrative buildings. The sick sector, the biggest of all, contained the residences and infirmary for the interns and all services devoted to them, such as school, church, workshops and leisure pavilions.

The neutral sector represented the place where healthy and sick could meet in a controlled manner. This kind of meeting was necessary both for medical and social reasons. Meetings between the patients and the physicians could happen at the medical services pavilion, for instance. This building was designed with separated entrances for medical staff and patients and their meeting only occurred at the consulting rooms. The parlatory was another important element of the neutral sector. This place was dedicated to the meeting of the patients and outsiders, mostly family and friends. As seen before, the consent of visits was an important aspect for encouraging voluntary internment. The structure of the parlatory varied among the colonies. In some cases, it was a building with adjacent rooms separated by a glass wall. In other, the separation was made by a surveillance corridor between those rooms. Other cases had less strict separation. For instance, at *Colônia Aimorés*, in São Paulo, the division was simply a balcony (Fig. 5) and some cases there was no building at all and only a fence separated the inmate from visitors [12].

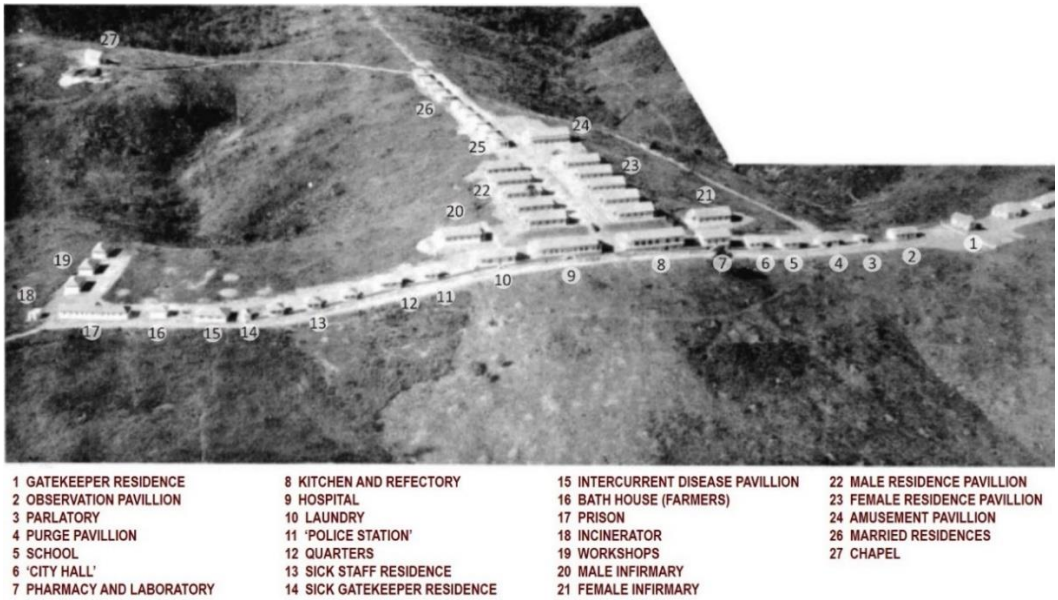

Fig. 3: Neutral and sick sectors at *Colônia Itanhenga* (Espirito Santo). Extracted from A lepra no Espirito Santo e a sua prophylaxia: A Colônia de Itanhenga – Leprosário Modelo by H. Souza-Araújo, 1937. Edited by the author.

[3] For a deeper analysis of leprosaria spatial structures, see ALECRIM, Laura and AMORIM, Luiz. Prophylactic architecture: spatial configuration of Leper Colonies. In: Proceedings SSS 2015 - 10th International Space Syntax Symposium. 2015.



Fig. 4: Main entrance of Colônia Getúlio Vargas (Paraíba). The sign reads "Hope is reborn here". Credit: Centro de Pesquisa e Documentação de História Contemporânea do Brasil / Fundação Getúlio Vargas. Photo reference: GC foto 527 / 4



Fig. 5: Parlatory at Colônia Aimorés (São Paulo) in 1948 – patients to the left and visitors to the right. Extracted from *Auto-imagem, fotografia e memória: constribuições de ex-internos do Asilo-Colônia Aimorés – SP* by Daniela Lemos de Moraes, 2005.



Fig. 6: Amusement Pavilion at *Colônia Santo Ângelo* (São Paulo). Extracted from *História da Lepra no Brasil – Período Republicano (1890-1952), volume II, by H. Souza-Araújo.*

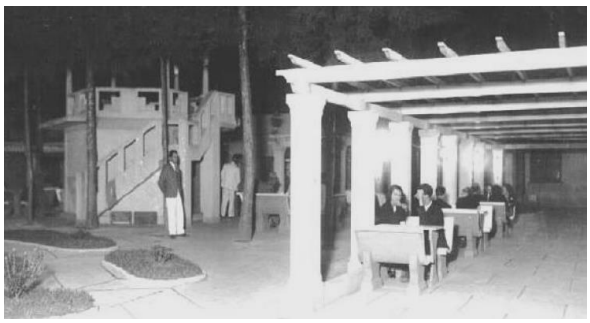

Fig. 7: Couples dating at *Colônia Santo Ângelo* (São Paulo). Extracted from *Resgaste histórico do leprosário Asylo Colônia Santo Ângelo* by Marilene Morera Feliciano, 2008.

Life within the space of the colonies was strictly controlled by a set of rules. The daily routine was regulated according to the hours for the development of predetermined activities: waking up, eating, taking care of personal hygiene, working, getting medical treatment, and enjoying relaxation time. Some colonies seem to have granted more freedom during leisure time, particularly for men. For instance, after an entire day dedicated to working, it was common to allow the inmates to go to the casino where they stayed for an hour or two (Fig. 6). In general, women were obligated to walk in groups and under supervision while men had more freedom to walk around the sick sector, provide they respected the schedule of the day and informed the guards on every movement. One also had to inform the guards when engaged in a romantic relationship, so they could allow the encounter. The encounter would happen under supervision, be it from the guard or a married couple (Fig. 7). At the end of the day, the guards inspected all the colony to check if everyone was back in their rooms and the lights were turned off. Until the following morning, all movement was prohibited [17, 18].

Despite the compulsory confinement, intense control of one's personal life and lack of contact with the outside world, the patients managed to transform the leprosaria into sociable environments. When studying the everyday life at *Leprosário da Mirueira*, in Pernambuco, Oliveira highlights the patients' resistance tactics: 'they did not build a history of life based on pain and suffering. [...] Within the space imposed on them, they reshaped their lives, forged new relationships, new pacts of familiarity and solidarity [...] they turned that space into a real city' [17 p. 107].

3. The obsolescence: from the new treatment to the uncertain future

In 1941, while Brazil was still building its colonies, at Carville National Leprosarium, in the United States, the sulfone therapy has been proved to work. Once the patients started this treatment, they stopped transmitting the bacillus. If the main argument in the leprosaria's favour was the need to isolate the bacillus, there was no scientific reason to isolate them anymore. The results of this treatment were recognized at the II Pan American Leprosy Conference in Rio de Janeiro in 1948. At the V International Leprosy Conference in Cuba, the sulfones were acclaimed as the first choice for leprosy treatment. The new prophylactic measure was based on an effective outbreak control, which could be achieved by

treating the ill and monitoring the communicants. This strategy was finally recommended at an international level at the Tokyo Conference in 1958. Two years later the same approach was suggested in Brazil by Orestes Diniz, director of the National Leprosy Service at that time [19].

The last leprosarium built in Brazil, *Colônia Águas Claras* in Bahia, was inaugurated in 1949, a year after the treatment with sulfones started in the country. Since the early 1940s, hospital discharge was already a possibility for the patients. The 1947 Regulatory Instructions for the Discharge of Leprosy Patients standardized the criteria in which patients could leave the colony and transfer their treatments to a dispensary. For this to happen, they needed six or twelve consecutive negative monthly exams, depending on the clinical form of the disease [20].

It is not possible to affirm whether segregating the sick contributed or not to the decrease of leprosy among Brazilians, but some research points that it probably did not. It might even have the opposite effect: "ironically, isolation has facilitated the continued spread of the disease by increasing the stigma and confusion surrounding it" [15 p. 309], which probably encouraged some people to hide their conditions.

Compulsory segregation was abolished as a federal official prophylactic measure in 1962, but voluntary internment continued to occur until 1986. Braga relates a case in 1954 when a leprosy patient was discharged from a leprosarium but was reinstalled on the same day. The admission document stated "social reasons", other than a medical one [18]. This was not an isolated case. Throughout the country, the leper colonies continued to host their ex-patients due to the difficulty in reintegrating those people back into society. This was so common that White states that at Rio de Janeiro, "when the doors to Curupaiti were opened, more people moved in than out" [21 p. 135]. Many of those people, as well as their descendants still live in former colonies (Fig. 8). Even though they can move freely in and out the facilities, White underlines that "as in many former leprosaria or Hansen's disease confinement centres, many residents of Curupaiti still consider themselves to be 'patients' and think of themselves as 'sick', particularly if they have disabilities or deformities"[21]. But they are not patients anymore and, in several cases, they are neglected by the state and by society.



Fig. 8: Ex-patient at a collective residence pavilion at *Colônia de Curupaity* (Rio de Janeiro). Credit: Fabio Teixeira. Available at https://www.vice.com/pt/article/pgxyv7/os-fantasmas-do-curupaiti.



Fig. 9: Church in ruins at *Colônia Getúlio Vargas* (Paraíba). Credit: Maryellen Badarau. Available at https://www.reporterespecial.com.br/ post/dramas-da-hanseniase.



Fig. 10: Partial view of the former casino at Aymorés Colony (São Paulo), which now holds a museum. Credit: Instituto Lauro de Souza Lima. Available at http://www.ilsl.br/instituicao.php



Fig. 11: José Avelino Memorial at Santa Isabel Colony (Minas Gerais). Credit: Daniele Borges. Extracted from *Memorial José Avelino: Um lugar de memória para iluminar memórias invisíveis* by Bezerra and Serres.

Even when the facility still operates as a health centre related to Hansen's Disease, now focused on ambulatorial activities, the budget of these establishments has been significantly reduced. This results in a poor state of conservation of buildings, both in residential pavilions and in buildings for community use, some of them are by now ruins (Fig. 9).

Since the 1980's a non-profit organization, Morhan (Movement for the Reintegration of People Affected with Leprosy), have been the main agent in favour of those who suffer or suffered from leprosy in Brazil. One of their most important achievement was probably a federal measure enacted in 2007 that establishes a special lifelong pension for those segregated in colonies until 1986. Brazil was the second nation in the world to do so, being Japan the first [28]. The importance of that goes beyond the monetary repair: it represents an official recognition of the transgressions made by the Brazilian Government.

In recent years, a few initiatives looked to the leprosaria as places of memory. At São Paulo State, all five former colonies are listed as heritage by the State's Heritage Department (Condephaat) since 2014. Before that, isolated buildings in some colonies had already been listed during the 1990s. At that first moment these buildings were valued mostly for their architectural aspects. In the most recent process, the study was developed for all the colonies at once which reinforces the idea of all these facilities working together as a system for leprosy's prophylaxis [22, 23]. The resolution for listing *Colônia Aimorés* pointed that the "heritage related to public health, and, especially, that related to infectious disease treatment did not have a deep study nor have been recognized despite its social and cultural significance" and include the leprosarium as a "component of a network that synthesize the political, social and cultural context of its time" and hence recognizes its listing as "a possibility to study and preserve the memory of a painful past that was almost socially forgotten – because undesired" [24 p. 314]. At *Colônia Aimorés*, now Lauro de Souza Lima Institute, a medical and research centre for dermatological diseases, we can find a memorial place, the Silas Braga Reis Museum (Fig. 10).

Porto states that the museum at *Aimorés* represents the institutional view of the colony's history and not the patients' perspectives: "the Silas Braga Reis Museum collection presents an institutional narrative, which contemplates medicine and its advances concerning the disease, giving the doctors and former directors, and not the patients who lived there, the protagonism in these memories" [25 p. 195]. Challenging this dominant view is essential because identifying these places as heritage goes beyond recognizing the importance of their architecture or the role they played in the history of health in Brazil. As Meneguello and Borges point out, this is also part of "the struggle of leprosy patients for the recognition of their rights for the way they have been thrown out of society for decades" [23].

This was the case of *Colônia Santa Isabel* in Minas Gerais, where one of the first initiatives to preserve the memory of the leper colonies in Brazil took place. In the late 1990s, the colony's portal and the urban setting was listed as municipal heritage. At that time, the main argument for its protection was that the urban plan, developed by locally renowned engineer Lincoln Continentino, expressed the sanitarian policy of its time. This plan can still be perceived today. Indeed, the colony portal is completely detached from the rest of the setting and it is not possible to identify the buildings nor the streets of the health sector, but the urban layout still intact in the rest of the colony and the sick sector is the one that "better preserve its original urban design and the buildings' typologies, the buildings that still exists has a bad conservation status but did not suffer mischaracterizing actions"[26].

The *Colônia Santa Isabel's* was also a pioneer regarding preserving the memory of the institution. They proposed the *Corrente da Memória* (Chain of Memory), a series of encounters of the city's inhabitants to "reconstruct the city's living history" [26]. This guided the activities in the site since then. The most valuable one was a collaborative inventory that had great public participation. It identified not only the architectural elements but also immaterial aspects of the colony. Among the immaterial aspects, it is important to highlight the identification of what they called personalities of memory, people from the past that were in some way important for the colony, and the living agents of memory, those people that still alive and whose lives could somehow represent the life in the colony [26]. At *Colônia Santa Isabel,* the previous Amusement Pavilion now holds the José Avelino Memorial (Fig. 11), an honouring device organized by former patients and staff themselves where objects, photos and other remainings of the segregation period are exposed [27].

4. The memory: final considerations

This paper provided an overview of the past and the present of Brazilian Leper Colonies. The mistake in leprosy prophylaxis resulted in one of the largest networks of this kind of colonies in the world. Many people do not even know these facilities ever existed. Many others think that those places still function as leper colony, resulting in the stigmatization of the place and its inhabitants[21].

As Serres and Borges underlined, leprosy memory is not usually claimed. It is a kind of remembrance that produced – and still does – too much pain for those affected by it. But this does not mean that this phenomenon should be forgotten. On the contrary, keeping this memory is a way of reconciling with the past [29]. Of course, this is not part of the dominant perception of heritage that privileges the monumental, old and aesthetic, what Smith calls the Authorized Heritage Discourse[30]. Those places represent "the destructive and cruel side of history"[31 p. 1] and yet initiatives to preserve this kind of

site is increasing around the world: “these sites bring shame upon us now for the cruelty and ultimate futility of the events that occurred within them and the ideologies they represented. Increasingly, however, they are now being regarded as ‘heritage sites’, a far cry from the view of heritage that prevailed a generation ago when we were almost entirely concerned with protecting the great and beautiful creations of the past” [31 p. 1]. The reason behind the recognition of those sites as worth preserving is that not exposing unpleasant aspects of the past might be just a different form of repression.

The identification of leprosaria as heritage alone is not enough. A careful approach is crucial. It is important to work on what image of leprosy to project, recognizing different voices and identifying aspects that might be underrepresented or ignored in the site’s interpretation [30, 31]. Although difficult, the leper colonies are a needed heritage that plays an important role in avoiding stigmatization of those affected with leprosy, be it in the past or the present.

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HEAL - Housing for emergency and affordable living

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Abstract
HEAL is a research work in which the aggregation of dwelling modules, designed to meet the new housing needs during emergencies, is designed and managed, using advanced digital tools.
Historically, cities have changed in response to threats or attacks, today more than ever, this transformation is clear. The concept of the house has changed, the experience of the recent lockdowns due to the pandemic has increased the already present trend towards a hybrid and multifunctional configuration, modifying the spaces of our homes in flexible environments. The forced stay inside our homes has led us to rediscover the outdoor spaces in their various types as a relationship with nature, although extremely domestic.
HEAL proposes a more responsive solution to the living space. The abacus of the modules allows to generate multiple configurations both in terms of settlement types and in terms of configuration of common and private interior spaces. The ability to compose, replace and vary building components in a digital environment allows detailed simulations of how the whole building can respond and react to external conditions. Plus, new shared spaces configurations can be tested, with the potential to decrease the transmission of infections.
Finally, the ability to semi-automatically transform the initial diagrams into BIM elements allows a precise control of the building components already in the early stages and, therefore, a considerable containment of the final costs.

Keywords: Emergency housing, Modular housing, Responsive architecture, Parametric approach,

1. Introduction
The present pandemic worldwide condition has shown up how much uncertainty is still characterizing our world and how resiliency mechanisms and flexible models are strategic. As architects and urban designers, we have decided to work on flexible affordable housing modules able to counteract different kinds of emergency situations, from sanitary emergency, to social needs, to climate disasters, to post war conditions. Modular housing has a rich tradition rooted in the Modern Movement experience as an architectural and building issue, but the related settlement issues still need a reflection. Considering emergency conditions as one of the drivers of city evolution, the research project HEAL tries to deal with urban settling flexible models through responsive architecture using a parametric approach.

2. Urban's form evolution in response to emergency context
Historically, cities had to transform following catastrophes and in response to different kinds of threats, so as to improve their own layout and prevent future attacks, as happened following the plague epidemic of 1300, the Cholera one of the 1800s or after the Great Fire of London [1].
After the Covid pandemic too, the cities will have to change to respond to the new raising needs. Following the new technologies, cities are in constant evolution, these changes are quicker and more abrupted especially after great crises. The Great Fire of London brought new building codes for fireproof constructions, infectious diseases, like tuberculosis, spurred the creation of wider green spaces and a search for sunlight and outdoor areas. Until the end of the 19th century, the fastest means of transport was the horse, to clean up the cities from the smell and disease the automobile was a success, this

allowed a new way of planning an urban centre and its mobility, with city enlargements and the relocation of shelters and hospitals in the outskirts.
During the present pandemic period, we are observing changing urban ways of living: the use of public transport is being reduced in favour of private transport, to avoid gatherings, even if we are trying to limit the use of fossil fuels, improving electric cars or scooters and bicycles, workplaces are becoming more flexible, and our own homes are always becoming our workspace as well. The concept of the cities divided into neighbourhoods, where you can live, work, shop and spend your free time within walking distances seems to be back [2].
This will also help in counteracting the phenomenon of gentrification, which has led less wealthy families to move to peripheral and less served areas, moving away from work and sociality areas, creating also an impact on the economic productivity [3], which was already on an important urban trend before the Covid appearance. Both of these attempts, to limit people circulation and to improve social mix and community neighbourhoods, might have an important impact on the evolution of the city's form, encouraging the regeneration of urban fabric through the development of new community spaces and flexible housing typologies.

3. Housing evolution in response to social changes

As a response to the pandemic condition but also to the relative economic crises and the smart working revolution, housing as well is undergoing changes. The house is the place where we must feel safe, if before it was the refuge from the chaos of the city now it also becomes the refuge from the virus, and it is hosting multiple functions. Therefore, it is inevitable that housing has to become more and more adaptive to better meet the needs of the occupants [4].
We have seen, during this pandemic, that the house has become the central pivot of the life of most people, it is no longer just the place where you sleep, but becomes an office, restaurant, school, space for recreation [5]. Most likely this pandemic will not be an exception (historically it is not), that is why the house has to become a more flexible and multifunctional place, to be able to reconcile the productivity of the individuals with their well-being. This requires innovative solutions for the small spaces of numerous current accommodation, such as the use of modular structures and movable walls, in order to make spaces adaptable to the needs of the user, but also the presence of open private spaces and storage spaces.
Therefore, we will also need to review the ratio between internal space and external space [6] both at the private and the collective level. To allow people to maintain a minimum of social life in a time where uncontrolled and crowded meetings have to be avoided, it might be interesting to develop private but collective areas such as the courtyards of buildings where a controlled and constant amount of people can gather. Furthermore, the private open spaces will also have the need to be in the foreground, in order to give the possibility to people to reconnect to nature when it is not available, even if in a more artificial and less wild form.

4. Housing modular design for flexibility

The modular design of the living space certainly makes it easier to create flexible and adaptable places. Modular homes can be produced much faster, being built in the factory and then transported to the project area.
The idea was developed in the 1930s following the first International Conferences of Modern Architecture. It was a period in which there was a pressing need for new homes and few resources to realize them. Le Corbusier began to formulate the idea of building houses in series, created in the factory as if they were aircraft or cars. To him, this way, the house would become a tool, accessible to all, healthy and safe [7]. Using the minimal spaces provisions forecasted by CIAM, made possible to have less waste possible and better efficiency of the space used. Then, the "house as a machine to live" and projects like the Maison Dom-Ino, Maison Citrohan and the Unité d'Habitation became models for a new generation of housing.
In recent years the modular and prefabricated design is returning to the scene, since this type of design allows to create new spaces of housing for emergencies in a short time, with low costs and low impact on the environment. For modular housing, more eco-sustainable and recyclable materials can be used and they allow to have less waste, since it is possible to control the production very precisely according to the needs of the customers [8]. Therefore, it is, possible to create building modules with a high technical level, but managing to achieve more accessible costs and maintaining flexibility in the design. Thanks to this approach, each module can be exchanged, modified, or eliminated in the final aggregation, without major problems. It is a very versatile type of design, which, depending on the needs, can be used for permanent or temporary installations and also allows a high degree of customization, both at a global level of the building and at the level of the single module.

5. Parametric approach to flexible housing and resilient city

Modular housing potential is related to its customization possibilities. In the Seventies of the last century Modular housing has been charged to be excessively rigid and not able to allow evolution of the house according to the evolving needs of the habitants during time. But nowadays Modular housing has no more to do with heavy prefab but with light structure and customizable configurations to manage which computational tools are required.
In addition to the multiple architectural variations able to satisfy a very wide audience of users, allowing multiple ways of living and a multiplicity of functions to be hosted at home, this research aims to deal with the urban scale trying to design aggregation models for modular housing in order to integrate modular emergency housing into the urban fabric. In this sense, emergency housing is not considered as a low quality, rigid and uncomfortable container which lands as a UFO landing in any empty space available. The HEAL project is aiming at conceiving a modular housing model addressing both architectural and urban levels.
We see a parallelism between the shift occurred in modular housing conception and the shift characterizing the “new global style”, also called Parametricism, as proposed by Patrick Schumacher [9]. For him current post Fordism age is based on customisation and complexity just like industrial modernity, where the modern movement developed the idea of modular housing, was based on standardisation and economies of scale. Nowadays the mathematics of Parametricicism seems to be the best tool to manage variations, hence to design variations and to produce them at a large scale. In this sense frame HEAL project is working on designing an abacus of facades’ elements compositions and finishing that can be combined with different typologies of private outer spaces in order to obtain highly personalised living units which production and aggregation is managed through parametric software.
At urban scale, techniques such as animation, simulation and form finding tools, as well as parametric modelling and scripting, have inspired a new collective movement with radically new ambitions and values. Starting from the concept of “continuous differentiation” [10] coined by Greg Lynn and Jeff Kipnis in the Nineties of the last century, parametric approach to urban design works by versioning and iteration process to interact with urban morphology and tectonic characters to avoid both mimicking and contradicting urban context. The final goal of the parametric managed housing aggregation is to contribute to urban resilience in term of housing emergency but also providing healing spaces at a block urban micro scale.

6. Housing for emergency prototype: design program

HEAL is a research project in which the aggregation of dwelling modules, conceived to meet the new housing needs during emergencies, is designed and managed, using advanced digital tools.
The project starts from the idea of designing affordable housing in a simple and fast way, setting up settlement principles in order to locate the housing complex in different areas of a city, matching several kinds of urban morphologies. For this reason, we have chosen the modular approach, which helps in building dwellings at a lower cost and faster, managing to have a certain degree of flexibility and customization. Thanks to the use of an abacus of modules, from which the users can choose the best solutions for them, from the layouts of the apartments to the finishing, new shared spaces configurations can be tested to suit many different urban and social conditions. The new private but somehow collective open spaces generated within the modules’ assemblage present a great advantage, in decreasing the infection’s transmission while offering the possibility of community life.
Designing in a digital environment helps to generate multiple different configurations in a short time and also allows to replace and modify all the components of the project, in order to better adapt to all the needed requirements.

7. Computational design: opportunities and threats in the case study

The housing prototype is based on the concentration of the project process under the architect responsibility, combining flexibility and freedom of expression of algorithmic design together with the control of information and data management, typical of BIM. The potential of algorithmic modelling in Building Information Modelling gives the designer the opportunity to autonomously programming a code, able in performing a certain repetitive operation, essential to the project, optimizing this way the entire workflow[11]. In this frame, the main challenge for designers becomes to translate the complexity of the real world into the simple rules and operations that will make up the algorithm on which Parametricism is based. This methodology used to design the housing prototype highlights the importance of the decomposition of design priorities into logical and creative solutions that can cope with even the most complex design problems [12].
The output of this process is the BIM model of a tower building in which it is possible to customize the position and type of housing solutions and to adapt the tower configuration to different urban morphological contexts.

The modelling process consists of several phases. Initially, the overall volume of the building is decomposed to identify the structural grid, then, through the definition of associative rules, the structural grid is filled with modules corresponding to the different residential functions (night area, cooking area, living area, sanitary functions, etc…). The developed algorithm defines local constraints, such as collisions between the aggregated parts (example: positioning of modules without overlapping but only juxtaposition), and global constraints, the recognition of some areas as more prone to some functions than others (example: identification of the staircase block), for the semi-automatic construction of the architectural object. The critical point encountered during the writing of the algorithm can be traced back to the definition of "universal" constraints that can support different types of construction. These rules, although banal for the designer, are difficult to translate into machine language in an environment that does not natively support many programming libraries.

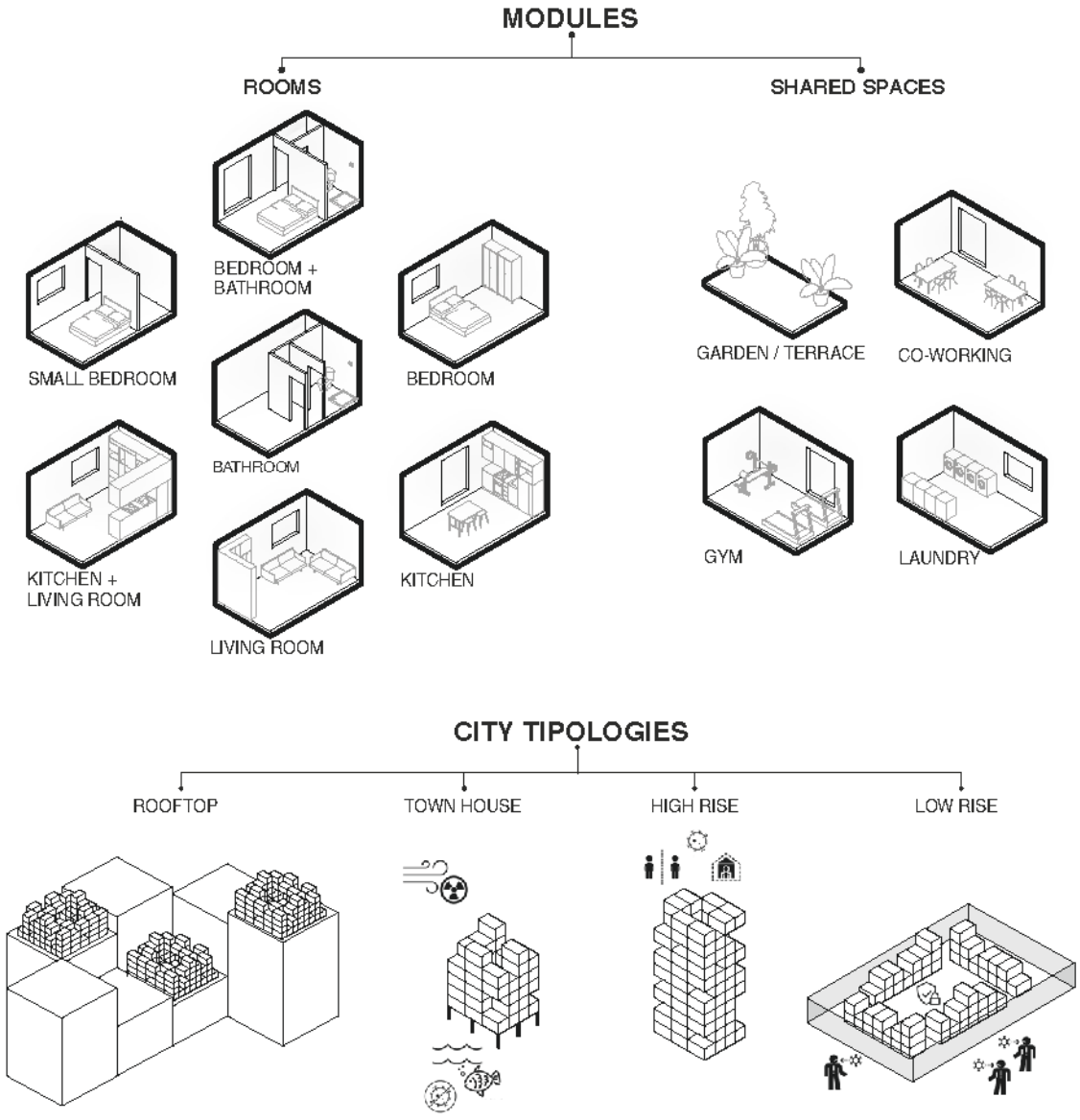

Fig. 1: HEAL Housing – Abacus of living modules and settlement typologies.

8. Responsive architecture: usefulness of simulations in emergency situations

The evolutionary and emergency states that characterize contemporary reality are no longer attributable only to extraordinary, exceptional and specific phenomena, but also derive from environmental transformations, social changes and the loss of specific building culture [13]. Design tools to plan adequate and timely responses plays a crucial role in terms of preventing human and financial losses [14] and would improve the resilience of even low-cost housing solutions.

In the building sector, the adoption of methodologies based on parametric systems has the advantage of guaranteeing greater quality and efficiency throughout the entire life cycle of a building; in the design

phase, conducting more accurate checks and simulations reduces errors and inconsistencies typical of the more advanced phases of projects carried out traditionally [15].
In emergencies this advantage becomes a real need if we consider the decisive importance that buildings have in people's lives.
Model management based on BIM systems and VPL applications would make it possible to visualize the potential and criticality of the project in a single environment.
In the VPL environment, given its nature, it is possible to convert design mechanisms to create flexible algorithms that can generate building schemes by hybridizing geometric information with the third information. Such schemes can be easily transposed into BIM applications as building components. The BIM environment manages the building components and can store the information used as input in the design, therefore the model managed in this environment can provide risk assessments by identifying the dependencies of different components [16].

9. Parametric approach: Possible applications and implementations

The case study is in its prototypal phase; therefore, it is only able to manage a few building types and further developments are necessary. The writing of associative constraints is to be optimized and it would be useful to be able to integrate environmental data for the optimization of the final architectural artefact.
However, it is crucial to emphasize that an effective response to emergency situations is a priority to overcome them. It is indispensable to develop systems to support the designer to facilitate the decision-making process. The advantages of adopting an algorithmic approach concern above all the affinity between the conceptual mechanisms of investigation and understanding of an object and the logical nature of the process, thus allowing greater control over the elements of the model and its information. It is possible to simplify the idea of an "algorithm" by likening it to a data flow in which each parametric component collaborates in the integration and modification of incoming information, resulting in a new list of output data [17].
Thanks to the introduction of Visual Programming Languages, the limitation of modelling is not related any more to the limits of specific software, sometimes a bit rigid, but has much more to do with the capability of the users, the designers, in translating functional need and formal requirements into simple parameters and algorithms. On the other hand, finding an effective algorithm presumes a profound knowledge of the object to be designed given the possibility of managing data that is not only geometric. A change in the methodology of model development must be considered, since the operations of rationalization of forms and decomposition of complex surfaces, which are traditionally thought of as operations linked to the most advanced phases, must become an integral part of the formal definition process from the early stages [18]. This implies, continuous updating and training on the emergence of increasingly sophisticated modelling tools. The challenge for the programmer might be to conceive friendly interfaces to improve self-learning.

10. Conclusion

This multidisciplinary research develops a multidimensional approach to healing housing and space design. Pushing modelling and algorithmic techniques to its limit, in order to constitute an effective support in managing a wide range of emergency situations. An underestimated opportunity given by algorithmic approach as a conception tool, is the opportunity to explicit the priorities assumed by designers and stakeholders allowing non-experts to share part of the decision becoming active in the emergency situation. This perspective broadens up a multitude of possibilities in healing space design conceived not as a top down approach but as a participatory process.

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From a hydroelectric power centre to an arts centre: the regeneration of the Fies hydroelectric power station in the Sarca valley

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Abstract
Many production buildings have been abandoned; few have had a new life after being closed down. Industrial buildings are abandoned for many reasons. These are sometimes related to the specific sector: for example, economic and production transformation or a decline in the quantity of materials etc., and sometimes they are specifically related to the building itself — to its technical life cycle — but also related to general factors tied to changes in policy, for example, a different use of the water supply or environmental factors.
For some disused industrial buildings, sustainable regeneration projects have been proposed and implemented by interpreting and recovering the value of the memory of the work, the architecture and the technology. We thought it would be interesting to analyse the renovation of the Fies hydroelectric power station located on the right bank of the Sarca river (Trento), which today is a space for the creation and production of contemporary arts.

Keywords: regeneration, re-use, re cycle, abandoned industrial buildings, intervention strategy

1. Introduction
For several years now, there has been discussion of industrial decommissioning, with production facilities located inside and outside urban centres, individual buildings or building complexes undergoing partial or total decommissioning. There are many reasons for this: the technological obsolescence of plant infrastructure, emitted environmental pollution, the location, urban land value factors, functional obsolescence, demise of the market demand for certain products, the inability of a plant facility to respond quickly to new demand and many others.
In Italy, as in other industrialised countries, disused industrial buildings have become a significant part of the building stock. The factories of the early twentieth century, those built between the two wars and in the 1960s, 1970s and 1980s, have been abandoned. Decommissioning has been continuous; buildings and complexes with extremely diverse settlement, formal, typological, structural and technological characteristics have been abandoned. It is well known that interrupting productive functions leads to eliminating all maintenance and then to an inevitable state of decay. The abandonment often fails to consider the value of an installation or its architectural and technological worth.
In the light of the increasingly urgent need for sustainable territorial and urban regeneration and greater attention to avoiding consuming virgin land to erect new buildings, the problem of recovering disused industrial buildings becomes strategic in the landscape transformation process.
The particular nature of the locations and the morphological, formal and technological characteristics of production sites hinder the implementation of coherent and compatible functionalisation and transformation interventions. The need for substantial financial resources to regenerate production areas very often impedes such interventions.
For several years, we have been engaged in a lively debate to achieve the regeneration of productive assets: several site listings have been drawn up, legislation has been enacted, incentives have been made available, but few physical regeneration measures have been implemented, and those few are mainly public initiatives.

In recent years, many attempts have been made to define processes of recognition and enhancement of production sites by associating them with sustainable policies for relaunching territorial competitiveness, especially with respect to qualitative and economic parameters.

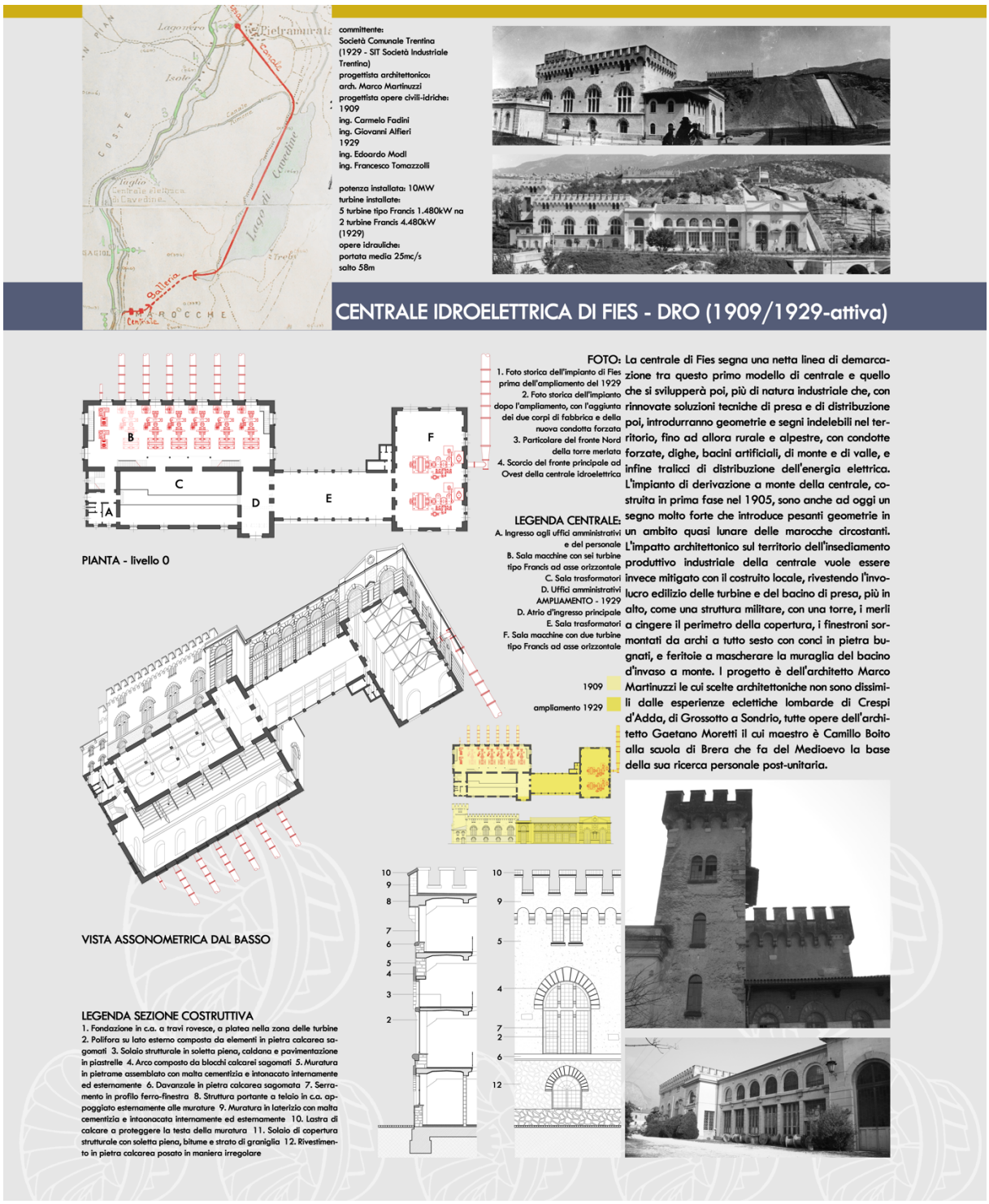

Fig. 1: The Fies hydroelectric plant (architect Giovanbattista D'Ambros)

During the current assessment phase, the problematic nature of productive architectures located in scenic areas became evident. These included structures such as hydroelectric power stations, mainly located outside inhabited areas, in many cases within green areas and adjacent to the courses of rivers. After just under a century of operational life, they have been totally or partially decommissioned, mainly due to the "ageing" of the plant and continuous technological progress.
For this category of productive buildings, the regeneration problem is twofold: on the one hand, an objective process must be carried out to enhance the value of the building without diminishing the

landscape value of the site, and on the other hand, hypotheses must be formulated for a congruous reuse of the building by incorporating new and appropriate functions.
There are many such disused hydroelectric power stations, and in this study, we focused on the Fies complex in the Province of Trento. The municipality of Trento erected it on a branch of the Sarca river where it operated for fifty years from 1909, after which it was abandoned and replaced by other facilities built on the river Sarca.
The hydroelectric power plant first experienced a phase of underutilisation before it was finally abandoned. This was followed by a recovery endeavour involving conservation and repurposing, and today the structure is no longer productive in the original sense but has become an art workshop and theatre centre serving the Trentino region and elsewhere.
The renovation of the Fies power station complex should undoubtedly be taken as an example: an empty building has been carefully and intelligently reused, revitalising the area, but this reuse also calls for reflection.

2. Fies power station

In the second half of the nineteenth century, Trento became an important military stronghold for the Austro-Hungarian empire. Quartering and production facilities were built to serve the military, together with a well-developed road and rail network and modern infrastructure, including electricity generation, water supply and sewage disposal.
The city immediately set about developing the electricity network to illuminate streets, public and private buildings, power factories, and the railway.
On 6 May 1889, the Ponte Cornicchio hydroelectric power station (one of the first in the Austro-Hungarian empire) was inaugurated in Trento [1], situated near the urban centre, by exploiting a 86 m fall in the Fersina torrent.
The power station was designed by the engineer Annibale Apollonio (a city engineer who had worked as a hydraulics expert) and championed by the mayor, Paolo Oss Mazzurana. Comprising six Siemens & Halske turbines, each driving a 140 horsepower direct current dynamo, it failed to produce enough electricity to meet the city's needs and thus, immediately after the plant became operational, the authorities contemplated the construction of other electrical stations in the surrounding valleys.
The municipality developed several studies supported by extensive technical and budgetary evaluations and finally decided to build a new hydroelectric power plant on the left bank of the Sarca river. It was decided to locate the power station between the Sarca and the Marocche, a majestic postglacial landslide site in the heart of the 'Valle dei Laghi'. The waters of the Sarca, a few kilometres south of Fies, were already used by the Prabi power plant to produce electricity for the Arco Kurort.
The study was first entrusted to the engineer Domenico Oss and a subsequent redesign was undertaken by the engineer Antonio Fogaroli. Soon afterwards, in 1903, the Municipality of Trento applied to the District Captaincy of Riva del Garda for a hydraulic concession pursuant to the Water Management Law no. 64 of 28 August 1879. The municipality was authorised to draw a quantity of water equal to 8 m3/s to be discharged into Lake Cavedine and then to draw 10 m3/s from the lake itself.
Expropriation procedures commenced acquiring land on which to build the hydraulic works and the power station building (74 plots in the municipality of Dro and 8 in the municipality of Cavedine). The procedures lasted over two years, and construction did not begin until 1905.
Works for the hydroelectric plant on the Sarca comprised earthworks, masonry and buildings for the hydraulic plant and the power station building; hydraulic and electrical machinery for the Fies power station; power transmission lines to Trento; the primary transformer station in Trento and its distribution system; grid power supply lines and secondary transformer stations.
The design of the technical systems was entrusted to specialist engineers, and the city engineer Domenico Fogaroli continued to supervise and coordinate the technical and architectural design work.
Procurement tenders were called for hydraulic and electrical machinery, and the Rüsch company from Dornbirn won the contract for the penstocks, the turbines and the sluice gates sited at the level of the alternators' loading basin. The Siemens-Schuckert [2] company of Vienna won the tender for the exciters, the transformers and the internal pipes, while the Wagner company of Vienna were contracted to supply the bridge crane inside the facility machine room.
The architectural design for the power plant and transformer stations construction was assigned to the architect Marco Martinuzzi (Murano, 13 September 1877 – Trento, 30 November 1949. After graduating from the Academy of Fine Arts in Venice, he moved to Trento, where the Municipality technical office engaged him. After some years, he resigned and worked as a self-employed professional in Trento).
The work proceeded rapidly, so much so that in the early months of 1907, the intake near Pietramurata was already completed, whereas the Pietramurata-Lake Cavedine link, the channel connecting the loading basin with Lake Cavedine (including the tunnel section), the recharging basin, the return channel, the bridge over the Sarca and the access road were all at halfway.
In 1906, construction work began on the power station workers' residential building.

Completion and start of operation of the power station was recorded in the city council session of 30 December 1908; an extremely detailed account of expenses was also drawn up.
The young architect, like many engineers of the period who were designing hydroelectric power stations, designed an imposing container against the landscape backdrop, evoking the formal stylistic elements of castles, cathedrals and prestigious buildings. In Martinuzzi's design, such elements are manifest in physical isolation and visually dominate the castle-inspired elements. Indeed, the Fies power plant has a cleanliness of forms and attention to measurement, proportions and the interrelationship between various building parts that evoke the rational spatial organisation of medieval architecture. The architect probably took inspiration from the nearby Drena Castle, drafting a wall plan marked by regular openings and turrets.
Martinuzzi then enhanced the formal imposing nature of the building by adopting Renaissance-style elements in the presentation of the facade and the doors and windows, likening the power station's elevation to Giuliano da Sangallo's Palazzo Strozzi in Florence.
The building on the banks of the Sarca [3], with its ample doors and windows, did not reference history or modernity; rather, the rhythm of the openings and battlements flowed with the movement of the water and the people walking the road on the opposite bank.
The architect Martinuzzi, probably on the instructions of the mayor Oss Mazzurana, counterposed the elementary layout with elaborate and complex elevations to emphasise Trento's supremacy over the entire province, and thus the political and economic power of the provincial capital.
The adoption of a formal stylistic syntax was also instrumental in declaring the Italian character of the territory since the Austro-Hungarian government had by then begun to berate the people of Trentino.
In this building, Martinuzzi aimed to exalt the positive idea of progress, seeking an effective "mediation between architecture and engineering".
Traditional construction materials and techniques were combined with innovative ones; concrete was widely used in this construction.
The perimeter walls in load-bearing stonework and the internal concrete pillars, with their characteristic rising taper on successive floors, rested on a complex system of foundations. In addition to supporting the heavy loads caused by the machinery and the elevation structures, the foundation frame had to accommodate the positioning of the turbine outlet channels and the transformer ventilation ducts. The complex foundation pattern is entirely made of Rhine sand concrete, then a layer of hydraulic cement to achieve maximum waterproofing.
The external walls and pillars were connected by variable section beams also made of concrete.
The horizontal elements, therefore, appear as ribbed plates aligned with the beams.
Most of the windows and doors have iron frames to resist humidity and support the large dimensions.
All door and window frames are in local limestone. Here, too, tradition is combined with innovation: the elements contained in the frames are made of artificial stone.
The Norman Guelph battlements are in brick masonry, horizontally covered with stone slabs and laterally plastered in mortar.
In homage to tradition, wrought ironwork forms the railings that protect the internal protrusions as well as the external barriers and lampposts.
The workers' residential building, built upstream of the hydroelectric power station, is a simple two-storey construction. The structure, surmounted by a pavilion roof, contained several compact apartment units. The building was erected with stone load-bearing walls and timber floor slabs.
In 1909 the first part of the works (pipelines, tanks and main building) was completed, and the hydroelectric plant began to produce energy, which was used to illuminate the city of Trento and to run the Trento-Malè electric railway, inaugurated in the same year.
An enlargement of the Fies hydroelectric power station was envisaged as early as 1912. First of all, the residential building located north of the power station was enlarged to provide the necessary accommodation for the workers employed during the construction and operation of the new enlarged plant.
In 1912, it was also decided to install three more turbine alternator sets (one of which as a reserve), each capable of generating 1500 kW. Thus the plant reached its planned potential of 6 + 1 sets.
The machinery companies that had supplied the first installation were awarded new contracts: the Rüsch-Ganahl company supplied the hydraulic equipment while Siemens-Schuckert supplied the electrical gear. The expanded facility went into operation in October 1923.
In 1928, a further plant expansion was decided, this time by erecting a new building located south of the existing one. The new building hosted new generators (four 8000 hp machines), which effectively replaced those installed in the first building.
In the first post-war period, with the annexation of southern Tyrol to Italy, the Fies plant was upgraded again (new turbines were introduced and capacity reached 10,000 kW) and integrated with the new power station erected further downstream, in the nearby locality of Dro and dedicated to Prince Umberto of Savoy.

The works extended beyond the power station: the head of water was further increased and, to improve efficiency, a new inlet at Lake Cavedine, a power station feed tunnel and two new penstocks were built. The new construction built downstream of the existing one adopted the same layout and height as the hydroelectric power station.
Also in this case, the floor plan is highly regular, the few rooms being connected by simple, rational routes, structured on coordination concepts rather than subordination. The connecting passages are mainly horizontal, and the only two existing stairs have linear ramps.
For the new structure, the designer did not follow the formal rules that were taking hold in functional architecture. In this extension, tradition asserts itself again. The gable, the large openings, and the cladding reference the stately architecture of the regime.
The large openings impart movement to the façades, and this solution eventually unites the two bodies of the building, which, from the viewpoint of the street, does not appear to be the addition of two blocks.
The new building structure is framed with concrete beams and pillars. These are clearly visible in the generator room.
Thanks to continuous rigorous equipment maintenance, the power plant continued to operate.

2. The Fies power station is today a space dedicated to contemporary art

With the creation of the imposing structures after the Second World War, in particular the construction of the Nago-Torbole power station [4] in the 1960s, the activity of the Fies power station reduced considerably. Technological upgrading led to a reduction in the size of the machinery, and many compartments were effectively abandoned. With increasing automation, plant operation gradually required less staff. The reduction in staff effectively caused the workers' residential building to become vacant.
While keeping a small part of the plant in operation, the Electricity Company has given much of the space on loan to a cultural cooperative set up in the 1980s.
Over time, a meticulous restoration project was carried out and today the Fies power station is a centre to produce performing arts and a place for experimentation and the creation of new cultural scenarios.
This maintenance and repurposing project did not preserve and enhance the facility's spatial nature. It was a philologically correct intervention also in terms of materials and construction techniques.
The transformer room is now a space for exhibitions and public events such as meetings, workshops and presentations. The turbine room has been transformed into a large theatre which, if required, can be divided into two rooms with 200 seats each. Some of the power station rooms are now used both as rehearsal rooms and as spaces for public performances.
The complex also includes a guesthouse equipped for winter residences, while the spring and summer residences are located in the former workers' dwellings in the immediate vicinity of the power station.
Each space has thus found a new role while maintaining a strong link with its origins, with the forest and the mountain that rises imposingly beyond the river.



Fig. 2.: Fies today: facade



Fig. 3: Fies today: transformer room



Fig. 4: Fies today: turbine room

3. Conclusion

Historians, scholars and cultural social circles in general, have recognised the architectural value of the Fies power station: it represents the starting point of the typological evolution implemented between the end of the nineteenth century and the early twentieth century in hydroelectric power station buildings. This was the structural revolution that gave rise to “monuments” of electrical generation, homogeneous containers of complex machinery instrumental to housing turbines and alternators. We consider them monuments insofar as their volume, elevation and formal refinement made them necessarily stand out from other architecture and natural surroundings.

Engineers and architects have attributed technological value to the small construction: the use of reinforced concrete reveals its modernity, not only in its floor plan and height but also in terms of construction. The constructional modernity of the workshop spaces contrasts with the use of traditional residential building materials and construction techniques, showcasing how the old can be harmoniously fused with the new.

The attribution of historical, architectural and technological values has led to the conservation and enhancement of the complex and has also inspired a repurposing approach that is absolutely correct.
This disused structure has experienced its regeneration, but such regeneration endeavours should make us reflect.
There are other hydroelectric stations in this area, which after having produced a lot of energy, have been decommissioned.
We have several hydroelectric facilities in a relatively small area, those of Santa Massenza, Dro, Prabi, Riva del Garda, Ponale, Torbole, etc. Some have been decommissioned, and some operate at reduced capacity, while others are currently undergoing the decommissioning process. They are all important systems, many of which were developed by well-known designers, such as Giancarlo Maroni and Giovanni Muzio.
If we were to consider all hydroelectric power stations together, they should all be preserved and enhanced. Such an endeavour would certainly be worthwhile for their environmental value, the memory of the work performed in them, their specific architectural and construction features, and because they are part of a network and each plant embodies a particular moment in industrial history. The networking of disused power plants could be a driver of development and an instrument of knowledge of the industrial and economic past, even if this heritage calls for a design approach based on the conservation and enhancement of all its constituent characteristics, be they cultural, historical, technological and environmental.
The conservation and enhancement project, extending over the entire local area, with the participation of the municipalities, could lead to an understanding of which type of repurposing to pursue. The problem is not the restoration itself but what we want to do with the existing stock.
In terms of building resource regeneration, we cannot only consider museums, exhibition and cultural spaces – in a small area, this is certainly not feasible.



Fig. 5: Fies today: control room

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Automated BIM information flow for internal comfort conditions in an historic building

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Abstract
The comfort conditions in confined environment have a great influence on well-being, productivity and quality of life. Achieving high standards of well-being for occupants inside historic buildings can sometimes be complex, which is why environmental and energy sustainability protocols can provide an efficient tool to design and verify these conditions.
The LEED Historic Building protocol allows to pursuit high internal comfort conditions, paying attention to the conservation of the building and its artefacts. This study, starting from the concept of Level Of Information Need, aims to identify the necessary data to achieve the LEED protocol credits for comfort and environmental quality. Once the necessary parameters have been identified within structured tables, it is necessary to analyse the data flow during the design phases in order to study an automatic data flow that can facilitate the design process within the BIM approach. The automation of the information flow will be set up with the use of a Visual Programming Language, which allows the automatic creation and transcription of parameters, by connecting Excel tables to BIM models. This research provides to designers a data management tool that reduce time used in exchanging information and decrease the human transcription errors. Therefore, the method developed has been applied in the retrofit design study of an historic farmstead in Milan.

Keywords: BIM – LEED – Historic Building – Internal Air Quality – Visual Programming Language

1. Introduction

Nowadays the use of a BIM approach for historic buildings retrofit is spreading in the building environment. This method allows to manage, share and check information and geometry in a much more efficient and dynamic way, developing an integrated design with cooperation between different teams. For the historic buildings, where the as built study and the cooperation are crucial, the BIM approach can be very useful, saving time and preventing human mistakes or design interferences. For this reason, the HBIM (Historical Information Modeling) approach is becoming essential for retrofit design.
The use of BIM by different disciplines leads to manage a large amount of information, which can lead to an overabundance of data, making the model heavier. There is indeed a need to create a quick and organised information flow that allows to create models easy to manage and with all the information needed, without having a surplus of data. The ISO 19650 introduces the concept of Level Of Information Need which is the description of the information deliverable to fulfil a specific purpose for which the data are required. The application of this

concept makes it possible to avoid excess of information and to provide a model with only the necessary data for the discipline under consideration.
Starting from this concept it has been possible to develop an automatic information flow able to pass information from excel tables, structured according to the Level Of Information Need, to the BIM model; in this way, information can be shared in an agile and efficient way with all the professionals involved, encouraging integrated design.
This research, in particular, deal with the passage of information involved within a sustainable retrofit project of an historic building, following the criteria of the LEED HB protocol. The design process of sustainable buildings is more complex than conventional project approaches due to the multidisciplinary design work teams that are required to address the requirements of environmental sustainability protocols. Achieving an integrated design solution prior to construction means that the design team must manage reciprocal task interdependencies and address a complex of information sharing requirements surrounding data coordination and exchange across multiple disciplines [1]
Leadership in Energy and Environmental Design (LEED), is one of the most well-known and commonly used green building rating systems, developed by the U.S. Green Building Council and it is a fundamental tool to design sustainable buildings. Italy is the first country in the world in terms of cultural, historical and architectural heritage. About 30% of Italian buildings are historic buildings, and many of these need sustainable restoration and refurbishment. GBC Historic Building certification is a rating system aimed at evaluating sustainability level of restoration and refurbishment (that comes from the Italian experience in this scenario), combined with the skills of the LEED international protocols (the most widespread rating systems in the world). This is a standard in which the recovery needed by most historical building coexists with the indications of the European targets on environmental impact reduction and existing energy redevelopment. The GBC HB rating system evaluate the sustainability in overall refurbishment activities starting from the design phase, till the construction phase and the evaluation of the efficient operation and maintenance of the building [2].
Given the large amount of information that are involved in building environmental analysis, the research has taken into account only the ones related to the internal quality conditions of the building.
In fact, the comfort conditions in confined environment have a great influence on well-being, productivity and quality of life. Achieving high standards of well-being for occupants inside historic buildings can sometimes be very complex, which is why environmental and energy sustainability protocols can provide an efficient tool to design and verify these conditions.
The paper, after an excursus on the latest scientific results about BIM information flow and its application to the LEED protocol, is structured in two main parts: the first one frames the method used to conduct the research, dealing with the definition of the Level Of Information Need for internal air quality of the LEED credits and its integration in the BIM process. The second part will show more in details the research steps and will share the results obtained by applying the method to a farmstead near Milan.

2. Literature review

The BIM approach is an important tool for all the professionals involved in the construction process: it can be applied to many disciplines and gives the opportunity to efficiently manage data exchanges throughout the whole built asset life cycle, including the operational phase. The BIM process is studied by many professionals to develop more efficient designing method that could improve the information management throughout the life cycle of the building. To this purpose were developed and studied framework and prototype for an holistic BIM for Facility Management workflow addressing information specification, verification and use. The study analyses a solution that addresses the entire BIM for FM workflow, from the definition of information requirements, through the development of the data container, to the management of the data container and its use in operation, using as main tool the Common Data Environment [3].
To achieve these goals appropriate filter and query methods and tools are required which enable the craftsmen companies to access BIM-based information resources with respect to their specific needs and working environment. Therefore, an interesting tool is to use visual

BIM query language (VBQL) to extract and query information from a BIM model [4] or to modularize a rule-checking approach using the LRML schema as the standard to represent building design rules. These studies recognized the great potential of VPL (Visual Programming Language) to retrieve information from a 5D-BIM [5]
Regarding the application of the BIM approach to sustainable design, a plug-in was developed to calculate the accumulated potential LEED credits with access to API of the BIM tool (i.e. Autodesk Revit, Google Map) and their library. The model concentrates more on predicting and calculating the other LEED points that could not normally be calculated from the design by using data mining method. Overall, this research demonstrated that BIM and LEED integration was feasible, even if with considerable constraints [6].
A study conducted by Azhar, Carlton, Olsen, and Ahmad [7] demonstrates how planners and designers may use BIM to analyse sustainability in pursuit of LEED certification by developing a conceptual framework that illustrates the relationship between various LEED credits and the related BIM-based sustainability analysis. The results of this study show that there is no one to one relationship between LEED certification process and BIM-based sustainability analysis because of the lack of LEED integration features in the used software and the analysis results can be used directly, semi-directly or indirectly to generate LEED documentation.
In this research environment, this study wants to focus on the possibility to developed an information workflow that will support the cross information with a BIM approach and will allow the designers to efficiently manage the information regarding the LEED credits.

3. Method

The first step was to define the Level Of Information Need for LEED HB protocol credits; in order to do so, the protocos manual and its schedules were studied to identify the relevant data.
Then was developed a framework that defines the extent and granularity of the information the study took into account. For this paper, were considered only the data needed to achieve the credits for the Indoor Air Quality (IAQ). The schedules were organized on Excel file to create default structured tables that could respond to the Level Of Information Need requirements and allow to automatically create and manage new information in the BIM model.
With the BIM authoring software, it is possible to customize the parameters assigned to the model's objects in order to add information to the default one. Shared parameters are definitions of parameters that you can add to objects or projects. Shared parameters are also useful when you want to create a schedule that displays various family categories. Ultimately a workflow has been studied to automate these data transfer from the Excel Level Of Information schedule to the BIM model; in order to achieve this, the VPL tool Dynamo, a plugin for Revit, that allowed to create a script that transfer data without having to manually rewrite them, was used.
A very important step is to analyse the BIM objects and choose the most suitable to be enriched with the new information in order to better manage the data and reach the goal. In fact, every BIM objects has its own properties and parameters depending on how the authoring software manage it. This decision will influence the final step, which is the definition of the BIM schedules to organize the parameter in order to answer to the LEED HB credits requirements. These schedules will show in a clear and easy way all the information needed to achieve the credits' points and will help the designer to design a sustainable building, keeping always in mind the steps and the requirements to achieve the final goal.
The information workflow starts from shared scheduled that can be consulted and modified by all the designer involved in the project, in order to collect all the needed data in an organized and fixed structure; then, the information are automatically transferred in the BIM model as shared parameter due to VPL scripts that associate Excel table with BIM objects. Finally, the shared parameter can be organized in schedules where are listed the needed parameter and their quantity in the project: all the information required by the LEED protocol will be displayed to be checked and consulted during all the design phases.
To make the VPL scripts more adaptable and user-friendly was used Dynamo Player, that provides a simple way to execute Dynamo scripts in Revit. It displays a list of Dynamo scripts in a specified directory, along with the current status of each script giving the possibility to open and modify it.

It is possible to design user input and output to be assigned before running the script. Once the input data are defined, the script will run by clicking on play and it will be possible to check immediately its success by the output data.

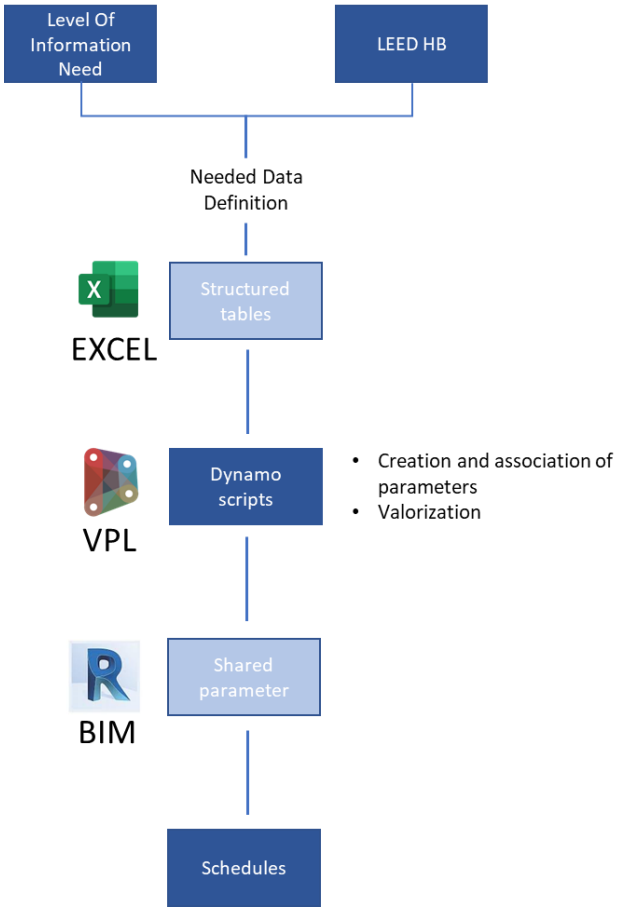

Fig. 1: Information Workflow scheme

4. Workflow application

This information flow (Fig. 1) was applied to the study design for the manor house of farmstead Sella Nuova, near Milan, a building existing since the 15th century. A redevelopment and reuse project was studied to create a social gathering place for the neighbourhood. The manor house is the heart of the project to create social relationships with common areas, bar and classrooms where people of all ages can learn and socialize (Fig. 2).

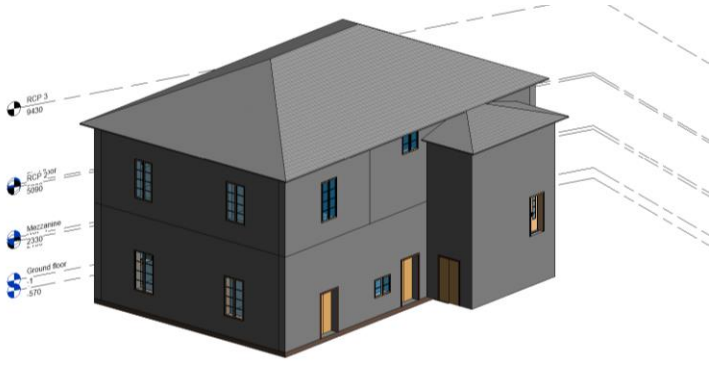

Fig. 2: Manor house of Sella Nuova farmstead, BIM model

The definition of the Level Of Information Need started from the study of the LEED protocol in its detail, to identify which data were necessary to achieve the desired credits. Once the necessary data was identified, the research moved on structuring the Level Of Information Need table to meet the requirements described in ISO 19650, where were identified the BIM objects to which the parameters were associated, the usage model, the author of the board and the purpose, i.e. for which discipline, the board was defined. For this paper, credits related to Indoor Environmental Quality were analysed. The area is structured into two possible paths: on one hand the goal of conservation and preservation of historic architecture, on the other the fulfilment of occupants' conditions of comfort and indoor air quality. This dual approach allows user to respect the historic environment by protecting surfaces and high-quality materials and, at the same time, to achieve the highest levels of comfort and indoor air quality attainable taking advantage of the potential offered by the boundary conditions.
Below it is shown the Level Of Information Need for the 6.2 LEED HB credit, regarding the control and management of the systems for the thermal comfort. The Level Of Information Need is the frame which defines the extent and the granularity of information to be exchanged and can be answered by a combination of geometrical information, alphanumerical information and/or documentation, as described in the UNI EN 17412-1. To specify the Level Of Information Need and how information is going to be delivered, it is useful to consider:

- The purpose for the use of the information to be delivered;
- Information delivery milestones for the delivery of the information;
- Actors who are going to request and actors who are going to deliver the information;
- Objects organized in one or more breakdown structures.

A schedule was defined to answer to these concepts, which specifies the Level Of Information Need and defines the granularity of the information needed (Fig.3).

OBJECT (*)	#Room		
COMMERCIAL BENCHMARK	Not applied		
PRICE LIST ID Code	Not applied		
PRICE LIST ID	Not applied		
COMPILER (**)	-		
MODEL USE	Sustainability		
PROJECT PHASE	Design		
(*) Trade name unified by "Hashtag" method (**) Appointed by the BIM Coordinator			
Modeling information	**Detail**		Rapresentation with shape and dimensions
	Dimensionality		3D
	Localization		Relative
	Look		None
	Parametricity		Yes: x, y, z
Alphanumerical Information	Sustainability	LEED HB cr. 6.2 IAQ	HB_cr6.2 Type of occupation
			HB_cr6.2 Presence of thermal comfort control system
			HB_cr6.2 Type of thermal comfort control system
			HB_cr6.2 Shared/multi-function room
Documentation	Documentation	LEED HB cr. 6.2 Attachments	HB_cr6.2 Floor plan - Thermal comfort control system location

Fig. 3: Level Of Information Need schedule for LEED HB credit IAQ 6.2

This table, structured following the requirements listed above and specified by the UNI EN 1742-1, was shared with the entire project team in order to allow its valorisation and consultation by the designers. In fact, not all data will have to be delivered by the same

designer, but it is up to the BIM Coordinator to define the different information responsibilities at the beginning of the process. Through an interdisciplinary information synopsis table, the BIM Coordinator designated the designers responsible for providing the necessary information [8].
To define the Level Of Information Need was important to identify the most suitable BIM object to which the information applies; for the 6.2 credit was chosen the object Room, because it is the element that can describe the entire environment of a building space and can give the right degree of specification required by this credit. Once the object was defined have been created as many schedules as rooms present in the building; in this way all the spaces could be described and, later, a summary schedule can be organised on Revit to have a global look to all the required parameter to achieve the protocol's credit.
Once the tables were filled, it was possible to transfer them to the BIM model as shared parameters. To make this step automatic, two scripts have been developed, via VPL, to link the excel table and the BIM model. It was created another schedule (Fig. 3), linked to the Level On Information Need one, which contains all the information necessary in the right order to create shared parameters.

Share Parameter Name	Share Parameter Group	Parameter Type	Parameter Group	Instance	Reporting	Value
HB_cr6.2 Type of occupation	IFC SustainableData	Text	PG_IFC	Yes	No	Bar
HB_cr6.2 Presence of thermal comfort control system	IFC SustainableData	YesNo	PG_IFC	Yes	No	1
HB_cr6.2 Type of thermal comfort control system	IFC SustainableData	Text	PG_IFC	Yes	No	Air temperature
HB_cr6.2 Shared/multi-function room	IFC SustainableData	YesNo	PG_IFC	Yes	No	0
HB_cr6.2 Floor plan - Thermal comfort control system lc	IFC SustainableData	URL	PG_IFC	Yes	No	C:\Users\maryr\Politecnico di Milano\A

Fig. 4: Excel schedule to create the shared parameters

The first script creates and associates the parameters with their Revit categories (Fig. 5). The second one valorises the respective parameters with their specific values (Fig. 6). The method of individualization of the "room" objects to which associate the values happens through direct selection from the model; in this way it is possible to value a single room or more rooms at the same time, according to the project requirements. In order to link the right values and create the parameters, the excel file has to be divided in different lists, one for each column; then every list it is connected with the node that will create the parameter in the BIM model. The check groups were added to verify immediately if the scripts have run properly, selecting all the wanted elements and adding the right number of parameters.

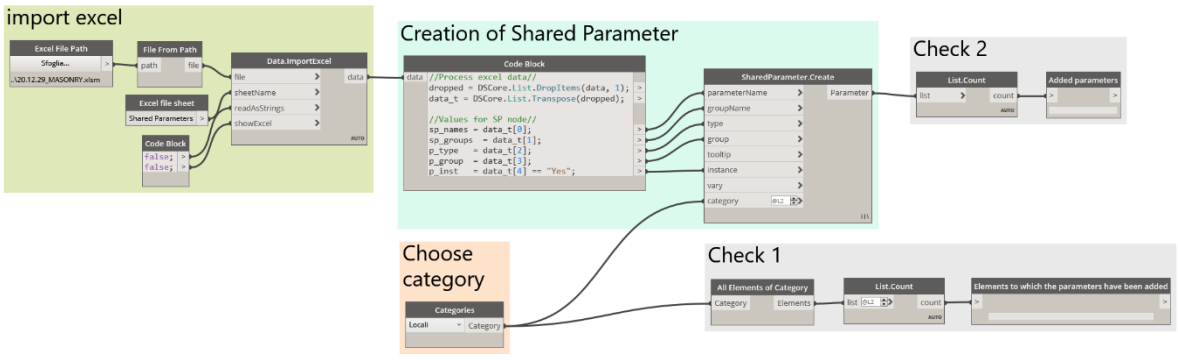

Fig. 5: Dynamo script to create and associate shared parameters

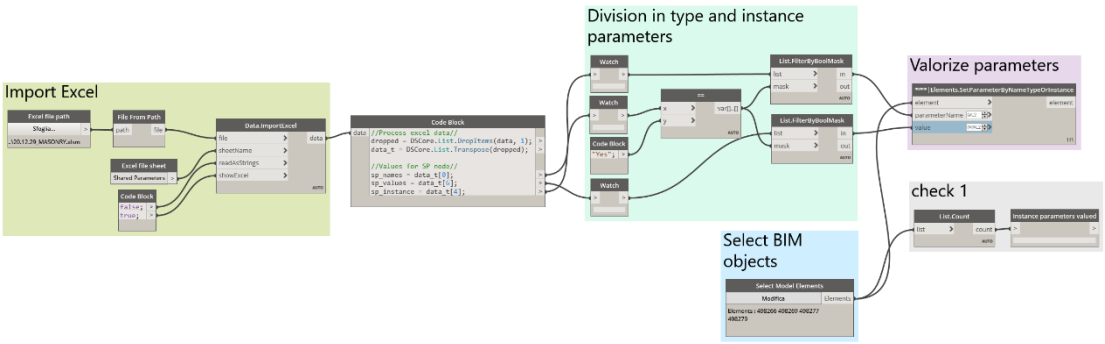

Fig. 6: Dynamo script to valorize the shared parameters

This tool allows to add only the parameters needed and update them throughout the design process without having to manually rewrite the data (Fig. 7). Once the parameters have been valorized it is possible to reorganize them in customized schedules to make them easily consultable in the BIM model; in this way it is possible to modify and control the LEED requirements during all the project cycle.

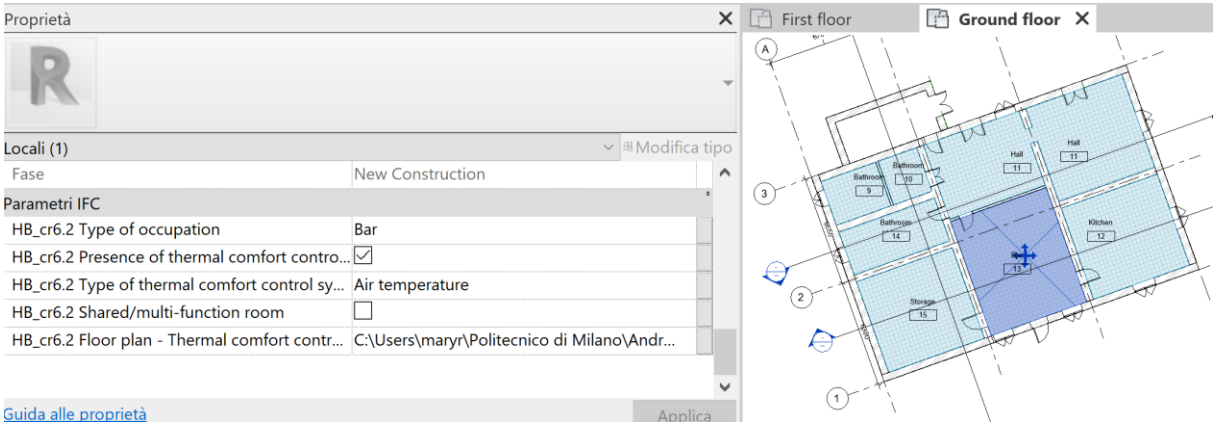

Fig. 7: Room parameters automatically created in the BIM authoring software

The schedules were organized to reflect the structure of the protocol requirements, so the information could be managed to facilitate matching the data needed to obtain LEED credits (Fig. 8-9). At the end of the process you have, therefore, a BIM model enriched with the necessary information to obtain the certification and design a sustainable building in every aspect.

<LEED HB Credit IAQ 6.2>						
A	B	C	D	E	F	G
Numero	Zona	HB_cr6.2 Type of o	HB_cr6.2 Presence	HB_cr6.2 Type of t	HB_cr6.2 Shared/	HB_cr6.2 Floor plan - Thermal c
Ground Floor						
13	Ground Floor	Bar	☑	Air temperature	☐	C:\Users\maryr\Politecnico di
Bar: 1						
9	Ground Floor	Bathroom	☐	-	☐	C:\Users\maryr\Politecnico di
10	Ground Floor	Bathroom	☐	-	☐	C:\Users\maryr\Politecnico di
14	Ground Floor	Bathroom	☐	-	☐	C:\Users\maryr\Politecnico di
Bathroom: 3						
11	Ground Floor	Hall	☑	Air temperature	☐	C:\Users\maryr\Politecnico di
Hall: 1						
12	Ground Floor	Kitchen	☑	Air temperature	☐	C:\Users\maryr\Politecnico di
Kitchen: 1						
15	Ground Floor	Storage	☐	-	☐	C:\Users\maryr\Politecnico di
Storage: 1						
First Floor						
1	First Floor	Bathroom	☐	-	☐	C:\Users\maryr\Politecnico di
2	First Floor	Bathroom	☐	-	☐	C:\Users\maryr\Politecnico di
3	First Floor	Bathroom	☐	-	☐	C:\Users\maryr\Politecnico di
Bathroom: 3						
6	First Floor	Classroom	☑	Air temperature	☐	C:\Users\maryr\Politecnico di
7	First Floor	Classroom	☑	Air temperature	☐	C:\Users\maryr\Politecnico di
8	First Floor	Classroom	☑	Air temperature	☐	C:\Users\maryr\Politecnico di
Classroom: 3						
5	First Floor	Hall	☑	Air temperature	☐	C:\Users\maryr\Politecnico di
Hall: 1						
4	First Floor	Hallway	☐	-	☐	C:\Users\maryr\Politecnico di
Hallway: 1						

Fig. 8: Revit schedule in which the parameters are organized to answer the protocol requirements

Identificazione zone (o gruppo di zone)	Tipologie di occupazione	Tipologia di controllo del comfort termico	Numero totale di spazi	Spazi dotati di controllo individuale
Ground Floor	Bar	Temperatura dell'aria	1	1
Ground Floor	Bathroom	-	3	0
Ground Floor	Hall	Temperatura dell'aria	1	1
Ground Floor	Kitchen	Temperatura dell'aria	1	1
Ground Floor	Storage	-	0	0
First Floor	Bathroom	-	3	0
First Floor	Classroom	Temperatura dell'aria	3	3
First Floor	Hall	Temperatura dell'aria	1	1
First Floor	Hallway	-	1	0
Totale:			14	7
Postazioni di lavoro provviste di sistemi di controllo termico [%]:				50
Conformità dei sistemi di controllo individuale del comfort termico: *Nota: La conformità del credito è possibile garantendo la presenza del controllo individuale del comfort termico per almeno il 30% degli occupanti.*				SI

Fig. 9: LEED HB schedule with the Italian protocol requirements for the credit IAQ 6.2

5. Conclusions

In conclusion, the developed method saves time, avoids transcription errors and does not burden the model with unnecessary information. The workflow is automatic and easy to manage, in fact, thanks to the use of dynamo player, the scripts can be launched with a few clicks. In this way it can be used even by designers with little experience of Dynamo. Thanks

to the selection of input and output is also possible to change the categories to which assign the parameters and be able to modify the workflow to best meet the project's needs. The method developed is, in fact, replicable and versatile and can be applied to different disciplines and become a useful tool for information management. Scripts can be linked to any BIM model, creating the necessary parameters. Using the schedules, information can be easily managed and reorganized to better meet project phases and needs.
Information management is especially important in historic building design, where the ability to organize data and transfer it securely and automatically is critical.
It is important to specify, however, that was not possible to convert all the information required by the protocol in shared parameters and schedules, due to the complexity of the data requested or the difficulty to identify the BIM object to which assign the parameters. It could be interesting to study more precisely the connection between the LEED protocol and the BIM software in order to collect all the information required in one file.
This method provides a starting point for applying the workflow to different disciplines and design phases. It can be developed to meet other needs, such as those related to systems facility management, where automatic information flow is critical. It will be necessary to continue to develop the concept of Level Of Information Need in different disciplines and for different categories, to be able to apply it to all the life cycle of the building. In this way it will be possible to have all the required information, but to import in the model only those necessary for the analysed phase or discipline.

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WORLD HERITAGE and DESIGN for HEALTH
ARCHITECTURE|CULTURE|HEALTH|LANDSCAPE|DESIGN|ENVIRONMENT|AGRICULTURE|
ECONOMY|TERRITORIAL GOVERNANCE|ARCHEOLOGY|SURVEY|HERITAGE|e-LEARNING
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Empowering younger generation through cultural heritage. Adaptive reuse strategies for the Sanità district in Naples.

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Abstract
The international scientific community agrees in recognizing training as an essential commitment in the use of the Recovery fund, to prepare the younger generations to face the new post-Covid 19 normal. Urban contexts and built heritage are central to this challenge, not only as a physical safeguard for the prevention of infectious disease, but as a lever for the cure and regeneration of societies and economies. Distance learning, in schools and universities, affected the educational and professional paths with an impact on social capital similar to that on physical capital that characterized the years of the world conflict.
The paper deals with the adaptive reuse of built heritage, in order to heal and empower the younger generation with services and residences for long life learning. The Sanità district in Naples, traditionally a place of health, is proposed as a pilot site where to validate the cultural and economic enhancement of urban systems, through the built heritage adaptive reuse, with the support of functional and technological innovations. The paper presents a circular model, which is gradually adapting to the changing urban environment according to the needs of young people in training. The model is able to generate new values resulting from synergies between the local community, the built environment, and new residents.

Keywords: Adaptive reuse, management control, heritage, student housing, local community

1. Long life learning for a new normal after Covid 19
In 2020, society and the economy were crucially affected by the pandemic caused by Covid19, in Italy as well as throughout the world. The health emergency limited human interactions, requiring a rethinking of the ways of using the space to reduce infections. The consequent suspension of several activities within the productive sector caused, in the second quarter of 2020, a contraction of the economy at a rate comparable to that recorded only during the Second World War. Distance learning in schools and universities, affected the educational and professional paths with an impact on social capital similar to that on physical capital that characterized the years of the world conflict.
Governments set up extraordinary measures to support employment and income. The payment of taxes was suspended or deferred. The banking sector was mobilized to continue providing credit to businesses and households. All available resources were deployed to protect our economies, supporting workers and businesses. However, this commitment could find a great slowdown in the absence of a shared effort to define and test new models of public and private space use, in compliance with the limits imposed by this virus.
The scientific community that has always recognized education as the driving force behind the growth of each country [1] today agrees in identifying universities as an opportunity to address the new post-Covid 19 normality. The creative effort shown in distance learning by many universities could be a valuable resource for raising the quality levels of training, combined with the advantages of learning by doing, to give life to new experiential learning models. The experience of the pandemic has highlighted

how much training is a process based on the acquisition of skills and abilities, on the construction of social relationships, on the contamination between knowledge and daily life.
The Recovery Fund today offers an opportunity to make the future we want, supporting the design and construction of spaces dedicated to long life learning in compliance with new models of space use and requirements [2].
The paper identifies in an enlarged design process of built heritage reuse, with the creation of university residences and services, an opportunity to review spatial models and trigger stable relationships [3]. As part of the funded research project "Playgrounds and Art for Communities in Transition: care pact for cities" (Call FRA Federico II, 2021 - 2023), the paper identifies in the Sanità district in Naples, a creative neighborhood open to changes. Artists, young university students and residents are involved with the design of outdoor collective spaces for living together in the new normal, adapting the models of training and social interaction to the emerging needs.

2. Student residences and services: new demands in a changing world

The *mobility of knowledge* is a phenomenon still not much investigated in its reasons, articulations and needs and that has significant impacts on the demand for goods and services and on the real estate market in cities, with a high potential for the host contexts in terms of social and economic experiments [4].
In 2019, the Italian National Institute of Statistics (ISTAT) recorded a number of university students in Italy equal to 1.7 million, of which 33.5% non-resident, compared to 49.8% who undergoes training as a commuter. Students still living at home with their parents are 70%, against 36% of the European average.
The reasons for poor mobility among young people in training are to be ascribed on the one hand to the quality and costs of residences and services, and on the other to several reforms in the university education system. The current offer of hospitality is often inadequate, rigid and obsolete, both in terms of spatial-functional articulation and far from emerging needs among young people.
The Italian reform of 1999 (Law No. 127 of May 15, 1997 and enacted by Decree No. 509 of the Minister of the University and Scientific and Technological Research of November 3, 1999) led to an increase in the number of universities, decentralized teaching centers with respect to the main universities and short degrees. In this way, one of the major obstacles to accessing the university was overcome, the one caused by the distance between the residence and the university headquarters.
In recent years, the suppression of many degree courses contributed to accentuate a condition of territorial asymmetry in the supply and demand of spaces and services to support training. In 2019, ISTAT highlights situations in which outward extra-regional mobility is very low, as in Lazio, Lombardy and Tuscany, with a satisfaction of domestic demand close to 90%, compared to university emigration regions, such as Basilicata, Valle d'Aosta and Molise.
Southern universities are still not very attractive for foreign students. Although the internationalization of the study has made progress in recent decades [5]: throughout the country, foreigners are concentrated in universities in the Northwest (39.2 per cent) and in the Center (28.7 percent), while only 6.2 percent of them study in a university based in the South and only 1.7 percent in one based in the Islands.
The quality of urban contexts, as well as that of residences and services, emerges as a discriminating factor in the choice of university sites. The demand for residences is part of a more complex need for an improvement of the training processes.
Europe and Italy can contribute to the definition of appropriate answers. Starting from the first examples of the 12th century, architectural and spatial models of a high expressive level were produced, up to the experiments carried out with projects that redesign outdoor collective spaces, through a complexity of social and recreational spaces. The architectural research answers to the needs of an extended community, that includes besides students often even citizens. Best practices for the design of collective outdoor spaces can be identified in the University Colleges in Colle dei Cappuccini in Urbino by Giancarlo De Carlo (1960 and 1987) and in the Campus of the Delft University of Technology designed by Mecanoo (2004 - 2013). Living environments and study support spaces are enabling factors in the process of acquiring skills and abilities, building social relationships, contaminating knowledge and everyday life; they are recognized as fundamental within long life learning strategies. Collective residences, libraries, reading rooms, laboratories, socializing spaces, sports facilities, increase the attractiveness of a university. They are also *demonstrators* of a renewal of the models of life, for a wider audience. Designing spaces and services for university students directly contributes to sharing a way of living spaces for collective use, appropriate to the instances of the pandemic.

3. Naples as case study

Naples was the oldest public university in the world. Over the centuries, this institution, founded on June 1224, developed a capacity of attraction towards professors from the European academic world, and students from all over the south of Italy. They saw in university education an opportunity for cultural

elevation and social ascent. In 1875 the University of Naples ranked third in Europe after Berlin and Vienna in terms of student population. Until 1925 it was the only one in southern Italy.
The presence of the university had an impact on urban development.
The current territorial structure of the four Neapolitan universities, Federico II, Luigi Vanvitelli, Suor Orsola Benincasa and Parthenope, is the result of a process of progressive decentralization of the offices, prefigured in the programmatic document for the agreement between Federico II and the Municipality stipulated in 1978 (Fig. 1). This document reorganized the universities within three poles: that of the historic center, and those of the Phlegraean area and the hills. The set of university institutes today is configured as a network of entities that are distinct from each other on the administrative and management level, but lived in connection by students in the experience of residency, thanks to the work carried out by the Company for the Right to Education [6]. Due to the very limited number of residences, private homes meet the emerging needs, usually with unsatisfactory housing standards within an unregulated real estate market.
In recent years, the network of Neapolitan universities and the city are experiencing a contradiction: on the one hand, a sharp decline in the enrollment of students who prefer to go and train in the universities of the north, on the other hand a renewed ferment of the cultural milieux, with a new ability to attract people and investments thanks to art, music, cinema and writing [7]. The historic center with the multiplicity and distributional capillarity of its functions, and the extreme flexibility of the times in which it is available, emerges as the great attraction for students. In the absence of a structured system of services, they see in the quality of life a new training opportunity, related to the liveliness of the social context [8].

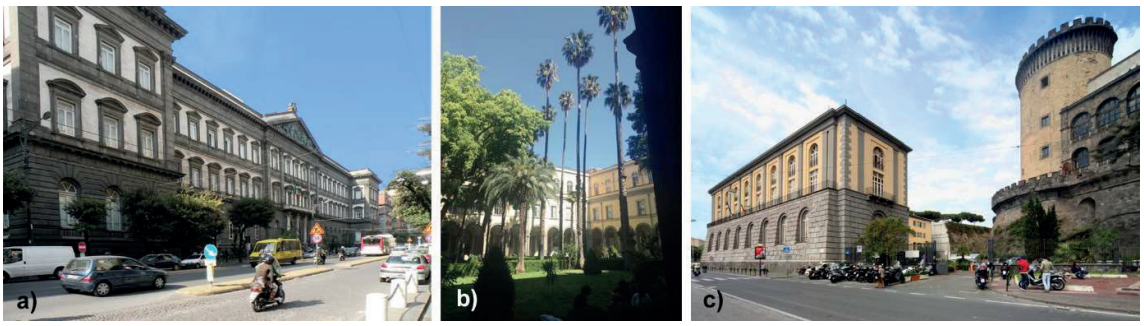

Fig. 1: The headquarters of the University of Naples: a) the University "Federico II" main building (ph. Vitold Muratov, 2010); b) the cloister of S. Andrea delle Dame, University "Luigi Vanvitelli" (ph. Ruthven, 2016); c) the headquarters of the University “Parthenope” (ph. Il Mattino, 2006).

4. The adaptive reuse of the heritage buildings

The reuse of the heritage buildings can be an engine of urban regeneration and renewal of the University and Training Institutes attractiveness in Naples. Heritage reuse is an opportunity to experience circular subsidiarity dynamics involving host heritage community, hosted student community (the people on the move), and the skilled knowledge.
Reuse is able to improve the vitality of the local environment, by engaging other actors and businesses above all in management. Furthermore, it can generate new ecosystems.
In detail, the objectives are as follows:

1. adaptive reuse of available buildings to host innovative models of housing and services;
2. definition of functional and management strategies, through the application of social innovation models.

In fact, social cooperatives and community businesses are able to involve citizens' abilities in the production of goods and services, as well as to have a lasting impact on the quality of the community's social and economic life.
Such objectives require the definition of a cyclical process based on the information/decision loop, which allows to define and constantly control the consistency and effectiveness of each of the actions introduced, compared to the overall regeneration strategy. The application of compatibility check methodologies for the adaptive reuse allows to identify and select the intervention solutions according to the specific environment. Furthermore, it allows to compare the real estate assets available for reuse with the new functions required, up to define the reuse projects of each building. The methodology allows to steer a system of actions aimed at leading the development of an area or an urban settlement by a constant loop of knowledge/decision/planning/management activities (Fig. 2).

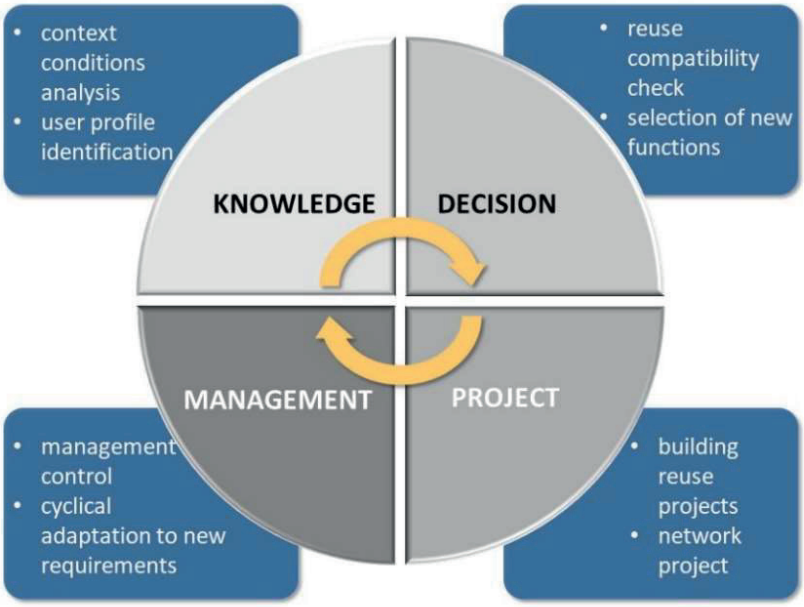

Fig. 2: Methodological diagram: the circular process.

The four steps of the process run cyclically, focusing on a system of experiential learning, which is achieved by actions and experimentation of projects, situations, tasks, and residential models. The stakeholders provide their skills and resources to constantly develop and reshape the urban system in accordance with the targets and the needs of the community (inhabitants and students). The experiential learning undergone by the urban system allows it to develop adaptive behaviours and improve its ability to deal with unforeseen situations and changes in its environment. The system is designed to identify new directions for development over time, not least through the creative ability and the sharing of cultural heritage between the local community and new residents.
The gained experience will contribute to the immersive training of young people who are temporarily living in the area. It will be a wealth of knowledge for the local community as well as a new starting point for further development.
The knowledge step aims at investigating the urban context, through an analysis based on a sub-system approach (Fig. 3). Knowledge activities primarily allow for the identification of available resources in terms of tangible and intangible heritage that plays a role in outlining the identity of the place and the local community. The census of the building stock available for reuse (which includes a preliminary analysis of the ownership of the buildings, of their size, location, construction characteristics and maintenance status) leads to the identification of a list of buildings to be compared with the set of new functions to be located in order to establish the optimal combinations building/function. At the same time, the socio-economic sub-system is analysed, to identify the available services needed for the new functions as well as the network of connecting services inside and outside the area. Furthermore, it is necessary to identify the actors that can be effectively involved in the process, by surveying the availability of existing social cooperation networks, as well as any potential stakeholders to be involved. Nonetheless, knowledge tasks not only concern the implementation environment of the intervention, but also include surveys aimed at identifying the potential users of the urban system and, more specifically, young people in training.
The decision step involves the application of multi-criteria evaluation tools (MCDA) to vet selected buildings for reuse compatibility [9]. The evaluations performed in this step are intended to identify, for each building considered, the preferred new use. The preference is given by the potential to achieve two main goals: 1) meeting the development needs of the area; 2) minimising adaptation to the new function. Regarding the first goal, a pre-assessment of functions is performed on the basis of criteria that allow to assess the effectiveness of the new use both in terms of its ability to improve the efficiency of the urban system and in terms of its ability to generate positive impacts outside the observed area.

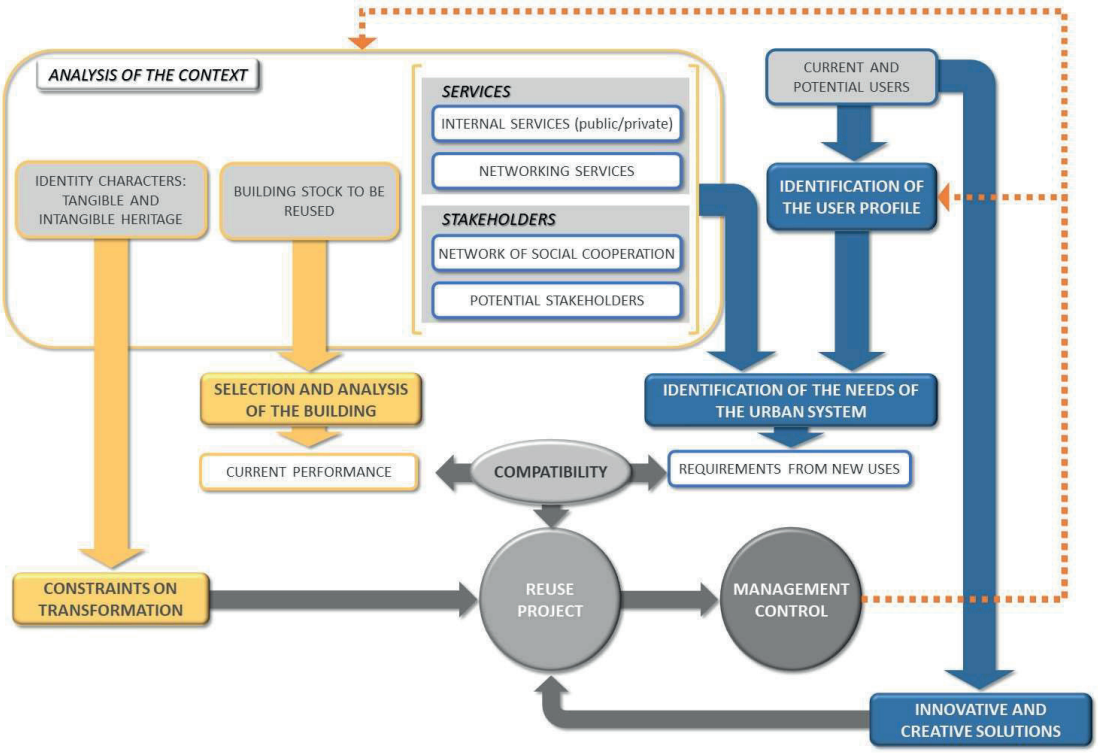

Fig. 3: Methodological diagram: knowledge, decision, design and management control.

The minimization of the alterations required by the adaptation of each building to a new function is checked by a comparison process between the building's current performance and the new use requirements selected at the pre-assessment. This requires establishing the layout of the activities in the building and identifying the elements on which to focus the design task, to meet the requirements not adequately met by the building as it stands.
The design step involves the development of reuse projects for each building and, for each project, an evaluation of the preservation potential of built environment identity features. The evaluation criteria considered in this step refer to the constraints to the transformation as defined in the literature within the reuse compatibility assessment processes [10]: perceptual-cultural, morphological-dimensional and material-constructive constraints. Students and the local community are actively involved in this step to suggest innovative and creative reuse solutions.
The management step involves constant supervision of the area to verify effectiveness and efficiency of the process. The management control requires the identification of key performance indicators, as a reference to verify cyclically whether the design solutions selected at the project stage are actually able to generate the expected results. Furthermore, monitoring is aimed at verifying any changes in the needs to which the urban system should react, resulting from changes in environmental framework conditions, in user profiles or in the model of interaction between young people in training and the local community.
The proposed approach has been verified at a neighborhood scale, focusing on the Sanità district in Naples.

5. A network of residences and services in the *Rione Sanità*: project requirements for an adaptive reuse of the built heritage

The definition of a residential and services model takes up the new challenge launched by the European Union with the idea of a Renovation Wave for Europe [11]. The working group identifies in the *Rione Sanità* (Sanità district) of Naples an incubator for innovation, which can contribute with synergies between students, researchers and the local community (public, private and third sector subjects) to drive the adaptive reuse towards a new normal post Covid. The proposal brings together built heritage, art, intangible culture and sustainability to innovate the models of public space use, and to outline conditions of balance between pre-existence and innovation.
The Sanità district in Naples is adopted as a pilot site:

- for the exceptionality of its built heritage - from the Catacombs of San Gennaro (II - III century), to those of San Gaudioso (IV - V century), to the Basilica of S. Maria della Sanità (works by Fra 'Nuvolo 1602);



Fig. 4: The Dome of the Basilica of Santa Maria della Sanità, Naples (ph. Giuseppe Guida, 2016).

- for the condition of isolation from the rest of the historic center, due to the construction, in the 19th century of the Capodimonte bridge;
- for the start in 2000 of an experiment aimed at creating job opportunities for disadvantaged young people, with the establishment of a social cooperative *La Paranza*, active in the cultural and artistic heritage enhancement through the involvement of citizens and professionals [12].

Having long practiced the culture of hospitality, the commitment to making the beauty of the neighborhood known makes this place and its community the privileged stakeholder for a process of social innovation. The hypothesis that the research team aims to validate is that starting from the binomial heritage - community, the project can help redefine the logic of living together and the spaces of long-life learning, in the post pandemic.

The proposal identifies the involvement of artists within the reuse process for abandoned buildings, an opportunity to welcome and integrate non-resident students with the neighborhood community. Art is identified as a support to implement the definition of project needs, with new and creative perspectives, also in light of the physical distancing requirements imposed by the pandemic. In the last decade there are more and more experiences in which artistic practices empowered the communities towards the demands of sustainability and towards the values of which heritage is the bearer with social, economic, and cultural impacts of great importance [13].

Since the 1970s with site-specific installations, the artistic practice drew a *geography of change* that, by investing the built environment, restored a new awareness and new roles for communities. Faced with the difficulty we experience in the new post-covid normality, the proposal recognizes the ability of art to accelerate the penetration of visions and models of use within the individual and collective living spaces [14]. Bringing students into an ancient neighborhood through an adaptive reuse of the built accelerates the process of creating a heritage community already underway [15]. The synergy between artists, inhabitants of the neighborhood and young people in training achieves two results: it favors the maturation of a model of use for public spaces based on the requirements of physical spacing, flexibility of use and equipping for temporary functions and promotes the recognition of individual responsibility towards the cultural heritage.

The proposal identifies in the courtyard system of the Sanità district, the spatial and functional core from which to restart the urban organization. Courtyards are places where sedimented urban values are concentrated and manifest, as in the emblematic case of the *Palazzo dello Spagnuolo* (Fig. 6).



Fig. 5: Rione Sanità, Naples: a) Piazza Sanità, "Luce" mural by Tono Cruz (2016); b) entrance to Palazzo Sanfelice (1724-1728); c) Palazzo dello Spagn**u**olo (1738) (ph. Bernard Blanc, 2016).



Fig. 6: The courtyard and the double-ramped staircase of Palazzo dello Spagn**u**olo in the Sanità district, Naples (ph. Bernard Blanc, 2016).

In the design proposal, these spaces assume at the same time, the role of custody for the settlement culture, and of extraordinary source of change due to the values they testify. The courtyard is used as a filter between the private space of the residence and the public one of the city; hosting aggregating functions, thanks to the creativity of the artists the courtyards become places of attraction for external

users and socialization for young people in training, in compliance with the requirements imposed by the pandemic.
The research has led to the definition of key performance indicators referring to requirements arising from the new function of the courtyard (Table 1). Such indicators allow to verify the adequacy of the new use [16] and to drive the reuse project towards minimal intervention solutions, consistently with the goals of preserving the architectural heritage of the Sanità District.

inner courtyard				
CLASSES OF NEED OF THE ENVIRONMENTAL SYSTEM	**requirements**	**key performance indicators**	**Unit of measure**	**Direction +/-**
USABILITY	shape and sizing	Largeness	floor area/number of users housed in the residence	+
		Shape regularity of the courtyard	h/m/l	h+
	furnishing possibilities	Gates opening towards the court	door width/ perimeter ratio	-
		Doors and windows around perimeter walls	n.	-
	accessibility	Access on driveway	yes-no	yes+
		Separation of access and exit gates	yes-no	yes+
	easiness of the paths	Shape regularity of the pathways	yes-no	yes+
		Roughness of the floor surface finish	h/m/l	m+
	easiness of identification	Design and presence of architectural elements belonging to the local architectural culture	yes-no	yes+
	stillness and calm	Screening from the outside to limit sound transmission	yes-no	yes+
		Elements to regulate the access of people/animals/vehicles from the outside	h/m/l	h+
	privacy	Screening from the outside to prevent visual intrusion	yes-no	yes+
	links	Effectiveness of the elements for controlling the interaction between private and community space	h/m/l	h+
	easiness to be joined	Potential for aggregation to adjoining covered spaces for community use	yes-no	yes+
	hygiene and health	Hand hygiene facilities	supply points/maximum number of users ratio	+
MANAGEMENT	easiness in cleaning and maintainability	Regularity of space shape	h/m/l	h+
		Surface roughness and unevenness	h/m/l	h-
		Water supply equipments	yes-no	yes+
	flexibility	Covering of uncovered spaces possibilities	h/m/l	h+
		Possibility of space partitioning	h/m/l	h+

Table 1: Key performance indicators for the reuse compatibility check of the courtyards.

The prefigured project scenario returns empirical evidence to the principle that knowledge-intensive activities are able to trigger symbiotic cooperation within local communities, because they involve new actors in flexible and proactive intersectoral processes of innovation and cultural hybridization.
By intervening in built systems, art is a communication and dialogue tool that takes care of citizens, becoming, to paraphrase Bertolt Brecht, humanity's last line of defense [17].

6. Conclusions

The pandemic crisis has highlighted the centrality of urban development based on an integration of residence and services, to be reached within 15 minutes. The most recent example is Paris. The "city in 15 minutes" was one of the points of the electoral program of "Paris en commun", the political platform of the Mayor Anne Hidalgo, re-elected to lead the French capital last summer. The idea of the Parisian Mayoress is a reference to the concept of "Intelligent Human City", developed by Paris-I University professor Carlos Moreno. According to the French-Colombian professor, it is necessary "to rework the concept of proximity, focusing on the six functions that each neighborhood should guarantee: living, working, providing, caring, learning and having fun".

The pandemic has undermined the model of centralisation of university institutions, which has deprived territories of services linked to education.
In Naples, the University has been the main driver for continuing to keep the settlement fabric functional and alive. The Policlinico and Monte Sant'Angelo campuses, built more recently, interrupt this rule, creating a boundary with the context in which they are located, presenting, even today, a series of critical points due to this caesura. With the experiment of the Sangiovanni campus, there is a return to the integration of university buildings in the settlement system. In this case a peripheral area, affected by heavy industrial disuse, is to be regenerated. In this case a peripheral area, affected by heavy industrial disuse, is to be regenerated. The experimentation on the case study is aimed at strengthening the communication channels with the actors operating in the settlement systems to be regenerated, and to take the settlement systems as a place where the efficacy of the research is verified and it is regenerated by the demands emerging from the territory. In particular, the experimentation proposed for the Sanità district aims to establish virtuous relations between cultural heritage and the environmental, economic and socio-cultural system [18], in order to mediate between the interests and expectations of the various actors involved. These complex systems require constant monitoring of the actions carried out on the settlement system and an innovative approach to enhancement policies, in order to seek new dynamic balances between protection and development. In particular, the Sanità district relies on a community capable of identifying the key values of the neighbourhood in which they live, a strong point for elaborating visions that reflect their aspirations, and for agreeing on development models that meet their needs without conflicting with the protection of their heritage.
In order to elaborate scenarios of adaptive reuse of cultural heritage, it is essential to strengthen the relationship between care of places and active citizenship, empowering the subjects who live and produce in the settlement system to be regenerated. The role of local communities draws a new scenario which foresees, concretely, effective and sustainable recovery policies, but requires adequate tools to entrust them with new responsibilities. In fact, the involvement of the community implies an improvement of the dialogue/cooperation tools in order to activate more effective and powerful communication channels so that the community participates, in synergy with the other actors, in the choices of adaptive reuse and maintenance of the settlement systems.
Lastly, the competition with telematic universities or those located outside regional or national borders, which the current pandemic has brought into play, can only be won by responding with the capability of the University to leave permanent traces on the territories in which it is located. The aim is to stimulate new ideas capable of generating innovation, initiating economic development and reusing the cultural heritage of a settlement system.

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Design for all, a strategic, inclusive and sustainable challenge for the Arab and Norman UNESCO itinerary of Palermo

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Abstract
Sicily, with its seven sites recognized by UNESCO, is the Italian region that can boast the highest number of them: the last elected is the city of Palermo, which since 2015 is also part of the prestigious *World Heritage List*.
The Palermo's Arab and Norman itinerary unfolds through also seven monuments: the Royal Palace, the *Palatina* Chapel, the Churches of *San Giovanni degli Eremiti*, *Martorana* and *San Cataldo*, the Cathedral, the *Zisa* palace and the *Admiral's* Bridge, adding also the Cathedrals of the cities of Cefalù and Monreale.
However, Palermo has some critical issues that make the tourist route difficult and uncomfortable, not easily accessible, because of the limited physical connections that make it difficult, both for citizens and tourists with disabilities to move from one monument to another one.
Communication and easy accessibility become urban and architectural design priorities, as well as the safety of use in the intricate maze of narrows and winding alleys, often presenting stairs or steep slopes inside the historic spaces, having discontinuous stony paving and so creating architectural barriers.
The theme could be extended to many other parts of the historic center and to the expanded use of all the city monuments: Palermo, a Mediterranean capital, becomes a monument and a great architecture of itself, experienced most of the year along the street and in the pedestrian paths, the squares and the other city open spaces.
This study aims to address the issue of accessibility for different users, with particular attention to the fragile ones and different ways of traveling/moving (on foot, by bike, in a wheelchair, etc.), extended to the analysis of the historic city center and with a particular attention to the Arab and Norman itinerary.

Keywords: Palermo, Arab and Norman UNESCO itinerary, design for all, protection, management, sustainable strategies

1. Introduction. From the origins towards the Arab and Norman itinerary for Palermo

The inclusion of an Arab and Norman itinerary for Palermo in the UNESCO *World Heritage List* (*WHL*) is proof of how much this city can really boast a very strong socio-cultural and historical-artistic richness. With its seven monuments, in addition to the Cathedrals of Monreale and Cefalù, the Palermo candidacy in July 2015 marked the beginning of another "itinerary", not only monumental but also touristic/economic and international, starting a relaunch of a financial recovery and a more aware attitude to the themes of the enhancement and protection of the historic city, the valorization of urban and extra-urban landscape, the decorum and safeguard use of places and architectures.
The UNESCO criteria on the basis of which the nine monuments have been registered in the *WHL* for exceptional characteristics are mainly these two ones:
- *criterion (ii): Arab-Norman Palermo and the Cathedral Churches of Cefalù and Monreale bears witness to a particular political and cultural condition characterized by the fruitful coexistence of people of different origins (Muslim, Byzantine, Latin, Jewish, Lombard, and French). This interchange generated a conscious and unique combination of elements derived from the architectural and artistic techniques of Byzantine, Islamic, and Western traditions. This new style contributed to the developments in the*

architecture of the Tyrrhenian side of southern Italy and spread widely throughout the medieval Mediterranean region; - criterion (iv): Arab-Norman Palermo and the Cathedral Churches of Cefalù and Monreale is an outstanding example of stylistic synthesis that created new spatial, constructive, and decorative concepts through the innovative and coherent re-elaboration of elements from different cultures [1]. Not surprisingly that the Mayor of the city considered the whole itinerary and the seven Palermo's inserted monuments as "tiles" of what he called the "*mosaic of Palermo*", a multiform and diverse net, also multiethnic and having a strong integration and equality.
However, the city reveals in its entirety, not only in the itinerary, its real Arab and Norman essence, its Mediterranean centrality and its role of reference point for all Europe.
The itinerary is part of a larger and more complex project and strategy of enhancement/conservation, which saw the participation of the Sicilian Region, the municipal Administrations of the three cities (Palermo, Monreale and Cefalù), and numerous secular and religious local Institutions (i.e. Superintendence at Monuments, Curia).
Nowhere else as in Sicily, and in this case in Palermo, is there a concentration of endemic characters, resulting from the sedimentation of colonization that have coexisted in symbiosis, in a clot of historical, geographical, political and cultural contingencies; the eminently Sicilian historical events are part of the broader entire European political history, in that of the territories bordering the Mediterranean Basin, a crossroads between Western Latin, Eastern Byzantine and Islamic cultures: the Islamic government, which established itself in Palermo in 937, obtains the control of the city by building the Emir citadel called *al-Halisah*, also defined *Kalsa*, that means "the Chosen" and in that period Palermo really assumed the role of capital of the Mediterranean, like other cities as – for example - Cordoba, Cairo and Constantinople.
Roger the Norman, who arrived in Sicily after 1055, was crowned as king of Sicily in 1130 into the cathedral of Palermo and the city became the capital of the first Norman kingdom of Sicily, with coexistence between peoples and cohabitation of Christian communities, Orthodox, Muslim and Jewish, becoming a multiracial and multilingual city.
Thanks to the Norman direction, which facilitated trade between northern and southern Italy, also favoring the Pisan, Genoese and Venetian merchants, the cultural rebirth of Sicily and Europe of the twelfth century took place, with the formation of an Euro-Mediterranean cultural *koinè* and an artistic expression, defined precisely as *Arab and Norman*, which placed Sicily at the center of the history of art during the Mediterranean Middle Ages. [2] [3]
It should also be remembered that Palermo, assuming as a Capital in 1130, became a tangible place of Arab and Norman way of living and syncretism, multifaceted and multilingual people, with material and cultural stratifications still now visible and tangible inside the city, due to its urban layout, the concurrence in a same district of churches and mosques, palaces and gardens, the variety of ethnic groups and religions: still in Norman times, the city was surrounded by the lush garden of *Genuardo*, which means "Paradise of Earth", connecting the city with that one of Monreale, with royal gayety pavilions and palaces, such as the *Zisa* one (also the *Maredolce* castle, the superior and inferior *Cuba*, the *Scibene* castle,…) [4].
The Norman client favored and became ambassador of a mixed Byzantine/Islamic/Romanesque culture from beyond the Alps, capable of capturing visitors of the time and then, over the centuries, other travelers of "paths" and "itineraries" such as Goethe, Guy de Maupassant and that of the *Grand Tour voyage*, as well as the cities of Cefalù and Monreale were inextricably linked to the Norman Palermo, due to the legend of the construction of their cathedrals, favoring the dreams of kings who have given rise to admirable examples of architecture.
Precisely the characteristics of strong integration between urban-countryside and landscapes, between architecture and nature are the generating reasons of the Palermo's UNESCO itinerary; its strength absolutely has been perceived during the itinerary itself, in an integrated and symbiotic path, which can be observed by all users, being they citizens or tourists, excluding and neglecting nothing/nobody, with the design aim that any user can join the itinerary in a regime of total visitability [5]. The nine monuments (the Royal Palace, the seat of the oldest parliament in Europe and its *Palatina* Chapel, the Church of *S. Giovanni degli Eremiti*, the Church of *S. Maria dell'Ammiraglio* also called *La Martorana*, the Church of *S. Cataldo* with its typical red little domes, the Cathedral, the *Zisa* palace, the *Admiral's* bridge, the Cathedral of Cefalù, the Cathedral of Monreale) which make up the site "*Arab and Norman Palermo and the Cathedrals of Cefalù and Monreale*", were therefore selected as serial emblems of historical-cultural relevance and because they appear in a good state of conservation, in decent general conditions of accessibility and usability [6].
These are religious or civil buildings of great value, the result of a choral work of workers who were able to reach thresholds of high artistic quality of the Mediterranean Middle Ages, as already specified, representing a synthesis of Arab and Norman artistic and architectural production, single but also capable examples to create a "network" and at the same time organic, some of which rise to real masterpieces for mosaic decoration (i.e. the Cathedrals of Cefalù and Monreale), to constitute an *unicum* (like the *muqarnas* wooden ceiling of the *Palatina* Chapel).

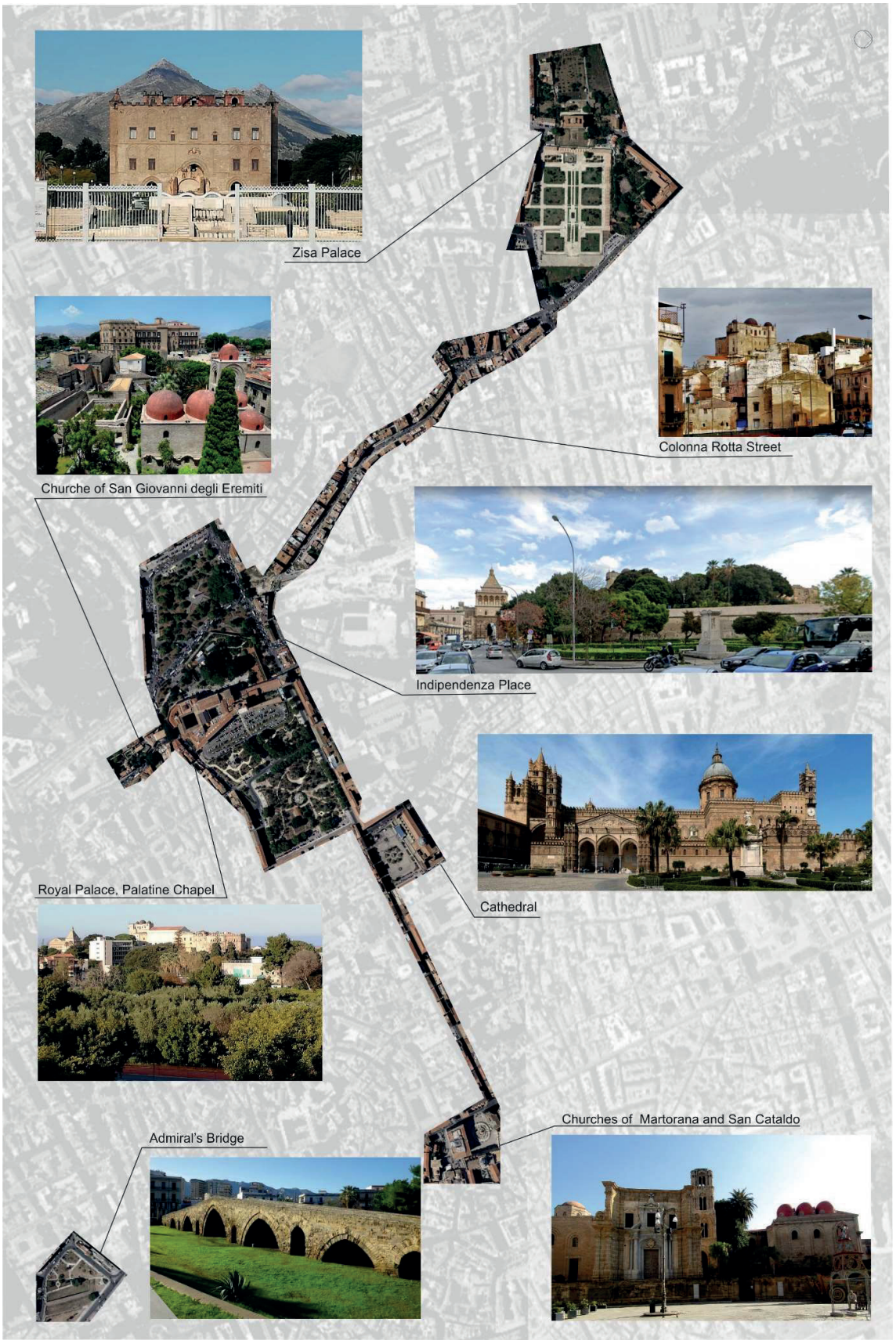

Fig. 1: Map of the Arab and Norman itinerary in Palermo, where it is clear that the *Admiral's* bridge and the *Zisa* palace are difficult to reach by foot (image elaborated by the Authors).

The route/itinerary is made today quite easy through the pedestrianization of most of the interconnection spaces: starting from the Royal Palace/*Palatina* Chapel, with the possibility of visiting the church of *S. Giovanni degli Eremiti*, crossing the Cathedral square and therefore being able to visit the Cathedral itself, along the *Cassaro* (current *Corso Vittorio Emanuele* main street) it is can easily to reach the Church of *S. Cataldo* and *S. Maria dell'Ammiraglio*, while the *Zisa* palace remains a little more isolated (also the *Admiral's* bridge), but however it is easy to reach through a maze of alleys and roads that are still suitable for vehicles, starting from *Indipendenza* square. From the same I*ndipendenza* square then, going up the *Calatafimi* driveway, it can be possible to reach the city of Monreale, while only by car or train to reach the city of Cefalù [7].
In Palermo, almost all the monuments, except the *Zisa* palace and the *Admiral's* bridge, fall within the historic center; in addition to the *General Regulatory Urban Plan* (P.R.G.) this area is also affected by the *General Urban Traffic Plan* (PGTU), which also regulates the mobility of the historic city, with particular attention to the pedestrianization of many parts of it, limiting vehicular traffic and enhancing accessibility [8].



Fig. 2: The Church of S. *Giovanni degli Eremiti*. Comparison with the road network before the UNESCO recognition (photo by the authors).



Fig. 3: *Vittorio Emanuele* main street, going to the *Martorana C*hurch. Comparison with the road network before the UNESCO recognition (photo by the Authors).



Fig. 4: (on the left) View from above of the city with its narrow, winding and steeply sloping streets and alleys, often with heavy vehicular traffic and difficult to walk (photo by the Authors); (on the right) the *Admiral's* bridge, with its difficult access and heavy walk way (https://mapio.net/s/56987175/).

2. Around the city, walking along the main and the hidden paths of the itinerary

The characterization of the current places and architectures of the Palermo's UNESCO itinerary is the result, in the historical city and in the expanded one, as well as in the countryside, of evolutions and stratifications: if swamps have been drained inside the city and the sea subtracted from the port area, limestone plateaus or valleys have been also connected and terracing due to different positions of the limestone banks and riverbeds or military walkways of the ancient walls, and what was once the countryside over time has become a consolidated city, with its chaotic development and its preferential roads; above all, what before it was the territory that separated small and large centers, gradually has turn into a conurbation and has shortened, with the infrastructural network, far distances.

Nevertheless, today the "urban landscape" steeped in history is perceived in a positive way and it is sometimes strongly and energetically correlated to a monument and its appurtenances, as well as the absolute anonymity of some extra urban contexts, in which currently authoritative and prestigious monuments are inserted, is negatively perceived. We must underline that the mentioned nine sites, making up the stages of the itinerary, they include not only the monuments but also their pertinences, equally important and of value, and for these reasons, in order to protect the individual parts, some important and significant *buffer zones* of first and second level have been planned for the itinerary itself, having a complementary and subsidiary role.

The first level *buffer zones* have, as their objective, the protection of the visual, structural and functional identity of each single monumental site, and they are identified in the urban tissue or neighboring landscape areas, while the second level *buffer zones* are acknowledged on a wider system of urban, socio-cultural and landscape relations, taking into account the perimeter of protection existing at the territorial level; our study focuses particularly the first level *buffer zones*, representing those in which it will be necessary to verify and promote additional measures aimed at encouraging the *design for all* measures, as well as an adequate pedestrianization and urban decorum [7].

Until the 2015 candidacy, Palermo appeared to tourists fascinating and contradictory and the visit of the monuments included in the UNESCO itinerary not only for foreign visitors but also for many other citizens was really difficult, especially if done by foot, as the city was not very equipped with agile routes, with adequate services and modes of connection/transportation. From the point of view of accessibility, the accesses to the monuments were often located in a different height position from that of the square or road in front of it, furthermore as regards the safety of use, the streets and squares or open spaces were often paved with paving compact stones in the historic city, with narrow sidewalks and sometimes the coexistence between pedestrian tourist flows and an intense vehicular traffic, and visual communication is closed absent or almost absent, especially for fragile users.

The itinerary also represents its strong "immaterial" characterization and therefore not easily usable because it lacks physical connections, that are able to allow direct passage from one site to another: communication, accessibility and safety of use were and are the only conditions of a compatible and possible use and visit ability [9].



Fig. 5: (on the left) Monuments of the itinerary placed on terraces (churches of *Martorana* and *S. Cataldo*); (on the right) stretches of the urban road network with strong altimetry drops, connected by stairs (*Danisinni* depression), (photo by the Authors)



Fig. 6: (on the left) Ramps for overcoming the altimetry difference in between the *Indipendenza* square and *Colonna Rotta* street, preferential direction of the path towards the *Zisa* palace; (on the right) narrow pavement in correspondence of *Bastione* street, with steep stairs leading to *Vittoria* square and the Royal Palace (photo by the Authors).

3. Protection, management, sustainable strategies and design for all for the itinerary

It is widely known how the three innovative concepts of accessibility, visit-ability and adaptability, must be understood as levels of quality of the physical living space, with a strong evolution of the "special" architectural design because it was projected for fragile people, towards a more global concept of *Inclusive Design* or *Universal Design* or, finally, *Design for All*, sustainable design that plays an important role in the processes of social inclusion: all environments, public and private, should be designed taking in mind the different needs of people.The application of concepts related to the principles of *Universal Design (U.D.),* according to the *Research Center of the University of North Carolina*, considers seven fundamental "*Principles*": 1 - *equity* - fair use: usable by anyone; 2 - *flexibility* - flexible use: adapts to different skills; 3 - *simplicity* - simple and intuitive use: the use is easy to understand; 4 - *perceptibility* - transmitting actual sensory information, 5 - *error tolerance* - minimizing risks or unwanted actions; 6 - *containment of physical effort* - use with minimum fatigue; 7 - *sufficient measures and spaces* - make the space suitable for access and use.

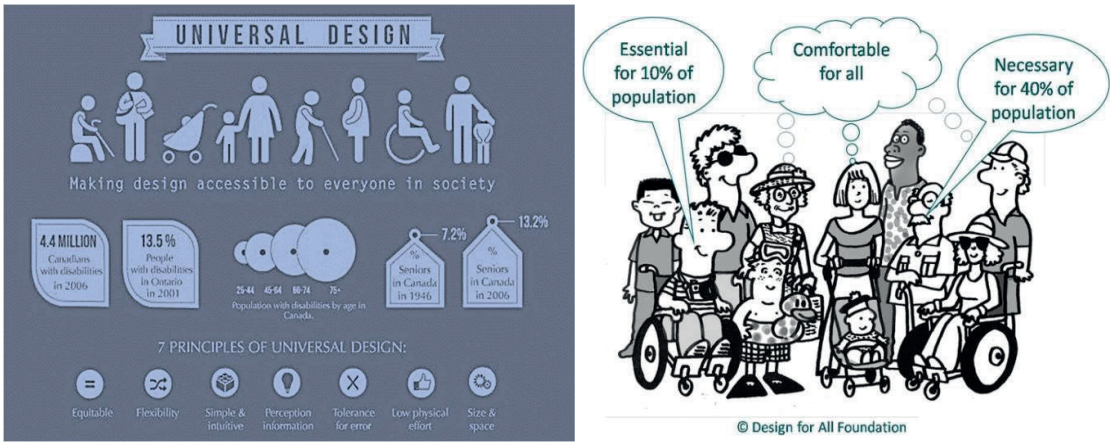

Fig. 7: The seven principles of Universal Design.(http://www.ordinearchitetti.mi.it/download/file/20432)

These principles are broader the basis of an accessible design to all, without barriers and have been developed to be applied in the widest possible number of sectors such as construction, transport, work environments, tourism activities and sports, also including communication technologies because *design for all* criteria are aimed at ensuring the participation of all in the world of information technology. The *Universal Design* approach also draws a new *raison d'être* from the debate that led to the *International Classification of Functioning, Disability and Health (ICF)*, which intends to order functioning, disability and health under the encouragement of *World Health Organization (WHO)* [10].
The ICF not only assesses disability and handicap, but is applicable to all people, even those in perfect health. The *ICF* language was created specifically to be internationally and inter-culturally used with very diversified objectives, both for a specific clinical use or even for epidemiological and health policy studies. The aims of *Universal Design* tend to "simplify everyone's life" by creating products, environments and communications that are universally usable at a low cost (if not free) with benefits for people of all ages and for the different forms of disability, based on and approaching the principles of equity and inclusion and producing benefits that offer everyone access opportunities while respecting individualities and personal peculiarities [11] [12].
From the point of view of the architectural design and communication strategies linked to the object of our study and therefore of the correspondence and adherence to the principles and objectives mentioned above of the Palermo's itinerary, this would mean - for example – the introduction of smooth floors into open spaces and confined spaces, entrances without steps and/or stairs, rough surfaces that require minimal effort for their practicability, stable, solid and non-slip surfaces, some easy systems for improving the outdoor comfort of resting and resting places that wind between one monument and another one; also, an adequate audio communications associated with information visible on the display, a greater visibility of information with associated audio redundancy, a greater visual contrast on panels and indications; the use of intuitive graphics (ideograms) with associated text descriptions, a clear visual indication methods to limit dependence on audio sources, the choice of language in speech synthesis tools; we would add also the rational use of access ramps to overcome altitude differences, bright routes in correspondence of dark or dimly lit environments, web pages that provide alternative text to describe images, instructions that provide information both by voice and video, labels affixed to the control buttons of equipment printed with larger fonts, some devices that allow visitors to choose to listen to or read the descriptions. While respecting the social and civil rights of all citizens, *Design for All* intends to design products, structures, infrastructures, programs and services in a synergic and coordinated manner, guaranteeing all people, as far as possible, to be able to move around the built environment, autonomously and to carry out all the activities that are possible (social, work, educational, recreational, tourist, ...) in a simple and intuitive way, in full safety and health, thus avoiding subsequent adaptations or providing for specialist interventions [13] [14] [15].
The design solutions must be appropriate, commensurate with the individual's performance capabilities, including everyone's needs, in order to avoid any form of discrimination. From all this considerations, it follows that the Palermo's UNESCO itinerary requires an integrated system for tourist accommodation, which can facilitate visits and the understanding/knowledge of the various monumental sites. In the areas adjacent to the sites, already at the time of the application, an analysis of the current state of the places had highlighted the need for some actions aimed at the implementation of protection, safety and usability, including the progressive pedestrianization and easy reaching of the mentioned *buffer zones* of first level, making the connecting paths of monumental emergencies safer and designed from the point of view of *design for all*, also equipping them with information signs, improving urban pavements and connecting sections with different slopes or difficult to reach for fragile users, ...



Fig. 8: (on the left) The entrance to *S. Giovanni degli Eremiti* Church still presents some critical issues due to the lack of connecting ramps; (on the right) the communication system between the various monuments is facilitated by a service of rented push scooters, strategically located along the tourist route, in this case at *Bologni* square (photos of the Authors).

In detail, the "Management Plan" of the itinerary has provided for particular attention to the degree of usability and accessibility of the sites, for this reason the strategic planning of tourism management has taken into account the conditions of accessibility of the site in terms of distance and time of travel from the main nodes of the infrastructural network of the city of Palermo, with the aim of solving the main shortcomings in terms of extended visit ability (not only for users with disabilities in terms of mobility), with appropriate dedicated assistance services and waiting spaces, at the access to the sites and along the route, removal of all architectural barriers … .
In particular, regarding the critical issues, the church of *San Giovanni degli Eremiti* presented, for example, really a difficult access to the monument at the time of the candidacy, due to visitor access from a secondary entrance and entrance to the church from a small metal staircase, and also the Church of *S. Maria dell'Ammiraglio* (*Martorana* church) presented an inadequate organization of the visit service; the *Zisa* palace has shown some accessibility problems inside the monument, the *Admiral's* bridge was accessible only on a panoramic and external level.
We also believe it is useful to underline that, also for the purpose of better planned actions in terms of social and cultural enhancement, the candidacy then also provided for the creation of eco-sustainable cycle-pedestrian connections with an high historical-landscape characterization, such as that between the cities of Palermo and Monreale, crossing the valley of the ancient *Kemonia* creek-Garofala valley, the path of the *Boccadifalco* drain, the *Luparello* plain and the former railway section of the *Palermo-Camporeale* line, not problematic for the purposes of height differences and therefore sweet and extremely favorable to cycle-pedestrian paths.
As regards the creation of tourist routes, sustainable and integrated with the traditional ones of the site, also a route inside the *Danisinni* depression, presents itself as a pedestrian connection axis between the Royal Palace-*Palatina* Chapel and the *Zisa* palace, inside a district - that of *Danisinni* - which still maintains the agricultural connotation (citrus groves, vegetable gardens), the permanence of the water, the remains of the ancient and homonymous stone quarry (*pirrera*), in a path that starting from the Royal Palace and crossing the Independence square reaches the district of *Danisinni* (across *Cappuccini* street, *Danisinni* street, *Danisinni* square) then can reach the *Zisa* street and the homonymous *Zisa* square, using some appropriate and necessary actions both of urban redevelopment of the areas, involvement of the local population and preparation of extended accessibility, both for residents and tourists.
The spaces that are located between the various monumental excellences can become an ideal, functional and physical connection system.
The climate of the city of Palermo enjoys a particular orographic condition that keeps it uniform for the different seasons of the year: winters are not very rainy and maintain a temperature of about 15 degrees centigrade, pleasant and easy for foreign tourists accustomed to climatic more rigid conditions. In summer, however, the presence of humidity and poor ventilation produce critical climatic conditions for those who, on foot or with small vehicles of transport, are forced to cross parts of the historic city with temperatures exceeding 40 degrees centigrade.
There are currently no welcoming conditions on these routes, especially for fragile users or those with mobility difficulties. This could be compensated through a punctual system of strategic places, currently in disuse, which appropriately designed for the improvement of environmental comfort, they can

constitute some connecting elements, resting and aggregation points both for the tourist and servicing all citizens.
To summarize the actions envisaged to favor services intended for fragile users, it's necessary the creation of access ramps for users with reduced mobility, brochures and information panels with *Braille* language in each monument, auditory paths, tourist guides and interpreters of the language of signs, tactile models of every single monument, tourist routes differentiated according to users and supported by multimedia products. To ensure greater accessibility, eco-sustainable shuttles are also provided for the transport of visitors from one monument to another, especially for thematic itineraries outside 1palermo and for people with disabilities.
All this aimed at increasing the number of disabled visitors to the sites, enhancing the accessibility level of the facilitated transport service, training specialized tourist guides and disabled assistance staff; by promoting and favoring the overall accessibility of the urban territory, the right to mobility can be guaranteed to the entire catchment area, not only tourists but any disadvantaged segment of the population (mothers and small children, the elderly, people with respiratory difficulties and heart problems, ...), the so-called "weak" or "at risk" users.

4. Conclusions. Actions already foreseen and objectives to be achieved

The issue of physical, sensorial and cultural accessibility of the architectural and landscape heritage is linked to that of the "democratization of culture". Accessibility is, in fact, now seen as a tool for achieving cultural and social equality. The *United Nations 2030 Agenda for Sustainable Development* also contains several references to accessibility divided into 17 Goals.
The Goal "*Making cities inclusive, safe, resilient and sustainable*" commits all World States to provide safe and sustainable access to transport systems, as well as universal access to green and public spaces, paying particular attention to the most vulnerable categories of society such as women, the elderly, children, people with disabilities.
Even in Italy, overcoming obstacles for maximum use by users has represented - from 2008 to today - one of the major fields of intervention of the Ministry of Cultural Heritage and Activities and Tourism (MIBAC) which has published the "*Guidelines for the overcoming of architectural barriers in places of cultural interest"*.
The debate on how it is possible to reconcile the safeguard and protection of the sites guaranteeing, at the same time, a wider use of the heritage and its transmission to future generations is very contemporary, especially as regards the methods of breaking down the barriers for total accessibility of historical monuments and cultural sites, taking into account architectural constraints and respecting legal requirements [18]. This issue becomes even more sensitive when it refers to sites or monuments inscribed on the UNESCO *World Heritage List*, which should be universal and bring together cultures, and which are not yet fully accessible and must facilitate access to users without threatening the value of the heritage. buildings and the environment in which they are inserted.
Far beyond the strict attention so far aimed at adapting to the programmatic objectives of the UNESCO candidacy management plan, in recent years in the city of Palermo there has been a much more conscious and always more reasoned attention to the issues of accessibility and *Design for all*; the municipal administration website aimed at tourists has implemented information on monuments accessible to the disabled, the blind or visually impaired, ... [19].
In some monuments of the itinerary, pedestrianization has been carried out (*S. Giovanni degli Eremiti* church, *Martorana* church with *Bellini* square have in front of monuments some pedestrian and car free spaces), ... , something has been done for sustainable mobility with shuttle buses dedicated, bike-sharing systems and even electric scooters, moreover, as regards the parking places, strategic points have been identified on the path that brings together *S. Giovanni degli Eremiti* church, with Royal palace, the Cathedral and the *Zisa* garden system, in order to organize dedicated spaces equipped with sustainable safeguards for the improvement of environmental outdoor comfort, as well as for the improvement of accessibility. This virtuous example could be a reference model for the other points of the Arab and Norman route. Finally, we recall that since 2004 to 2008, on the occasion of the restoration of the mosaics and wooden structures of the *Palatina* Chapel thanks to the sponsorship of the patron Reinhold Würth, damaged by the earthquake that occurred in 2002, the 800-day long construction site was able to complete a special and meticulous restoration, which also allowed the mosaics to be studied in depth, even those in a higher and not easily legible position, by means of a convenient scaffolding useful not only for restoration building phases but also for tourist use, with the unique possibility for visitors to be able to admire from near both the mosaic decoration and the wooden and painted *muqarnas* of the wooden ceiling. Certainly an example of not perfect example of accessibility to all, but surely a proof of virtuous collaboration between restoration, sustainable tourism, enhancement of cultural heritage.
In this sense, it is typical of the character of the city, Palermo has done more and will demonstrate its figure and its character in future.

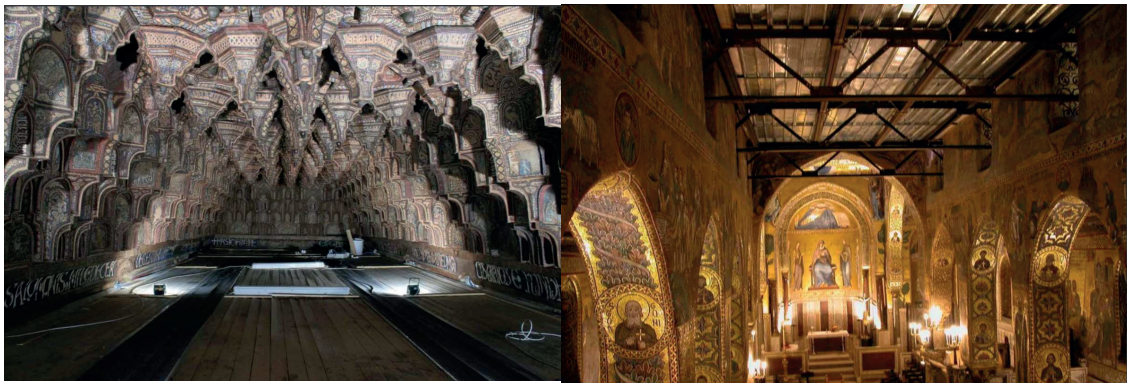

Fig. 9: The *Palatina* Chapel with the scaffolding useful to restoration but also reliable and open to touristic visitors (photo by the *BB.CC.AA*. Superintendence of Palermo).

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Distretto Sociale Barolo in Turin: Permanence and Transformation of a Complex for Health and Social Inclusion

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Abstract
The complex of buildings known as the Distretto Sociale Barolo is today a significant presence in the urban context of Turin, which bears witness to the actions undertaken by welfare associations during the 19th century. Born in 1823 at the behest of the marquise Giulia di Barolo, it assumed an important role in the city in promoting social inclusion through initiatives aimed at the care of the sick, education and employment. Within the complex, health care was provided in the structure called Ospedaletto di Santa Filomena. Inaugurated in 1845 and intended to help girls from poorer classes, today the building is entrusted to the association Camminare Insieme, run by volunteer doctors who offer free help and protect the health and well-being of the weaker sections of the population.
Starting with a study of the documentary sources kept in the Opera Barolo archives, this paper illustrates the first results of research aimed at investigating the permanence and transformation of the asset in its tangible and intangible components. The consistency of the complex is still legible even though it has been adapted to the needs of contemporary society. In this direction, the involvement of third sector organizations has represented an opportunity to conserve and renew this architectural heritage while keeping alive its original charitable purpose.

Keywords: history, permanence, transformation, health, social inclusion

1. Introduction
The Distretto Sociale Barolo was born in Turin in 2017 when a two-year memorandum of understanding between Opera Barolo, the City of Turin, the Piedmont Region, and banking foundations (Compagnia di San Paolo and Fondazione CRT) was signed (fig. 1) [1]. Since its founding, it has set itself the goal of experimenting with new forms of welfare and assistance in the health field with public/private governance. This commitment was subsequently renewed by signing the 2020-2023 protocol aimed at enhancing the activities present in the complex [2].
The district is in the northern area of the city between Via Cottolengo and Via Cigna and includes 14 buildings owned by Opera Barolo. The latter is an institution founded by testamentary provision of the marquise Giulia Colbert Falletti di Barolo in 1864 to continue the action of charity, social, political and cultural commitment started with her husband Carlo Tancredi di Barolo. The activity of the marquise in the current district started in 1823 and stood out in the 19th century city for its important role in promoting social inclusion through initiatives aimed at the care of the sick, education and vocational training [3].
This complex of buildings is now a significant presence in the urban context of Turin. It looks like a citadel of human promotion that aims to help women in difficulty, vulnerable young people, prisoners, migrants and marginalized subjects. The area has 14 organizations and associations that follow the axes of the mission of the Opera Barolo, renewing and adapting to contemporary society the spirit of the 19th century institution.

Starting with a study of the documentary sources kept in the Opera Barolo archives, this paper illustrates the first results of research aimed at investigating the permanence and transformations of the asset in its tangible and intangible components. Specifically, the discussion will focus on a building of the complex, the Ospedaletto di Santa Filomena, characterized since its foundation by health care for the poor.

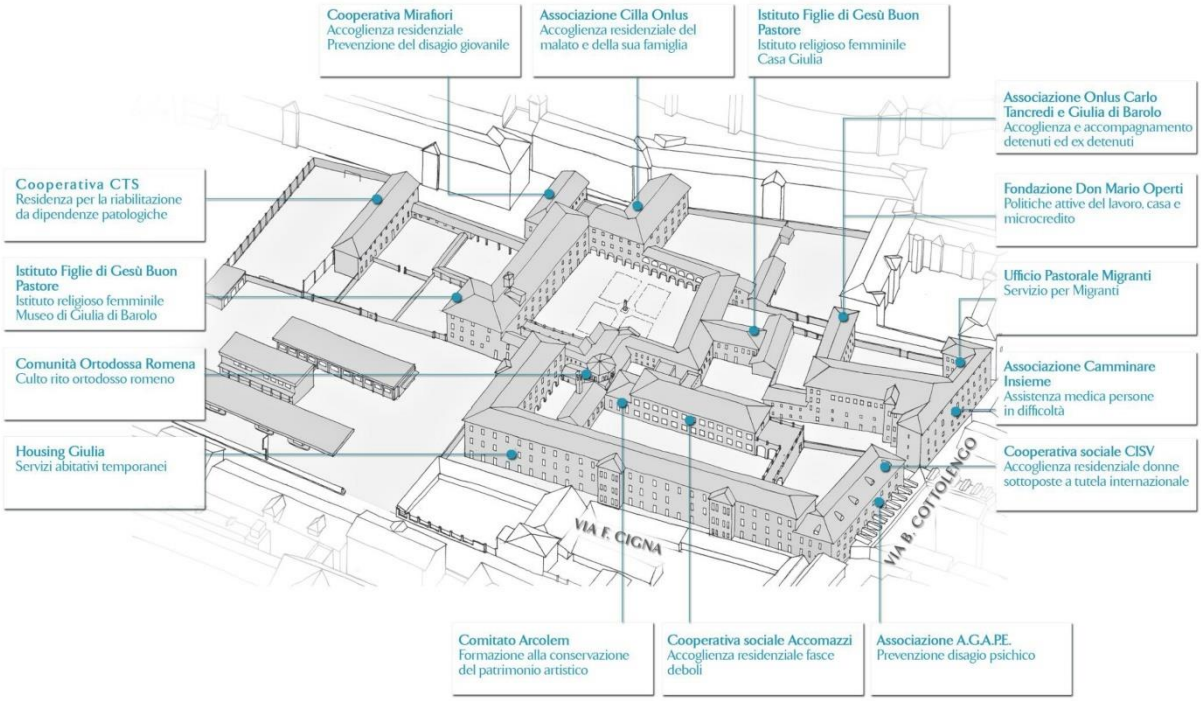

Fig. 1: Distretto Sociale Barolo, current intended use (http://www.operabarolo.it/it/p-25/distretto-sociale-barolo)

2. Construction of the Complex

The construction of the complex of buildings now known as the Distretto Sociale Barolo took place in the 1820s in Borgo Dora, in an area characterized by important connections with other welfare institutions. Even today the presence of these institutions gives this part of the city a strong social vocation (specifically, the Piccola Casa della Divina Provvidenza founded by Giuseppe Benedetto Cottolengo and the complex of Santa Maria Ausiliatrice by the Salesians in the Valdocco district) [4].

In 1823, the marquise undertook a first initiative in support of women with the creation of the Rifugio Institute, intended to accommodate former prostitutes and single mothers. Within the institute the girls could find hospitality, were educated and trained for a subsequent reintegration into society. Later, the Refugino was created next to the Rifugio with the objective of welcoming underage girls in difficulty. The desire to set up a real center dedicated to social welfare in the 19th century city continued in 1833 with the creation of the Maddalene Institute. This was conceived as a religious congregation, canonically erected in 1845, whose goal was to accommodate former guests of the Rifugio who wished to consecrate themselves to the monastic life at the end of their recovery process. Initially, the institute was located on the upper floor of the Rifugio but a new adjacent building designed specifically for the new congregation was built between 1835 and 1841. As a continuation of the project, in 1838 the realization of the Maddalenine Institute also began. The institute was intended to house and educate young girls under the age of twelve, who were practicing prostitution [5].

A first representation of the consistency of the complex in the 1830s is contained in the *Tipo regolare del terreno proprio del Governo, e di quello dell'Ill.ma Sig.ra Marchesa Faletti di Barolo; e Piante del Fabbricato construtosi tanto sul Terreno del Governo ad uso dell'Opera Pia del Rifuggio, quanto su quello proprio della prelodata Ill.ma Sig.a Marchesa ad uso del Monastero delle Maddalene* [6]: the drawing shows the articulation of the area with an indication of the ownership of the land on which the buildings was located and indicates in black the presence of buildings pre-existing to the interventions promoted by the marquise [7]. The light gray color represents the building of the Rifugio built on the land purchased by the government, while the dark gray color indicates the Maddalene monastery. The wall separating the land owned by the government and that of the marquise, which was later demolished, is shown in red (fig. 2).

To complete the marquise's project, the Ospedaletto di Santa Filomena was built to provide aid to girls from the less wealthy classes. The idea of founding a hospital was born in the marquises Carlo Tancredi and Giulia Colbert Falletti di Barolo in 1833. The initial project was to be carried out in Moncalieri, where the marquises had bought a house and built a chapel in honour of Santa Filomena. However, since 1839 the marquise decided to move the hospital to Turin, for more convenient treatments and qualified

doctors. As a result, she bought a piece of land and built the building located in Via Cottolengo 24, between the Rifugio Institute and the convent of the Maddalene Sisters, at her own expense. However, it took a few more years to complete the project, until its inauguration in 1845 [8].
A floor plan of 1874 signed by Alessio Ruella, bursar of the Opera Barolo, illustrates the articulation of the complex with the inclusion of the hospital: the document, entitled *Opera Pia Barolo Ospedaletto, Rifugio e Ritiro delle Figlie Pentite pianta del piano terreno, 1874*, shows in black the Rifugio Institute, enlarged compared to the original nucleus, in gray the Maddalene Institute (or Ritiro delle Figlie Pentite), in red the Ospedaletto di Santa Filomena. The sequence of the buildings was marked by the presence of green areas and by an internal infrastructural organization aimed at ensuring the independence of the functions and the connection with the public road system. The boundary of the lot to the east was marked by the presence of the Casa della Divina Provvidenza (fig. 3) [9].

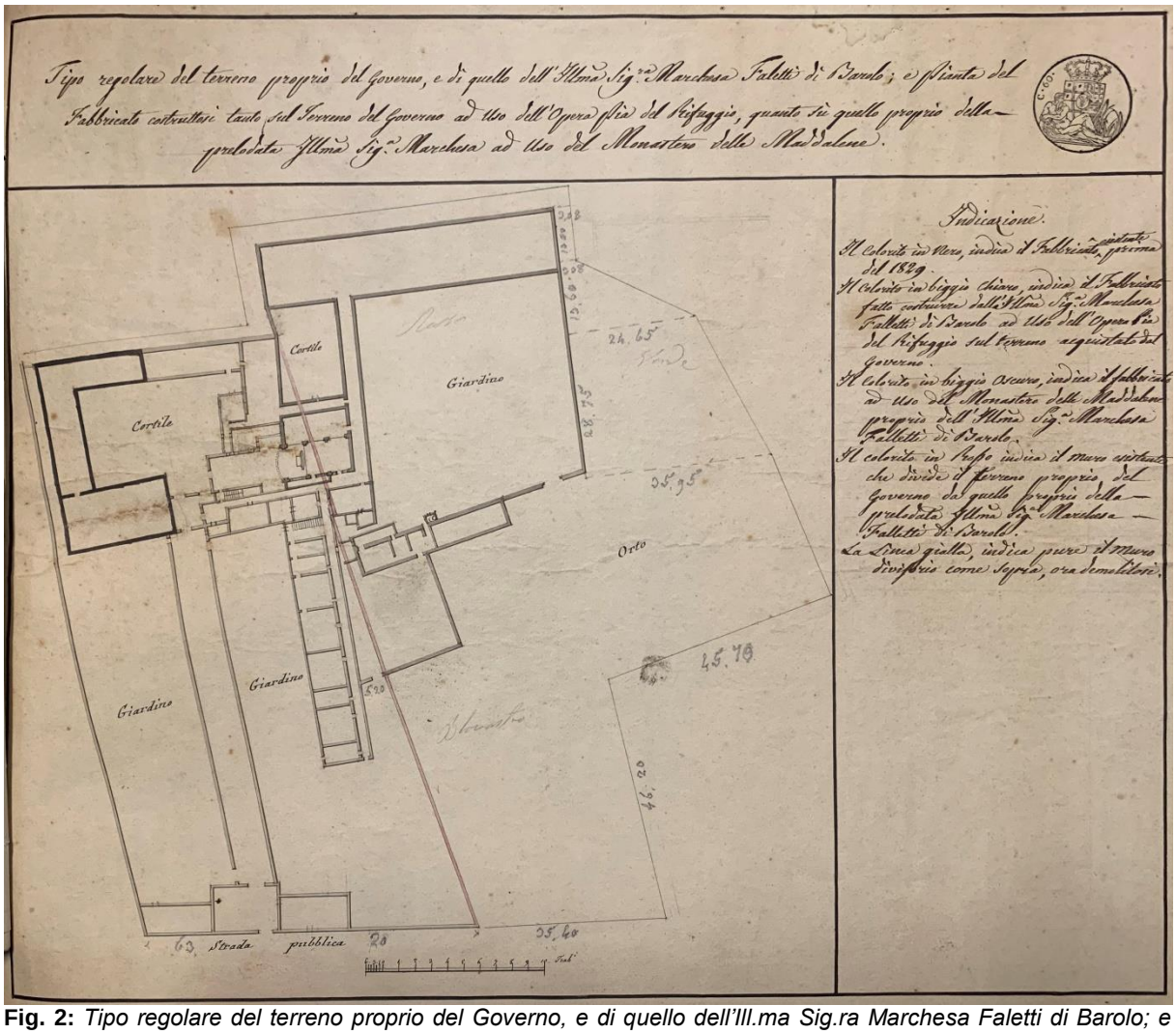

Fig. 2: *Tipo regolare del terreno proprio del Governo, e di quello dell'Ill.ma Sig.ra Marchesa Faletti di Barolo; e Piante del Fabbricato costruttosi tanto sul Terreno del Governo ad uso dell'Opera Pia del Rifuggio, quanto su quello proprio della prelodata Ill.ma Sig.a Marchesa ad uso del Monastero delle Maddalene* (AAOPB, sezione VI, Planimetrie, stampe, disegni e manifesti, VI.3.1-5)

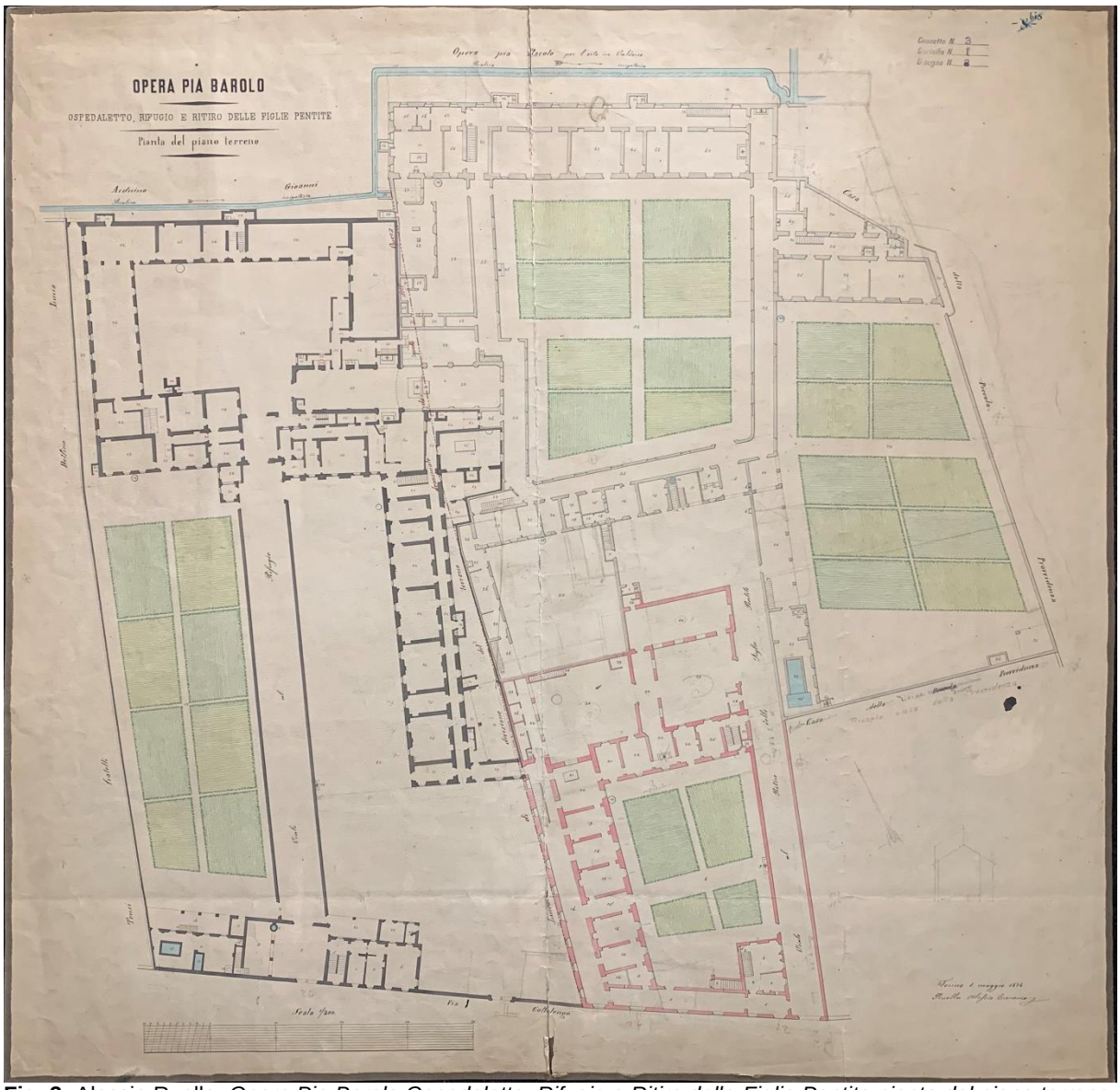

Fig. 3: Alessio Ruella, *Opera Pia Barolo Ospedaletto, Rifugio e Ritiro delle Figlie Pentite pianta del piano terreno*, 1874 (AAOPB, sezione VI, Planimetrie, stampe, disegni e manifesti, VI.3.1-4)

3. Ospedaletto di Santa Filomena

3.1 Origin and Transformation

The Ospedaletto di Santa Filomena was equipped with three medical sections: one surgical, one allopathic and one homeopathic. The management was entrusted to the Sisters of San Giuseppe, while a group of oblates, the Tertiaries of Santa Maria Maddalena took care of the nursing aspects. Next to the Ospedaletto di Santa Filomena in 1857 arose the Laboratory of San Giuseppe, a school of weaving, embroidery and knitting for girls of humble origins.

The plan of the complex drawn up by Ruella in 1874 illustrates the conformation of the hospital which featured a structure divided into three sleeves to delimit an internal space used as a garden. The structure was accessed through the southern building overlooking the public street (Via Cottolengo). To the north of the northern sleeve there were two other courtyards, overlooked by the oratory and the Laboratory of San Giuseppe and the service rooms. The internal uses of the complex are documented in a survey of the early 20th century [16]: on the ground floor it is possible to recognize the presence of reception and service rooms (waiting room, medical examination room, dressing room, refectory, kitchen and oratory of San Giuseppe, technical rooms containing the radiator). The upper floors housed the infirmaries according to a distribution scheme that contemplated the presence of a large room with a side corridor for access to the main space. The stairwells were in the corners of the structure (fig. 7).

The complex represented by Ruella was transformed and enlarged at the end of the 19th century following the request to adapt the structure to the changed needs. A municipal ordinance relating to the arrangement of the facade and laying of sidewalks along the southern elevation dates back to February 16th, 1898, to be completed by June 15th, 1900. The ordinance stated that the building “ha il muro a

due piani fuori terra privo di gronda, molto scrostato, sucido e senza marciapiede in pietra" [10]. The interventions carried out by the Opera Barolo in the following months were aimed at fixing this portion of the building. As a matter of fact, on July 23rd, 1898, the Opera Barolo was authorized to build a new access to the complex in the south sleeve and to enlarge four windows on the ground floor according to the project of engineer Giuseppe Tonta (fig. 4) [11]. In response to the ordinance of February 16th, on June 23rd, 1899, the sleeve on Via Cottolengo was enlarged and raised and a new portal was inserted on the project of Giuseppe Tonta under the direction of the Bellia company (fig. 5) [12].
With a project dated May 19th, 1903, the hospital underwent a modification of the sleeve located inside the property, in a transversal direction to Via Cottolengo, and used as an infirmary: Giuseppe Tonta's solution provided for a rise of about 1.5 m and allowed to give the infirmary on the second floor a height of 5 m to the advantage of the hygienic conditions of the room (fig. 6) [13]. The project foresaw raising the roof and constructing a new, higher ceiling, as well as lowering the windows to the floor level and constructing a stone balcony along the perimeter wall. The execution of the masonry works and of the accessory interventions was entrusted to the Bellia company. The technical studio Hennebique was involved in the execution of the reinforced concrete works, with a project signed by engineer Giovanni Antonio Porcheddu [14]. This is testified by an estimate dated August 2nd, 1901 for the pillars and floors, accompanied by a sketch of the dimensions of the pillars and beams and the thickness of the slabs (fig. 8). In a subsequent document dated April 12th, 1903, engineer Porcheddu suggested using hollow reinforced concrete beams in the corridor according to the Siegwart system and acknowledged the non-applicability of the technology to the larger room given the capacity and span of the beams required [15].
Further interventions carried out in the 1910s were oriented to the extraordinary maintenance of the complex with the provision of iron windows [17], adaptation of the heating system to the renewed volume of the building [18] and renovation of rooms for use as infirmary on the second floor of the sleeve overlooking Via Cottolengo [19]. Moreover, in consideration of the great development of medical and surgical treatments at the hospital, the rooms used for laboratories and surgical operations had become insufficient: the lack of space adjacent to the hospital building made it impossible to build new ones, so the hospital administration turned its studies to an arrangement of the existing rooms to the changed needs with a narrowing of the service areas. Two rooms on the ground floor were adapted for new uses. Similarly, new operating rooms were built with an improvement and expansion of the bathroom facilities. The project of surveyor Martina, bursar of the Opera Barolo, was approved in 1907. The masonry work was entrusted to the Bellia company, which had already carried out already the previous adjustment projects. In addition, the blacksmith works were commissioned to the Enrietti company (fig. 9) [20].
In the following years, the good functioning of the Laboratory, which provided for the education of many students, required an increase in external surfaces, in view of the limited area available. The space necessary for the enlargement was acquired by the Maddalenine Institute, which, as illustrated in Ruella's plan of 1874, was the assignee of a vast outdoor area used as a garden. The 1912 project by Martina divided the Maddalenine's courtyard by a new partition wall and extended the portico adjacent to the institute [21]. The courtyard of the Laboratory was later equipped with a canopy [22].
In the decades preceding the Second World War, the Ospedaletto di Santa Filomena underwent general interventions aimed at ensuring the full performance of the functions assigned to it without disrupting the consistency of the building. These operations involved the floors of the infirmary on the first and second floors [23], the consolidation of floors and ceilings and roof restoration [24], as well as the addition of new plant engineering components (installation of an elevator [25] and water heating by radiators [26].
Between February 1942 and July 1943, the building was severely hit by aerial bombardments. Consequently, the upper floor, with the whole ward of the medical division, and the Laboratory of San Giuseppe collapsed. Together with the reconstruction of the damaged rooms, it was necessary to arrange and raise the body of the building overlooking Vicolo delle Maddalene. In the report drawn up by the Technical Office in 1948, this sleeve was recognized as antiquated from both a structural and a distributive point of view, and no longer suited to the modern requirements of hospital construction [27]. The building continued to operate until 1972, when it definitively ceased to function as a hospital, but it continued as an infirmary and then as a medical-surgical outpatient clinic, and finally as a boarding house for elderly self-sufficient women. The latter also ceased operations in the 1990s [28].

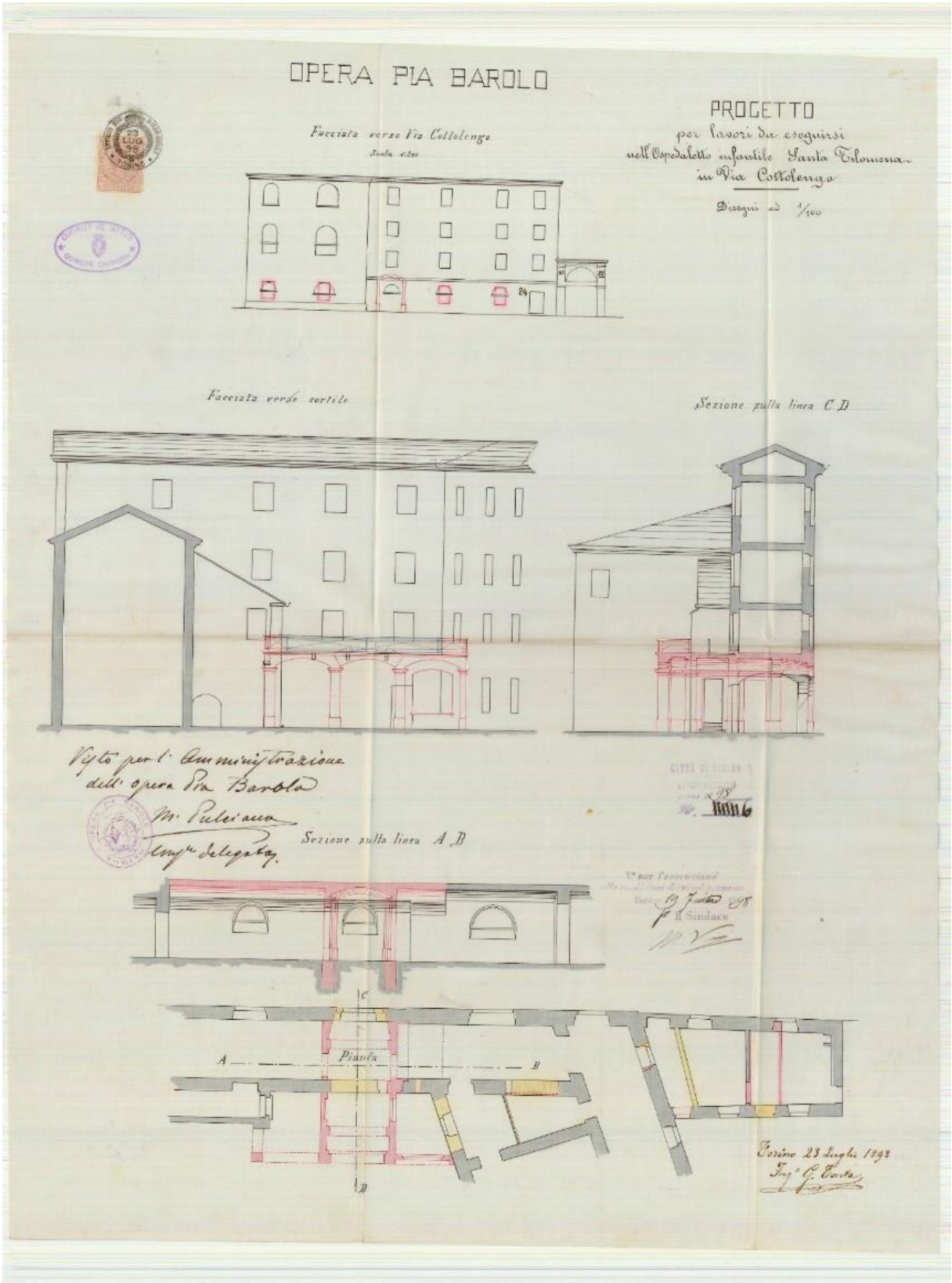

Fig. 4: Giuseppe Tonta, *Progetto per lavori da eseguirsi nell'Ospedaletto infantile Santa Filomena in Via Cottolengo*, 1898 (ASCT, Progetti edilizi, 1898/6)

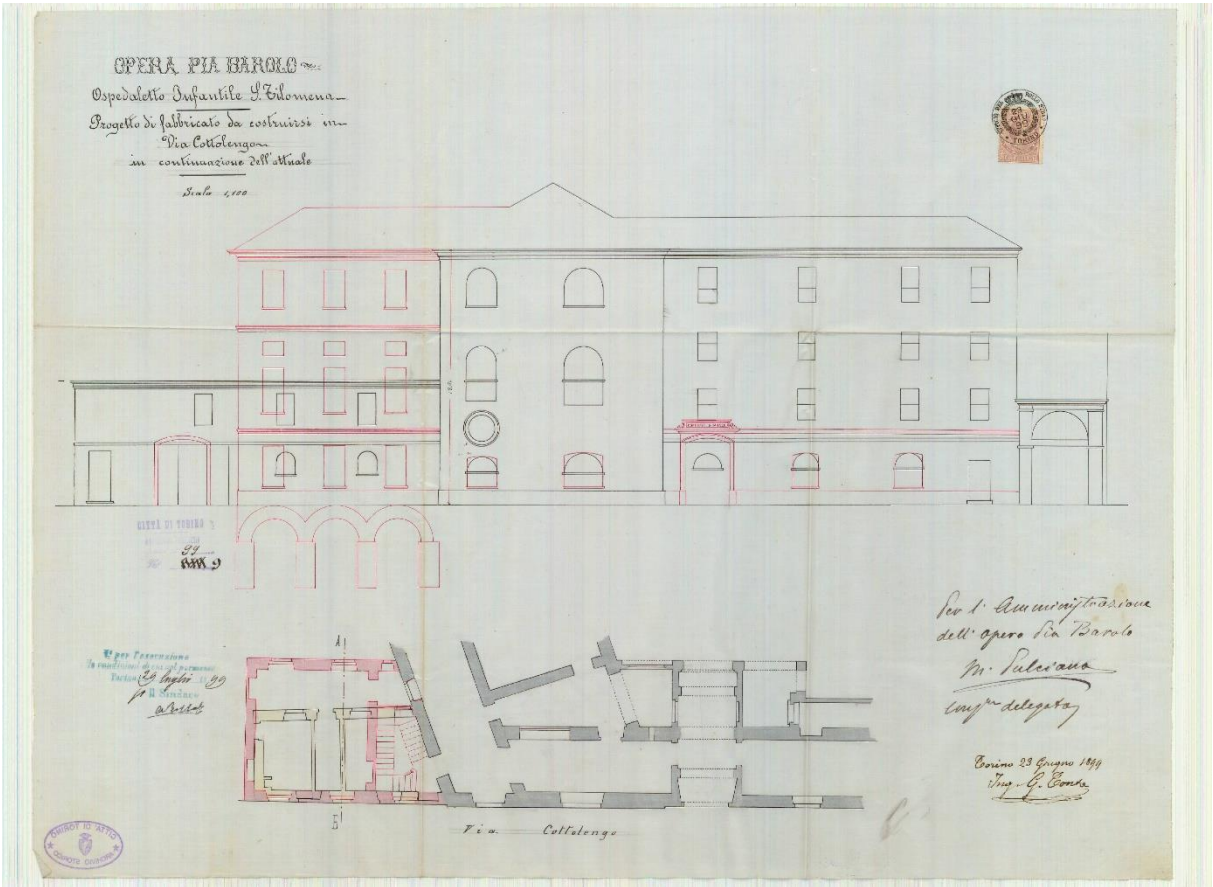

Fig. 5: Giuseppe Tonta, *Progetto di fabbricato da costruirsi in Via Cottolengo in continuazione dell'attuale*, 1899 (ASCT, Progetti edilizi, 1899/9)

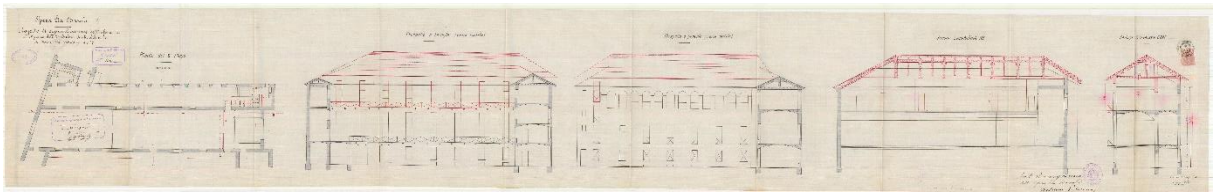

Fig. 6: Giuseppe Tonta, *Progetto sopraelevazione dell'infermeria al 2° piano dell'Ospedaletto Santa Filomena in Torino, Via Cottolengo n° 24*, 1903 (ASCT, Progetti edilizi, 1903/166)

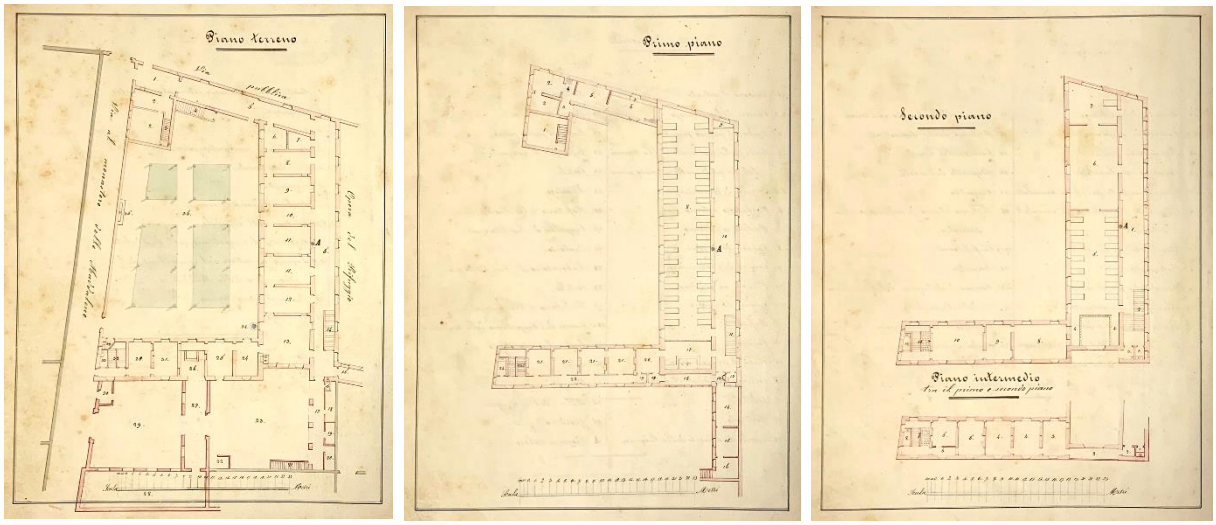

Fig. 7: Ospedaletto di Santa Filomena, [early 20th century] (AAOPB, sezione VI, Planimetrie, stampe, disegni e manifesti, VI.3.6.1-11)

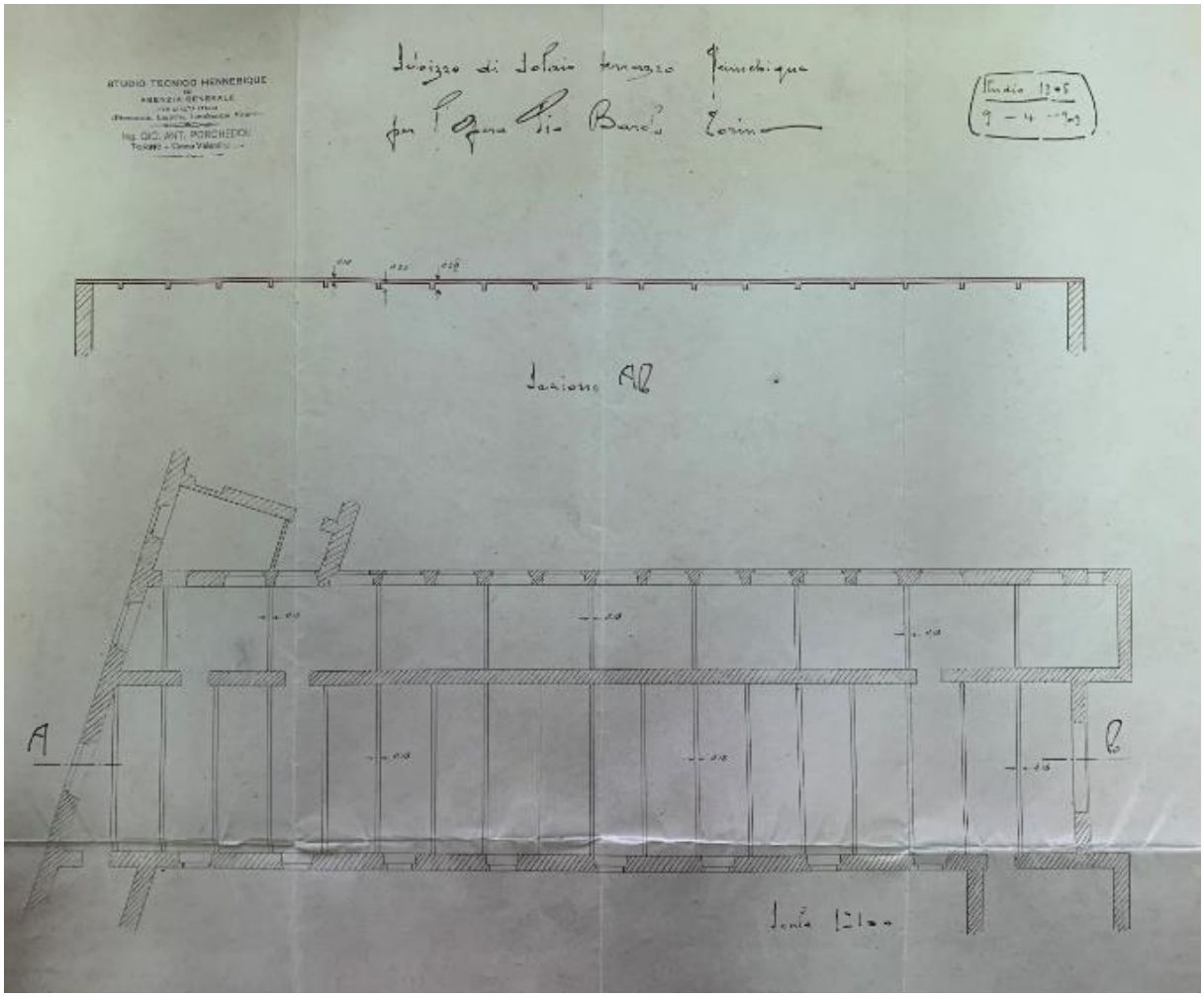

Fig. 8: Giovanni Antonio Porcheddu, *Schizzo di solaio terrazzo Hennebique per l'Opera Pia Barolo*, 1901 (AAOPB, sezione IV, Istituiti Filiali, faldone 211, fasc. IV.6.2-20)

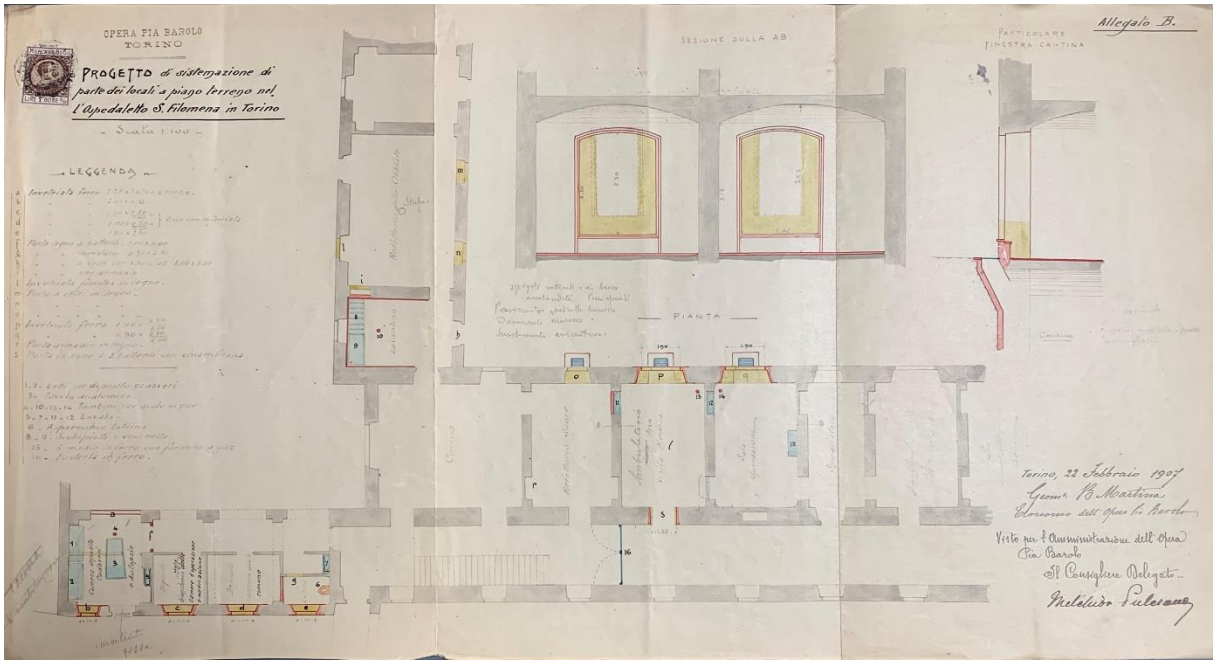

Fig. 9: *Progetto di sistemazione di parte dei locali al piano terreno nell'Ospedaletto S. Filomena in Torino*, 1907 (AAOPB, sezione IV, Istituiti Filiali, faldone 211, fasc. IV.6.2-36)

3.2 From Decommissioning to Current Use

At the beginning of the 1990s, the lack of the original function was resolved by assigning the structure in free concession to the association Camminare Insieme. The association was founded in 1993 on the

initiative of volunteer doctors [29]; in the same year, an agreement was signed between the Opera Barolo and the association for the use of the spaces, as the project was part of the institutional purposes of the Opera. In 1994 the outpatient clinic was born thanks to a grant from the municipality of Turin for the renovation of the disused premises. Today, the building provides free outpatient services for indigent people, foreigners without medical assistance and people in difficulty, according to a vision that considers health as a common good [30]. Finally, in 2011, part of the building of the former Ospedaletto di Santa Filomena was renovated and granted on loan to the association Cilla, which offers hospitality to families of patients in city hospitals.
In the context of the initiatives of adaptive reuse of disused architectural heritage, the case of the Ospedaletto Santa Filomena represents an effective example of balance between intrinsic value and use value. The current function assigned to the building, in continuity with its historical use, has allowed Opera Barolo to maintain an active role in the urban and social landscape of Turin. The complex has reached the 21st century respecting the stratification of values of the asset.
The consistency of the building is still legible in the context of an adaptation to the demands of contemporary society, to the new needs and social and economic instances in progress. Current reflections on the commons place the accent, in fact, on the social utility that the individual and the community can gain from their use [31]. Along the same line, the involvement of third sector organizations can take on a significant weight in the definition of a renewed model of development that focuses on the sustainability of processes and the improvement of collective well-being. According to this vision, they can therefore be configured as a specific form of governance inspired by ideals of cooperation and solidarity, overcoming a vision that relegates them exclusively to a position of subjects aimed at the production of services ignored by the state or private entities [32].
In the case of the Ospedaletto, the new life of the building has resorted to non-profit associations to define new forms of management capable of updating a model of 19th century origin. What distinguished the action of the Opera Barolo, therefore, was not a change of use but a review of the management organization. It follows that the presence of non-profit organizations in the Ospedaletto di Santa Filomena has favoured a reuse oriented to public utility according to a broad vision of the asset and its effects not related only to economic components.
The example of the hospital testifies how the use of the building can be renewed over time without denying its historical roots. It represents an opportunity to preserve and adapt this architectural heritage while keeping alive its original welfare purpose, with a permanence of tangible and intangible components through social use [33].

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WORLD HERITAGE and DESIGN for HEALTH
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ECONOMY|TERRITORIAL GOVERNANCE|ARCHEOLOGY|SURVEY|HERITAGE|e-LEARNING
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Cultural and Landscapes Heritages: Mobility, Fruition and Accessibility for all

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Abstract

At such a delicate historical moment, in which the pandemic health emergency has reduced the mobility of citizens, a new resilient culture is affirming its capacity to encourage and guarantee the use of cultural and landscape assets for all. This study analyzes some international and national experiences that have already been implemented, or are at an advanced planning stage, which point to a new way of understanding the accessibility of places by users with specific needs and permits their visitation which was previously impossible. Our discussion will deal with Agrigento in particular: the city itself, the Valley of the Temples, its historical center and all the naturalistic treasures of its hinterland. Though the area has been struggling almost permanently with a serious socio-economic crisis for decades, it is an increasingly interesting destination for travelers, even in the new mode of experiential tourism. In this context, despite efforts being made to create routes and systems to ensure the cultural heritage is utilized, in particular between the Valley of the Temples and the urban center, issues of accessibility and inclusiveness remain unresolved. Unfortunately, at these latitudes, the gap between Italian legislation on the subject and its practical impact is still enormous and in some ways insurmountable. Only a reversal of trend, primarily at the cultural level, will allow us to transform long-standing weaknesses into new and interesting strengths, while ensuring both accessibility, and a resultant increase in tourism, as well as the improvement of urban mobility for all.

Keywords: accessibility, fruition, urban mobility

1. Introduction

The cultural heritage of a country is the result of the historical-cultural-architectural production of the peoples who have dominated it and includes the great tangible and intangible assets commonly called "*cultural goods*" (1). This heritage, which passes on the individual and community memory of a specific territory and a specific historical period to future generations, represents an important tool for aggregation, social cohesion, cultural exchange, values and emotions, as well as the sharing of knowledge and skills, and must be guaranteed to all. This includes those who, temporarily or permanently, suffer from reduced motor or sensory capacities. Yet guaranteeing access to this heritage is not always possible as, in our cities, accessibility and use of certain spaces and artifacts are both marked by significant inequality. Due to architectural barriers – which, unfortunately, are still present in some sites today – it is not possible for different categories of people to access, learn about, and enjoy their own cultural heritage, effectively preventing its use by a significant part of the public. Then, "*if the difficulty of finding practical information about the places that preserve our culture is added to this inhibitory feeling, this public, already scarred by its own insecurities, will feel totally excluded and unable to shake off the sense of total frustration*" (2). In this scenario, institutions and civil society – attentive to the needs of every individual – must make every effort to ensure that cities and public goods in general, are accessible to everyone in an easy, autonomous, comfortable and safe way. The correct and responsible development of a civilized country, in fact, cannot ignore the implementation of *governance* that aims at the "*sustainable mobility*" of everyone. One of the key requirements for an inclusive society is that everyone must be able to participate and enjoy the social, economic and cultural assets of that

society. Historical heritage is a significant asset, a great resource for the community that reflects the society of the past and forms an integral part of a Country's cultural identity. To make the built heritage more accessible, it is essential to be aware of the different needs of people and how these needs can be met in various ways. It is important to remember that often the best and most appropriate way to make places more accessible is through management solutions that may sometimes require very few physical interventions or alterations of the urban fabric, such as well-planned access strategies, as well as careful, sensitive and elegantly designed solutions. In this regard, a tangible and significant signal comes to us from some urban realities that have aimed at a new way of understanding the accessibility of places by users with specific needs, which has permitted previously unvisitable sites to be frequented. These are resilient experiences – international and national – of great cultural and cognitive enrichment, and of high formative and educational value. They are cities that stand out from others for having undertaken various initiatives aimed at promoting actions – that are effective and efficient – in favor of disabled people with different physiological or pathological conditions (Table 1) – towards which one often feels guilty or inadequate – as well as the application of *best practices*, the use of innovative technologies, the adaptation of structures with suitable tools and means, and that are capable of overcoming obstacles and architectural barriers (3). The focus of this study are the activities promoted within the Archaeological Park of the Valley of the Temples in Agrigento, a UNESCO site since 1997.

Table 1 **SIZE OF DISABILITY**

TYPES OF DISABILITIES	DESCRIPTION	DIFFICULTY
MOTOR DISABILITIES	Reduced mobility due to problems in the legs, feet, neck, back, arms and hands	Difficulty moving independently Difficulty in carrying out the main daily functions (walking, sitting
SENSORY DISABILITIES	Limited or absent vision Ability to hear limited or absent	Reduced ability to see clearly Difficulty of written communication Difficulty of oral communication Difficulty hearing audio presentations
INTELLECTUAL DISABILITIES	Long-lasting diseases that present pathologies that result in behavioral disturbances	Slow learning Difficulty of behavior Difficulty in understanding concepts Sensory and motor difficulties Restricted ability to perform basic life functions
OTHER DISABILITIES	Variety of diseases	Food problems Heart problems Pressure problems Respiratory difficulties Stomach, kidney and liver problems Diabetes Epilepsy

2. Cultural Heritage: Accessibility Actions and Projects in Europe and Italy

When it comes to accessibility, the number of initiatives and projects for the sustainability, protection and innovation of cultural heritage carried out in cities is still limited, despite the fact that the European Union – for several years – has financed projects in support of cultural heritage in the context of a series of programs (Horizon 2020, Erasmus+ and others) and is collaborating with the Council of Europe, Europa Nostra (4), UNESCO and other partners (fig. 1). Additionally, the Access City Award (5) was established in 2010 which allows cities with more than 50,000 inhabitants to highlight their accessibility projects and publicize the initiatives that have been carried out in the tourism sector in order to accommodate visitors with special needs. Over the years, the prizes have been awarded to the cities of Avila (Spain, 2011), Salzburg (Austria, 2012), Berlin (Germany, 2013), Gothenburg (Sweden, 2014), Borås (Sweden, 2015), Milan (Italy, 2016), Chester (United Kingdom, 2017), Lyon (France, 2018), Breda (Netherlands, 2019), Warsaw (Poland, 2020), Jönköping (Sweden, 2021). This is a due recognition of cities that have made it easier to access public areas, play areas for children, public transport for the disabled and the elderly, thanks also to new communication technologies.

2.1 European Projects

Among the first projects launched in 2010 by the European Union we should mention the *LHAC* (League of Historical and Accessible Cities) project, which aims to improve the accessibility of historic cities and, at the same time, promotes the development of sustainable tourism and the protection of cultural heritage. Its multiple objectives include: the implementation of innovative accessibility solutions aimed

at allowing people with disabilities and their families to fully enjoy recreational and cultural activities; the promotion of tourism and the social development of involved cities; the development of pilot projects that can serve as inspiration for local authorities and stakeholders; the exchange of best practices and know-how; awareness raising, idea exchanges and actions undertaken that afford greater accessibility. These objectives have an impact on the long-term cultural and social development of the European cities involved, also promoting tourism among people with disabilities. To date, six accessible tourist itineraries have been created in six European cities: Avila (Spain), Lucca (Italy), Mulhouse (France), Turin (Italy), Viborg (Denmark), Sozopol (Bulgaria). Tourist itineraries include buildings of historical interest, museums, restaurants and shops, parks and tourist information centers which are designed with the needs of people with both physical and sensory disabilities in mind, though residents and tourists can also certainly benefit from them. The presence of accessible information signs such as tactile signs, sign language, audio guides and other interactive tools along the routes allows everyone to explore the urban landscape independently.

As part of the European Disability Strategy, 2010-2020, the *Disabilty Card* project should also be mentioned. The project aimed at introducing a card that allows people with disabilities to access a series of free – or reduced cost – services in different areas like transport, culture and leisure throughout the national territory and in reciprocity with other EU countries. The aim is to help people with disabilities travel more easily between EU countries. Among the first eight countries to kick off the project were Belgium, Cyprus, Estonia, Finland, Italy, Malta, Slovenia, and Romania along with various Italian stakeholders such as - the Ministry for Cultural Heritage and Activities, the Ministry of Transport, the Presidency of the Council, the Department of Regional Affairs, Autonomy and Sport, ANCI, the Conference of the Regions, INPS, AGIS, ANEC and Assomusica. In Italy, the project was implemented and managed by FISH (the Italian Federation for Overcoming Disabilities), in collaboration with FAND (the Federation of National Associations of Persons with Disabilities) – following the EU guidelines for the construction of requested structures and the operational sharing of common protocols.

Another project is *Greenways 4ALL* (Accessible Tourism on European Greenways 4All), co-financed by the COSME program of the Executive Agency for Small and Medium-sized Enterprises (EASME) of the European Union, which aims to improve accessibility for people with disabilities to greenways, trails, and pedestrian paths. The project is coordinated by the Spanish Railways Foundation in collaboration with the European Greenways Association (EGWA), together with the Plataforma Representativa Estatal de Discapacitados Físicos, the Comunidade Intercomunale da Região Dão Lafões and the Fundación Vía Verde de la Sierra. It is also supported by Movilidad Ampliada - Accessible Madrid, AstroAndalus and Turismo Vivencial.

In 2016, within the EU Horizon 2020 research framework program, the *ARCHES* (Accessible Resources for Cultural Heritage EcoSystems) project pays particular attention to museums, so that they are more inclusive cultural environments for those with differences and difficulties associated with perception, memory, cognition and communication. ARCHES develops an online software platform and applications for portable devices, promotes multisensory activities (touch tours), exploiting innovative technologies such as augmented reality: Avatars, embossed printers and models, context-sensitive tactiles, audio guides, metadata and advanced image processing techniques. One of its most innovative aspects is the creation of inclusive work groups in which people, with and without disabilities, interact in an environment, deciding and testing together which are the most effective solutions to their needs in the museum area.

In 2017, to foster inclusiveness in education and the ability to creatively deal with different groups of students with and without disabilities, a project called *TANDEM* was launched. The goals of the project include developing inclusive programs of educational activities; training museum staff to improve their skills and develop innovative and inclusive educational programs; a better understanding of the issues related to inclusion and a deeper understanding of the specific needs of each group; the exchange of expertise on methods, tools and approaches between staff members; the inclusion of more people with disabilities in project activities, giving them the opportunity to experiment and improve their skills. Project partners are the Museo de Arte Contemporáneo de Castilla y León (MUSAC), the MU-ZEE-UM, an art educational organization, the South Trøndelag Museums (MiST), the Institute for Artistic, Cultural and Natural Heritage IBACN) of the Emilia Romagna Region, the Estonian Maritime Museum, the Calouste Gulbenkian Foundation and the Berlin Wall Foundation.

With the *AMBAVis* project (Access to museums for the blind and visually impaired through 3D technology, 2019), the use of 3D technologies and multisensory methods were introduced, to allow blind and visually impaired people to participate in the educational services and exhibitions of the museums. The project partners are the Vienna Economic Institute, the Manchester Museum, the Austrian Federation of the Blind and Visually Impaired (BSVÖ), the German Association for the Blind and Visually Impaired (DBSV eV), Trnka n.o., an non-profit organization based in Bratislava dedicated to the research and production of audio descriptions of audiovisual works, the Österreichische Galerie Belvedere and the Center for Virtual Reality and Visualization (VRVis).

There are other projects that deserve mention, but we conclude this brief excursus with the *Google Art Project* of 2019. The idea behind it was to “democratize” accessibility to culture and promote its conservation for future generations. It is a network composed of 345 museums and institutions worldwide whose main objective is to make art accessible to everyone through the implementation of a digital platform where over 63 thousand works of art can be virtually explored, customized and shared by individual users. One of the museums in the network is the “MAXXI” National Museum of XXI Century Arts in Rome. Project partners include the Archaeological Center of Scladina cave (Belgium), the Museum of the Royal Tombs of Aigai (Greece), Vulcan UAV Ltd, Pix4D, the French National Center for Scientific Research (CNRS, France), Liverpool John Moores University (UK), and the Center for Research and Technology-Hellas (CERTH, Greece).

2.2 Italian Projects

Italy is one of the European countries with the highest quantity and variety of cultural heritage sites and, for these reasons, has launched several projects aimed at guaranteeing both physical and sensory accessibility. One such project from 2010 was *A.D. Arte*: an information system linking the cultural heritage of thirteen different Italian regions: Abruzzo, Basilicata, Calabria, Campania, Emilia Romagna, Lazio, Lombardy, Marche, Piedmont, Puglia, Tuscany, Umbria, and Veneto. The project, created by a team of Italian experts with the collaboration of representative associations of the disabled as well as the participation of various European organizations, includes architectural modifications aimed at improving the accessibility of some of the most visited sites throughout the country. Among these, “*An elevator for Michelangelo*” in the Medici Chapels of Florence; the *Tarquinia accessibility path*, in the Etruscan necropolis of Tarquinia; the elimination of barriers in the archaeological area of the Palatine hill and Roman Forum; the *Hendrik Andersen* and *Olivia Cushing*: between utopia and reality project; “*The memory of beauty*” project which includes a series of guided tours specifically aimed at people with Alzheimer's and their companions; the *Historical Ostia Ageless City project*, which created an accessible and environmentally friendly route through the archaeological site of historical Ostia for people with disabilities.

The most interesting Italian project is certainly "*Culture without Barriers*", launched in 2012 on the occasion of the International Day of Persons with Disabilities, which promotes the enhancement of cultural heritage through the organization of events and activities specifically dedicated to people with sensory and physical disabilities like the activities organized in museums, where during the visit it is possible to download or consult audio-video guides, images and insights into the collections using Quick Response Codes (QR) and Near Field Communication (NFC) systems, as well as sensory and tactile tours.

Another project is *C.A.R.E.* (Accessible Cities of the European Regions). By sharing urban development strategies that involve the participation of citizens with different needs from the life of the city, the project seeks to create a network of accessible services and facilities between European cities by promoting a common standard of accessibility, involving both citizens and tourists. The project is promoted and implemented by the Region of Lombardy, A.I.A.S. Milan onlus, the Region of Emilia-Romagna, the Municipality of Bologna, the Municipality of Ferrara, the Municipality of Forlì, the Region of Umbria, the Province of Ancona, the Province of Pesaro-Urbino, the “*Yes You Can*” association, and Venice Cards – the City of Venice. Four pilot projects have been carried out. The first, in Lombardy, concerns accessibility for the disabled to the urban public transport system. The second, in Emilia-Romagna, deals with the creation of a list of 450 accommodation facilities that offer services with specific needs (for example, temporary or permanent mobility problems, allergies, food intolerances, etc.). The third, in Venice, is the “*Venice Card*,” designed to help elderly or disabled people, that offers access to public transport, both on land and over water, public toilets, museums and discounts on other recreational and cultural activities, as well as a map of barrier-free routes around the city. Finally, the fourth project “*I’m coming too”* proposes the creation of a public garden accessible to all in the Municipality of Rimini, with particular attention to the needs of blind and visually impaired people.

Another noteworthy initiative is the *Videoguide LIS* project, which is a platform accessible via various tablet devices, smartphones, and web apps, that allows any museum to include a video guide in sign language among its informational materials. To date, the museums that provide this platform in Italy are the Royal Palace of Caserta, the National Archaeological Museum of Reggio Calabria, the Mondragone Civic Museum, the Nieddu del Rio Palace and the ArcheoDeri Archaeological Park. The videoguide was developed and created by digi.Art Digital Services for Art and Cultural Heritage, in collaboration with the National Italian Agency for the Deaf.

In 2013, the Region of Piedmont launched a one-of-a-kind initiative called *Turismabile*, together with the Onlus Council for People in Difficulty. The goal is to encourage tourism in Piedmont through the creation of accessible routes not only for people with motor difficulties or perceptual disabilities, but also for anyone with special needs. It is an innovative project that – through ad hoc itineraries easily accessible to people with motor difficulties or sensory disabilities – works in two directions: the creation of a regional help desk for free advice as well as the creation of a promotional circuit throughout the Piedmont area.

For deaf visitors there is the possibility of guides/LIS translators or of being equipped with free tablets, specially designed to guide them on their visit. The Region is also very attentive to sport. In fact, a specific itinerary has been created to allow ski lovers to access all the facilities present.
One city that has done a lot in terms of accessibility is Venice. The city boasts one of the most important historical and artistic heritages of the world, with churches and other places of historical importance, palaces, and museums that can only be reached by bridges, calle (streets in Venetian toponymy) or gondolas. This certainly suggests a lack of accessibility. Yet, due to the fact that it does not have car traffic, it is a pedestrian city that can be lived without the stress of traffic. Thanks to the "*Gondolas without Barriers*" project, a gondola space (located in Piazzale Roma) is provided that is easy to access even for people with mobility difficulties, in particular for those using wheelchairs. In addition, new bridges have been built without steps as well as walkways for crossing the minor canals, which allow easy crossing from one island to another even for those with walking difficulties. On the tallest and most difficult bridges, removable ramps or adequate elevators have been installed for crossing. On the bridges that permit it, "facilitated steps" have been built, which are ramps with low steps that allow disabled people to go up and down without much difficulty. For those with sensory disabilities, raised signs have been created at the end of dangerous calle without parapets to signal the end of the calle and the beginning of the upcoming canal. For blind or visually impaired people, tactile maps and multimedia and sensory paths have also been created, which stimulate the sense of smell and sight, the creation of spaces and environments that can be used by anyone also through the creation of special software that allow blind, deaf or elderly people to enjoy the artistic heritage more easily.
This brief analysis collects some examples of how the issue of accessibility and usability of the built heritage has been addressed in the urban environment.
But what are the difficulties encountered while visiting archaeological areas, parks and historic gardens? Generally, these are types of heritage that extend over vast areas where it is necessary to walk distances of several hundred meters – often over uneven and uncomfortable paths for everyone – and to overcome differences in height due to differences in altitude between various areas or within any of the properties present.
Among the most important archaeological sites, sensitive to the issue of accessibility, are the Imperial Forums, where the project "*Without Barriers*" was carried out. This is the first loop, at the heart of the Palatine hill, 1.5 km long that allows you to cross the ancient public area of the capital and learn about the most important monuments of the Forum. It is an interesting intervention, especially in light of the ability to apply facilitation tools for users, integrating them with the architectural peculiarities of the environment.
Another site that deserves attention is the Pompeii Archaeological Park which, together with the Municipality of Pompeii and the collaboration of the Ministry for Cultural Heritage, Activities and Tourism, launched the *Pompeii for All project* in 2018. The project aims to address the issue of accessibility for people with motor, sensory and cognitive disabilities, as well as the issue of inclusion, in order to give everyone the opportunity and the right to be citizens in every respect, without distinction whatsoever. An accessible path was identified across the whole park together with an experimental system of "*WithMe*" electronic bracelets – for use by blind and visually impaired people – capable of sending signals aimed at guaranteeing the safety and security of the visitor. Deaf people can also take advantage of a dedicated accompaniment, to make the most of the Pompeii site and fully grasp the suggestions and atmosphere of the places. Specialized deaf operators and native LIS speakers, allow you to organize a visit tailored to the specific needs of the deaf, thus overcoming a further barrier to the accessibility of cultural heritage.



Fig. 1 – Accessibility Projects: Examples in European and Italy.

3. Case Study: The Valley of the Temples in Agrigento

Though Agrigento, its Valley of the Temples, its medieval historic center and all the naturalistic treasures of its hinterland have been struggling for decades with a serious socio-economic crisis, they represent an increasingly interesting destination for travelers, even under the new flag of experiential tourism (Cilona T. 2019). In this context, however, issues of accessibility and inclusiveness in the symbolic places of the city, its Valley, and the enchanting naturalistic sites remain substantially unresolved. Some interesting projects, that have already been carried out or are in an advanced design phase, foresee the Archaeological and Landscape Park of the Valley of the Temples as the leader of a new way of understanding accessibility for users with specific needs, which would allow the majority of them to visit sites that were hitherto inaccessible. It is interesting, both from a priority technical profile and from a broader cultural point of view, the effort made to create paths and systems that guarantee the use of the entire Valley.

3.1 Heritage Accessible to All

The Archaeological and Landscape Park of the Valley of the Temples in Agrigento, a UNESCO World heritage site since 1997, is characterized by a series of important Doric temples from the Hellenic period in an exceptional state of conservation. A very popular tourist destination, at 1300 hectares in size, it is one of the largest archaeological sites in the Mediterranean. In recent years, issues of "*expanded*" accessibility as well as the full use of cultural sites have become a primary need together with the enhancement, conservation and active protection of cultural heritage. The goal is to ensure the right of "*access to everything for everyone*" – abled and disabled – and to break down any barrier (physical, sensory, or cognitive) that limits access to places of culture, as required by national and international legislation. The Park, in collaboration with the Cooperative Culture Society, not only ensures a facilitated cultural experience for visitors with different abilities – with special needs or with sensory difficulties – but allows everyone to be able to enjoy the archaeological site through the adoption of functional solutions accessible to the greatest number of users. All this is made possible thanks to the specific training of the entire staff that takes care of visits as well as a facilitated reading guide, written in accessible languages, which contains various educational materials dedicated to the spaces of the site as well as their contents. Over the years, in fact, the Park Authority has equipped itself with qualified and competent personnel as well as structural, didactic and informative supports in order to eliminate the physical, sensory and communicative barriers and to guarantee a full understanding and enrichment of all users during their visit.To resolve the various critical issues and ensure that everyone can freely and independently access this unique place, a virtuous and participatory path has been identified that allows guests to visit 85% of the archaeological area (fig. 2), orographically characterized by steep and sloping grounds, including the Kolymbethra Garden, an enchanting site located within the archaeological area and managed by the FAI since 1999 (6). The new park accessibility project was launched with local associations that work with people with disabilities as well as organizations involved in accessibility and mobility, such as the Rinascita Social Cooperative Society, the Disadvantaged Elderly Assistance Project, the Saieva Associations, the National Deaf Organization, the Italian Association of Amyotrophic Lateral Sclerosis, New Wings, and the Agrigento Tourist Consortium. Since the project aims at breaking down barriers, stairs, and differences in height that can hinder a visit to the Valley, many specific interventions have been carried out in favor of the disabled. Among others are the identification of facilitated paths, the placement – along the entire route – of restrooms and panels in Braille, the possibility to use video guides in LIS (Italian Sign Language), the creation of access walkways for prams at the Temple of the Dioscuri and at the Temple of Juno, adequate parking at the Griffo Museum, Porta V and Temple of Juno, as well as the opportunity to visit the great exhibition "*Building for the Gods*" by MondoMostre (imposing construction machines of the ancient Greeks, rebuilt on a 1:1 scale, which are easily accessible and equipped with dedicated signs usable by all subjects). In addition, there is also the possibility to utilize latest generation electric wheelchairs (7) – specially purchased and made available to those with special needs – to allow everyone to move freely in the archaeological area and discover different routes without anyone's help.

3.2 Inclusive and Usable Paths

The Park offers specific routes for every type of disability.

These include a path for deaf or hard of hearing visitors: at the main entrance of the Temple of Juno or Porta V, monitors provide information on the places of greatest interest shown on two general site maps. Along the way, panels equipped with QR codes allow the activation of videos in sign language.

There is a path for blind or visually impaired visitors: at the entrance to the Temple of Juno, there is a large general map of the site in Braille with the indication of the location of other panels installed at points of interest.

There is a route for visitors with motor disabilities or reduced mobility: at the main entrances of the Temple of Juno and Porta V, two general site maps provide explanations about the facilitated routes and indications of the degree of difficulty, percentages and slopes of the site. These visitors and their

companions also have the opportunity to use the shuttle service within the area free of charge. There is also a route for visitors with specific dietary needs: the cafeteria-restaurant, located at the center of the Via Sacra a few steps from the Temple of Concordia, offers gluten-free products.
The educational path is aimed at visually impaired or blind people who are accompanied by a companion. This itinerary consists of using tactile maps, to learn about the temple architecture, and touch a three-dimensional scale reconstruction of the Temple of Concordia.
The *Environmental Path* and "*Green Ways*" is a very pleasant experience to do inside the Kolymbethra Garden. The visit allows guests, and their companions (parents, teachers, friends), to familiarize themselves with places and learn their history, characteristics and curiosities in an engaging way thanks to "easy to read" texts, enriched with photographs, illustrations and maps (8). Visitors with intellectual, sensory or motor disabilities can discover this corner of paradise – which contains the colors, flavors and aromas of the Sicilian landscape, with its scenery and its hypogea, excavated 2,500 years ago – and learn more about the history of the ancient swimming pool of Akragas subsequently transformed into a splendid Mediterranean garden (fig. 3).
The inclusive educational action, therefore, allows the public to learn about the value of nature as well the millennial history of the Kolymbethra Garden. For people with physical disabilities it is possible to arrive comfortably by car to the garden from contrada San Marco.

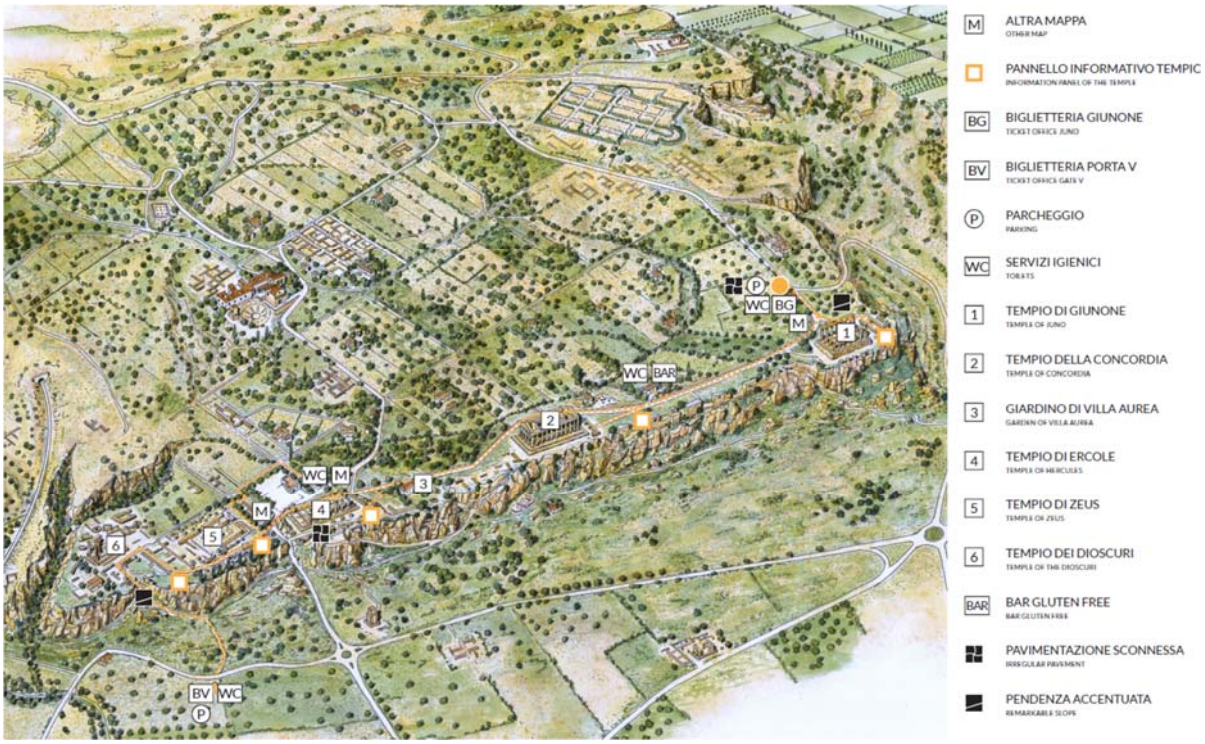

Fig. 2 - General Map Valley of the Temples: Inclusive and Usable Paths, by https://www.parcovalledeitempli.it.

3.3 A Model to Imitate in the City Center

The new accessibility model, which inspired the Park Authority and is offered to all its potential users, is certainly an excellent example to imitate and replicate in the urban environment as well.
Unfortunately, the city center, not far from the Valley of the Temples, does not have paths and systems that guarantee the use of its cultural heritage, its shores or its hinterland.
All of these sites are concerned with the urban disaster of the last sixty years with which we are confronted every day.
The gap between Italian legislation on the subject and its practical effects at these latitudes is still enormous, and in some ways unbridgeable. A trend reversal that is primarily cultural is capable of transforming some longstanding weaknesses into new and interesting strengths in order to guarantee both the accessibility and usability of tourist sites as well as the improvement of urban mobility for all. For these reasons, it is extremely important to keep the discussion alive about accessibility and inclusion and on the perception of disability.
A city becomes truly accessible when the culture of the city itself is made accessible. Museums, noble palaces, churches, cinemas and theaters – which in this case are the emblems of culture – must necessarily be equipped and adapted with systems that guarantee accessibility; unfortunately in Agrigento this is not always guaranteed.

The integration of accessible facilities with a quality infrastructure network certainly increases the attractiveness of the city itself. The fact of creating something accessible for those with a particular disability makes the structure or service even more comfortable and usable by the whole population. In Agrigento some efforts have been made, but much more still needs to be done. We hope that the city will follow the model of the Archaeological Park and will undertake new accessibility paths thanks to a more enlightened, sensitive and attentive *governance* to the issue of accessibility.



Fig. 3 – The Kolymbethra Garden: a moment of the visit with a group of disabled people.
Photo by M. Ala, Responsible for the educational services Kolymbethra Garden.



Fig. 4 – Example of the Project: *Building for the Gods.*

CONCLUSION

This study presents an overview of some projects and initiatives implemented in Europe and Italy on the accessibility of cultural heritage in all its forms: sensory, physical and cognitive. A keen interest has emerged in finding solutions that allow all citizens to freely access cultural heritage, thanks to positive examples of good practices at multiple levels. At the same time, this study highlights a bitter truth, that the removal of physical barriers in a structure is not enough to permit accessibility to the property itself. Physical accessibility is undoubtedly a fundamental prerogative but it is not the only condition that permits the structure to be truly usable by everyone. Think of people with sensory disabilities, for example, who require special systems in order to effectively make use of cultural sites. Fortunately, at the design level, the trend of trivially reducing the concept of accessibility to physical access alone is slowly making room for a more complete and inclusive practice that takes into account the needs of all individuals. The sooner we change our mental approach towards these sectors of the population the sooner they will be able to freely enjoy their cultural heritage without obstacles for anyone.

Notes

(1) The expression cultural heritage was introduced into Italian legal language around the sixties by the "Franceschini Commission" and shortly after by the "Papalado Commission". Since then, legal regulations have increasingly clarified this concept. Its evolution can be reconstructed precisely through the analysis of the numerous laws and legislative decrees governing the matter, testifying the difficulty of integrating legislation with the rapid evolution of sensitivity towards conservation, protection, enhancement as well as the use of the historical-artistic heritage. According to the Legislative Decree n. 112 of March 31, 1998, are understood as cultural assets, "*those that make up the historical, artistic, monumental, demo-ethno-anthropological, archaeological, archival and book heritage and the others that constitute evidence having the value of civilization thus identified on the basis of law*".

(2) M.G. Gargiulo, 2009.

(3) In the Ministerial Decree no. 236 of 1989, art. 2, we read: "*by architectural barriers we mean: physical obstacles that are a source of discomfort for the mobility of anyone and in particular of those who, for whatever reason, have a reduced or permanently or temporarily impaired motor capacity; obstacles that limit or prevent anyone from the comfortable and safe use of parts, equipment or components; the lack of precautions and reports that allow the orientation and recognition of places and sources of danger for anyone and in particular for the blind, the visually impaired and the deaf*". The term and the very concept of architectural barriers not only include physical obstacles (steps, stairs, doors, narrow passages, etc.), but they have considerably expanded to include elements of various kinds, which can also cause limitations. perceptive in nature or can, due to their particular conformation, cause disorientation, fatigue, discomfort or danger. Pathways with slippery, irregular or bumpy pavement, stairs without handrails, steeply sloping ramps, waiting areas without seating, lack of indications to facilitate orientation or the identification of sources are therefore architectural barriers. danger, too high a bar counter, etc. Compliance with the legislation for the removal of architectural barriers responds to the expectations of people with disabilities and at the same time offers the possibility of using cultural sites to a wider public, not identified as a disabled person, who will equally take advantage of these provisions. In fact, it is important to underline the principle recalled several times by the legislation, that is, that architectural barriers are an obstacle for anyone. In fact, we must not forget that there are people who can be defined as people with invisible handicaps, who constitute the most important and numerous group. There are many invisible handicaps, of all kinds and of different degrees, and can be of a transitory nature. In most cases they escape an unskilled observer and are therefore often ignored by everyone. They mostly concern elderly people, pregnant women, convalescents or people affected by disabling diseases (obesity, heart disease, diabetes, nephrology, back pain, etc.), which involve a decrease in the use of one or more bodily functions such as locomotion, sight, hearing, speech and also general behavior, so the equipment adopted to make places of culture accessible to disabled people become extremely useful for them too and guarantee their usability at all levels. The interventions to overcome architectural barriers must also include furnishings and any other component or equipment essential for the usability of the environments.

(4) Organization founded in 1993 with the aim of protecting and celebrating cultural and natural heritage, it is now recognized as the most representative heritage organization in Europe. The main objective of Europa Nostra is to put heritage and its benefits at the center in the public consciousness and to make heritage a higher priority for public policies both at European and national level. Its specific objectives are to promote, at European level, high quality standards in the fields of conservation of cultural heritage, architecture, urban and rural planning, and to promote a balanced and sustainable development of the urban, rural, built and natural environment. Europa Nostra tries to focus on the importance of shared cultural heritage as a backbone of European identity, which contributes to the strengthening of citizenship itself.

(5) The award was launched in May 2010 on the occasion of the approval of the European Disability Strategy (2010-2020).

(6) A place of peace and serenity (atarassico), that recapitulates the agrarian and natural landscape of the Valley of the Temples, where immersed and inebriated by the perfumes of nature, it is possible to admire, together with the archaeological artifacts, the Mediterranean scrub, the extraordinary biodiversity of citrus and other fruit-bearing trees. A landscape of great potential for the socio-cultural, tourism and economic development of the city, which together with illustrious landscape of the Valley of the Temples, linked to the cultivation of the almond and the olive, represents a unique and exceptionally rare landscape of irrigated arboriculture. Accessibility to

the site is guaranteed by an easy-to-use network of dirt paths, that can be traveled on foot or by bicycle - rebuilt thanks to the historical memory of older farmers and the discovery of the original traces in the ground (M. Ala, T. Cilona, 2018).

(7) Electric wheelchairs strongly desired by the director of the Park archeological, Sciarratta Roberto architect.

(8) Specialist visits are supervised by the Garden's educational services manager, Dr. Maria Ala.

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WORLD HERITAGE and DESIGN for HEALTH
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Green Projects: architectural design tools for nature. Planning and recovery opportunities for our cities

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Abstract
The world's urban population is growing. It is projected that by 2050, the world will be more than two thirds urban. Population growth in cities entails the need to develop new ways of design or regeneration of urban areas that consider issues such as the impacts of climate change and emissions.
Buildings, cells of our cities, and the construction sector are a major source of global rising energy use and emissions. This underlines the importance of a strategy to reduce energy demand and decarbonizing the built environment through recovery the building heritage and the design new architectures and urban planning with attention to nature aspects. A "global transformation" to a highly energy efficient and low carbon building and construction sector is essential to realize ambition of Paris Agreement.
It is important that the actions for recovery and design of architecture and public spaces must concern relationship between city and nature. Among the various design solutions there are actions, such as the "Urban Forestry" and the "Vertical Forest", which are attentive to the role of nature and the ways to incorporate it into the architectural project, demonstrating concrete and positive effects on the city and climate and environmental issues related to it. These are design challenges, highly current and oriented in the professional future, also requires attention in didactic for the formation of the architecture student and designer figure.

Keywords: Green projects, sustainable projects, Vertical Forest, Urban Forestry, urban regeneration

1. Introduction
The UN dossier "World Urbanization Prospects 2018" [1], shows that, by 2050, two thirds of the world population will live in cities, with a decline of the world's rural population. This trend is mainly driven by three countries: India, China and Nigeria. Progressive urbanization could be a positive factor. In fact, the concentration of inhabitants in the cities would make it possible to provide essential services in a more economical way and could help minimize the environmental impact on the planet. This can be an opportunity only if the countries are able to manage the flow of population displacement with virtuous policies and practices of cities governments. But at the same time, population growth in cities will be a need to develop new settlement projects on the boundary of the urbanized environment, with a recovery of urban built heritage and suburbs areas. In this context, the issue of impacts on climate change is fundamental, as underlined by 2030 Agenda for Sustainable Development. This Agenda, a plan of action signed in September 2015 by the governments of the 193 UN member countries, through economic, social and environmental principles, shows reflection and development methods to promote prosperity while protecting the planet, with attention to the cities and communities (Goal 11) and at the thirteenth Goal "Climate action".
It is evident how these two themes, cities and climate, are connected. It is the "Global Alliance for Buidings and Construction" that shows this correlation. The building and construction sector is, in fact, one of the sectors that need to be "decarbonized" to achieve the Paris Agreement commitment and the United Nations (UN) Sustainable Developments Goals.

Many architects and architectural firms, following this “commitment”, have embarked on the path of “green integration” into their new architecture design and in their actions and projects for the “re-design” and recovery of the urban built heritage.

2. Context

Buildings, “cells” of our cities, are among the major sources of GHG emissions in most countries in the world, thus playing a fundamental role in addressing challenges such as climate change and pollution. It is estimated that for many developing countries, such as the United Arab Emirates, the building stock is set to double by 2050. So, it is clear the need to improve the existing building stock, which is crucial for a sustainable transition.

The “2020 Global Status Report for Buildings and Construction” by Global Alliance for Buidings and Construction (GlobalABC) shows that global energy consumption of the global buildings sector remained constant compared to the previous years, while the global emissions (combined direct and indirect energy) from the building increased to 9.95 GtCO2 (gigatone of carbon dioxide) in 2019, or around 28% of total global CO2 emissions (IEA 2020). The building operation and construction industry energy-related emissions account for 38% of global CO2 emissions [2].

The buildings sector emission increase is due to a continued use of coal, oil and natural gas for heating, combined with higher activity levels in regions where electricity remains carbon-intensive, resulting in a steady level of direct emissions but growing indirect emissions (i.e. electricity). Electricity consumption in building operations represents nearly 55% of global electricity consumption.

The increase in emissions in the building and construction sector underlines the pressing need for a strategy to reduces energy demand and emissions: this thanks to the reduction of energy demand in the built environment, to decarbonization the power sector and to implementation new strategies on materials that reduce the lifecycle carbon emissions.

The International Energy Agency (AIE) estimates that, to achieving a net-zero carbon building stock by 2050, the direct building CO2 emissions would need to decrease of 60% by 2030. This would happen if the sector emissions reduce about 6% per year, from 2020 to 2030.

The decarbonization of the building stock and building sector by 2050 is only possible if there is the contribution by nations, trough the urgent adoption of legislative regulations, investment policies and thanks the use of intelligent technologies. An example is in European Union with his initiative announced in October 2020: “Renovation Wave”. This “plan”, for public and private buildings, has set an aim to increase the renovation rates across the EU for the next ten years. This will improve the energy performance of building heritage, improving life quality for inhabitants, reducing greenhouse gas emission and promoting digitalization and the reuse, recycling of building materials. The goal is to have 35 million buildings renovated and up to 160.000 “green jobs” created in the construction sector by 2030.

A “Global transformation” towards an energy efficient, low carbon emission of building and construction sector is essential to achieve Paris Agreement goals, that is to limit the increase in temperature to less than 2°C by 2030. To date, due to the decline in emissions due to the pandemic situation, it is easy understand how is really possible a reversal of trend, through a “green pandemic recovery” by implementing “green policies and plan” [3].

3. Opportunity for the city and nature

The growth of cities and the increase in population underline the fundamental need to change tack and fight pollution, reducing the environmental impact of urban areas.

According to report of the Green Building Council Italia (March 2020), the change can take place in actions such as: decarbonization, passing from “the zero-energy buildings” to “building with zero CO2 emissions”; adopting circular economy, through the reuse of building materials and activating platforms useful for this purpose; water efficiency, by encouraging technologies for reducing water and energy consumption; the protection of the soil and biodiversity, re-naturalizing abandoned areas. This can be possible by introducing and updating regulatory and legislative environment, financing virtuous actions and research and development projects. The imbalance between natural resources and urban environment creates the need to enhance and transform parts of cities into green areas, able to absorb CO2 and purifying the air of various pollutants such as PM10-PM2.5.

The green areas, located within the cities, help to mitigate the Urban Heat Island Effect (UHI), which thanks to evapotranspiration, are able to increase the humidity of the air by decreasing the temperature. Last but not least, there are all the psychophysical benefits that are perceptible in terms of quality of life. It is understandable how the actions for the redesign of the city must not only follow the process of building renovation but also greenery and nature aspects. A necessary combination that must enter into the conception and living in our “smart cities”.

Among the various architectural design solutions there are two modes of actions that pay close attention to the role of nature, incorporating it. These, in recent years, have proved contemporary not only in the architectural design, but also in the concrete and positive ideas and effect on the city, climatic and

environmental issues. They are the design of “Urban Forestry” and “Vertical Forest”. Urban Forestry is the planning and management of trees, forests, and related vegetation in urban areas and communities. Many countries, as in the case of UE, are developing policies for the design and enhancement of green areas. Plans are drawn up for more development of urban forestry, considering it an excellent tool for combating climate change and pollution. The forestry adapts to the territory in which it is immersed, taking the forms of urban gardens, parks and public gardens but also as roofs, green facades and the “Vertical Forest”. These planning methods are significant for new architectural projects and in the recovery operations of the building heritage through retrofitting operations.
The architecture is added to the green areas, thus improving the ecological balance of the city, leading to benefits to building itself. The concept of vertical green, a green roof or a green façade, allows the building to be in harmony with the nature and to contribute to biodiversity [4].
The building envelope and not built interstitial spaces between buildings become opportunities for expansion of nature into the built.
From Bangkok, where ten urban parks with native species were created between 2014 and 2018, to Phoenix (Arizona, USA) where three million trees were planted to “fight” the rapid expansion of the city, numerous virtuous examples can be identified. As in Lima where the reforestation of areas adjacent to the city has reduced the risk of natural disasters by stabilizing the land. Another case is in Beijing, China, where the 2004 “Forest City Program” made it possible to restore greenery to the city, by planting 54 million trees, creating 23 wooded areas such as the “Dongjiao Forest Park” (ten times larger than Central Park).
The keystone of these project is not only the role assumed by “plants” and greenery, but nature that became a design concept where, thanks to the encounter between nature and architecture, a “hybrid reality” is created.
From SITE and James Whines with his theoretical projects of the “Highrise of Homes” to the Vertical Forest of Milan, the vertical green buildings play an important role in defining a new landmark in the city, without neglecting the housing issue and its needs.

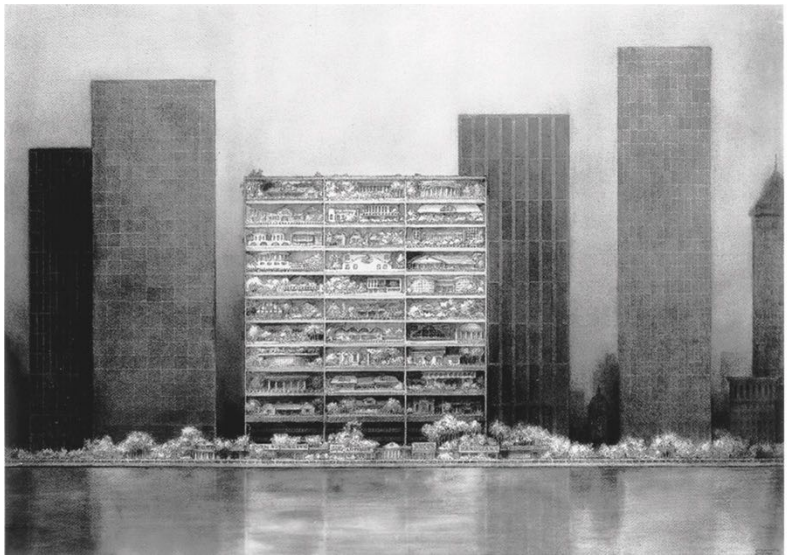



Fig. 1: On the left: Highrise of Homes - for location in a major American city – SITE, James Wines - ink, wash and charcoal – 1981 ((© SITE New York, www.siteenvirodesign.com)
Fig. 2: On the right: Highrise of Homes – Theoretical project by SITE for urban locations in the USA – 1981 – Color rendering by J. Wines showing a multi-story matrix that can accommodate a vertical community of private houses, clustered into distinct village-like communities on each floor (© SITE New York, www.siteenvirodesign.com)

3.1 Vertical Forests

Vertical Forests are “tower for tree inhabited by humans”. These buildings, often of tower type, became “anti-sprawl devices” that replace the “traditional materials” of the external urban surfaces, with the changing polychromy of the leaves of the vegetation placed on the overhangs. The architecture and its designers have the task to bring the theme of environmental sustainability to the urban scale. Many architects, such as Stefano Boeri and his SBA in Milan, design skyscrapers that represent a prototype of an architecture of biodiversity.



Fig. 3: Drawing scheme of the benefits of the union between architecture and nature.

The compromise between architecture and nature underlines the possibility of an urban recovery following the respect of nature. In this way nature is introduced into the city and making it coexist and cooperate with construction.
There are numerous examples of vertical forest.
The “Vertical Forest” (2014) by architect Stefano Boeri represents the “pilot episode” in Milan, that marks the starting point for the countless project under design or under construction, such as that of Lausanne, Utrecht and Eindhoven.
The Italian Vertical Forest is the prototype building of a new architecture of biodiversity, which connects the relationship between man, nature and other living species. A house for trees and birds, inhabited also by humans [5].
The complex, consisting of two residential towers of 112 and 80 m height hosting 800 trees, 15,000 plants and 5,000 shrubs. The equivalent of 30.000 square metres of forest and undergrowth, over an urban surface of 3,000 square metres. The building becomes an architectural “device” that promotes the coexistence of architecture and nature in urban areas, up to the creation of urban ecosystems.



Fig. 4: Vertical Forests, Stefano Boeri Architetti: Bosco Verticale in Milan, Italy (left), Wonderwoods in Utrecht, Netherlands (in the middle), Trudo Vertical Forest in Eindhoven, Netherlands (right). (© Stefano Boeri Architetti, www.stefanoboeriarchitetti.net)

Boeri’s work and its vertical forests represent a “manifesto” against the pollution of the urban environment: the plant species were positioned on the buildings to form a green filter, capable to suck in 30 tons of CO2, produce 19 tons of oxygen and absorb 80kg of fine, polluting particles every year.
The project of this green architecture is the result of the interdisciplinary work of architects (Stefano Boeri, Gianandrea Barreca, Giovanni La Varra) and botanists (Studio Emanuele Borio and Laura Gatti). Proof that Architecture and design are union of different knowledge and skills.

The vegetation acts as a green filter, from inside to outside, reduces energy consumption and pollution of the urban environment. In fact, this determining a reduction of nearly 3 degrees between outside and inside temperature and, in summer, the decrease in the heating of the facades by up to 30 degrees.
After this first practical example in Milan with a sustainable and lively high-density architecture, thanks also to its aesthetic change over the seasons for the various plant placed on the facades, it is possible to transport this experiment of forestation of social architecture. The Project of Trudo Vertical Forest in Eindhoven, under construction, is intended for social housing. The skyscraper is 75 metres with 19 floors of apartments with cost less rents. The high percentage of greenery, for each housing unit of 50 square metres, there is a terrace of 4 square metres with a tree and 20 bushes. A real ecosystem with over 70 different plant species, capable to absorbing more than 50 tons of CO2 a year, fighting pollution and climate change. The features “tree-tower” make it a reproducible and modifiable model according to the needs of the designers and the place, becoming a symbol of ecological necessity.
The various tower building projects are able to transform the physiognomy and landmark of our cities that have a high density of inhabitants and buildings.
This is the case of the “One Central Park” project by Ateliers Jean Nouvel, in the recovery of the Carlton & United Brewery area in Sydney. Two residential towers that transform Sydney’s skyline. The project starts from a new public park that extends on the façade of buildings. Each apartment is quipped not only with a balcony, but also with its own piece of park. In this way, the city has a new green element on an urban scale. The envelope formed by green walls and climbing vegetation follow the principles of sustainable architecture with attention to the reduction of energy for cooling and the reduction of atmospheric pollution [6].

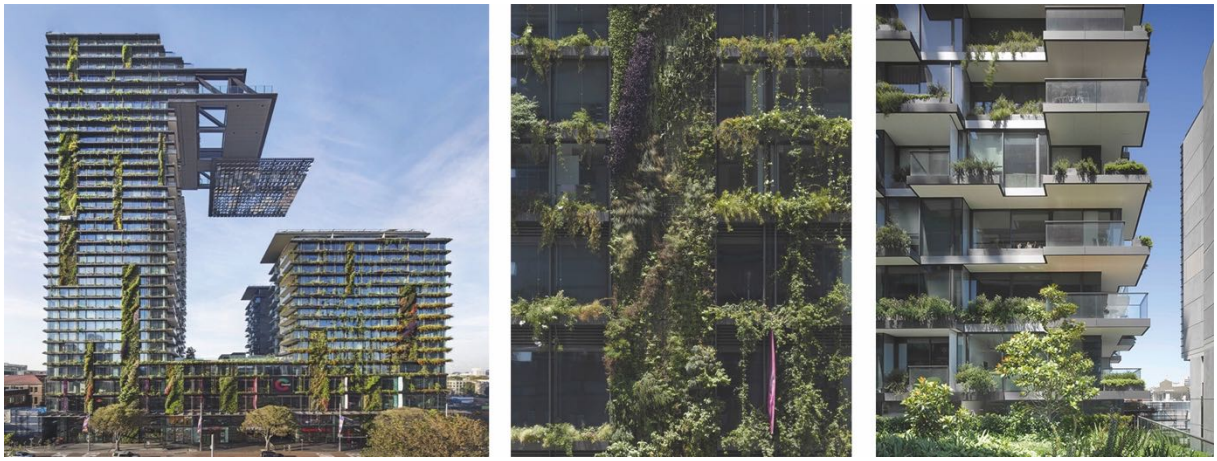

Fig. 5: One Central Park, Ateliers Jean Nouvel, Sydney, Australia (© Ateliers Jean Nouvel, www.jeannouvel.com)

3.2 Urban Forestry

Regeneration of the city with the use of nature means acting effectively in reducing the impact of climate change and making the urban environment more resilient. Urban forestry is not only a central issue of environmental policies but is an opportunity for the regeneration of the city and its suburbs.
A real strategy for the government of the territory. In Italy there are a series of events such as the “Forestami” program of the Municipality of Metropolitan city of Milano and the experiences of Turin and Mantua. The most important example is the project for the urban forestation of Prato, where the green is declined both on the landscape issue and as a fundamental theme for the health of citizens. It is again Boeri who contributed to the formulation of the Operation Plan which plans to plant 190,000 trees (approximately one for each inhabitant) in the city by 2030, through actions capable of attracting funding and incentive for the regeneration of the city. An effective environmental compensation tool that finds its implementation in the regulatory body of the Operational Plan. In fact, the strength of this Plan is given by incentive for green regeneration of abandoned areas by offering volumetric bonuses, with the request that a part of the surface be used for greenery.
Boeri’s “Prato Urban Jungle” project shows the concept of a green space in the city, where nature is an active tool for the health of citizens.
Through this project the city obtains a renewed urban quality, which becomes sustainable and contributes, through the Urban Forestry, to a redevelopment of the urban fabric, in particular in the neighborhoods on a social and community level. Particularly important is, in fact, the design of Prato Social Housing both in terms of regeneration through nature and for the creation of social spaces that are determined.



Fig. 6: Prato Urban Jungle, Stefano Boeri Architetti, Prato, Italy. (© Stefano Boeri Architetti, www.stefanoboeriarchitetti.net)

The areas and the urban fabric, redesigned with high density vegetation, are returned to community as natural and “demineralized” soil. There is transformation of paving into permeable surface, and public spaces in are capable of absorbing numerous tons of CO2 and increasing the well-being of the inhabitants of the city.

4. Design tools for the didactic

The topicality of the theme of urban regeneration through the use of nature within the city is increasingly oriented towards the near professional future. For this reason, even in the academic field, attention to urban recovery and new construction issues that look at the combination of architecture and nature is increased and studied in the experiments of university laboratories.

An example is the project for the recovery and “redesign of the limit” of the old city of Potenza (1). The space around the Guevara tower becomes an opportunity to insert a public green space in the dense historical fabric of the city. The study provides the first step the elimination of a school building that is now abandoned and without any architectural value and which denies the view and the transition from the main street of the old town to the tower. An urban park is designed around it, consisting of urban gardens with many tree species and vegetation. This allows for the growth of the ecosystem and biodiversity. A new balance is established in the relationship between built space (on which a retrofitting intervention is applied) and nature. Important are the increase in permeable surfaces in this part of the city and the creation of new social spaces. An Urban Forestry operation that would give the city a new environmental and urban quality.

Another theme dealt with in a thesis workshop is that of the recovery of a public housing building from the 1960s, located on the outskirts of the city of Potenza, and of the urban space adjacent to it (2). The aim of the project is to establish a new balance between built space and nature, and to regenerate a residential area of the city.

The architectural retrofitting operation consists in adding a volume to the facade that allows the construction of loggias and terraces, also improving the interior spaces of the apartments, and offers a direct relationship with nature placed on the buildings and in the urban park.



Fig. 7: Project ideas and graphic elaboration of the architectural retrofitting and urban forestry (1)



Fig. 8: Project ideas and graphic elaboration of the architectural retrofitting and urban forestry (2)

These types of operations, especially on social housing buildings, are capable of triggering revitalization processes that affect the entire neighborhood and the city [7]. The increase in green permeable surfaces and the creation of vertical and horizontal green surfaces, with the improvement of the buildings' energy, thanks to the new envelope and the shielding of the vegetation, restore a renewed environmental and urban quality. The design choices were guided by the desire to reconnect a portion of the city to the urban fabric, where the new urban park connects with the unused green areas around it. In this way, the project intervenes both on a social and environmental level, with the ability to reduce, break down and absorb pollutants, such as fine dust and CO2, giving this place a role in attracting community.

5. Conclusions

Large portions of our cities, especially those that refer to social housing, consist of architecture that no longer conforms to current architectural standards. A minor building that needs a reinterpretation and a redesign capable of interpreting the new needs of contemporaneity. The need for urban regeneration and architectural recovery policies is clear, without neglecting the issues that refer to the "environmental question".

The analysis of the case studies underlines the successes of architecture in representing a valid tool for addressing issues of eco-sustainability, climate change and pollution. The experiences described and the didactic exercises show that the introduction of nature into the urban fabric and architecture produces both effects in reducing the impact of climate change and on the social level, improving the reliance of places and communities. Environmental issues are closely related to the theme of contemporary living.

Green architecture, in the acts of the Vertical Forest and Urban Forestry, related to architectural retrofitting, can be considered a suitable tool for a concrete opportunity for the redesign of the existing architecture and to plan new settlement methods that aim to create places that are attentive to environment and social aspects [8].

Notes

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From a disused industrial area to an innovative sustainable campus in Milan

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Abstract
In a scenario that reveals an ever-increasing competitiveness between territory, cities, geographic areas and territorial systems, the real estate operators are engaged in important relaunch and requalification activities. They are aware that in the competition between urban areas there are awards more dynamic "systems" able to combine the safeguarding of one's own territory with the hypotheses of redevelopment.
The redevelopment foresees at the base of the design a regeneration process of the existing buildings in response to the new market needs and in line with the sustainability and circular economy vision.
The paper, through a multiscalar approach, from a macro-territorial and metropolitan level up to the level of the neighborhood, will represent a scenario of the economic dynamics and the territorial structure in which the cities in the last twenty years and will illustrate the case study of an important recovery project of disused industrial area.
The regeneration process to create a multipurpose center designed for the service industry and for leading consumer and B2B companies will be described.
The integrated campus, a former industrial complex of more than 29,000 sqm fully regenerated, is 100% Carbon Free and 3 buildings has the LEED Gold certification.

Keywords: Keywords Environment, redevelopment, valorization, urban regeneration, resilience

1. Introduction
The cities play a primary role in developing urban interventions with the goal of improving social cohesion, and economic and environmental sustainability, toward the creation of more resilient urban environments.
There represent the innovation drivers and the preferred centers for the production of knowledge and all the necessary resources in order to face the international competition and overcome possible structural crises on a territorial basis.
This processes, however, requires to overcome criticalities and bonds that metropolitan cities face on different scales and dimensions – mainly economic, environmental and social – including aspects relating to the variation of the settlement/functional trends and the complexities of urban transformation/regeneration and building restoration activities. [1]
The transformation phenomena of the cities and the economic crisis [2] produced dismissed areas and Buildings and it becomes necessary to identify new development models: the reclaiming of unused spaces through a new architecture become the possible strategies to find answers to the new social needs of the cities.
An architectural project translates as responsibility towards the society and the real world, knowing how to understand and reveal the social and cultural essence and physics of a place, building with materials suitable for every circumstance today even more so in an era in which he called himself to make the building less energy-intensive. [3]
According to the Triple Bottom Line (TBL) theory, to guarantee sustainable development of the built environment it is necessary to consider three elements: economy, environment, and society.

Renewal or new construction operations must therefore include interventions that aim to achieve maximum environmental sustainability while ensuring the highest economic value and greater well-being of individuals. [4]
Environmental certification protocols have been developed to overcome information asymmetries to provide reliable and internationally valid label concerning buildings sustainability. Simple and affordable information is then provided to investors and tenants with all its sustainability characteristics. [5] [6]
There are various environmental certifications of buildings around the world, some of the most widespread type are: "Leadership in Energy and Environmental Design (LEED)", was developed by the american non-profit U.S. Green Building Council (USGBC) [7] and "Building Research Establishment Environmental Assessment Method (BREEAM)" first published by the Building Research Establishment (BRE) [8]. that have become the main used certification protocol worldwide.
In Italy, in addition to LEED and BREEAM certifications, other protocols are employed for residential buildings. CasaClima [9] is widely used for residential developments while for social housing projects and the ITACA Protocol (Protocollo per la Trasparenza l'Aggiornamento e la Certificazione degli Appalti) [10] is the most common standard.

Based on the premises, this paper will analyzes the Milanese experience as an example of urban resilience, to demonstrate "the capacity to recover quickly from difficulties", hence to tow territories toward resilience [11], by exploring the real estate strategies that supported the recovery from the crisis.

2. The Milanese experience

In 2008, the economic crisis involved all of Europe. In Italy, the stagnation of the market continued for several years, impacting severely the real estate sector. A considerable volume of real estate vacancy and unsold was accumulated, especially in the office sector [12] [13]. In this context, the metropolitan city of Milan has emerged among the first European cities that rapidly recovered and successfully overcame the economic crisis without losing their leadership role [14].
In this scope, we studied the investments of the major real estate players who have directed their attention to Milan and focused on the real estate dynamics that characterized the city of Milan in the past decade by analyzing a large database, provided to Politecnico by "Il Quotidiano Immobiliare-QI" [15], the first Italian online magazine and search engine about real estate issues. This database collects all the real estate investments in Italy from 2012 to 2017.
Our scrutiny shows that most of the recent urban renewal programs involve the commercial sector, and and devote great attention to environmental sustainability.
We can see that Milan (with over 11 billion euros in the period 2012-2017) is the metropolitan city preferred by investors. The metropolitan city of Rome attracts only one third of the volume produced by Milan. Milan sees more than 150 transactions above 5 million each. Rome reaches barely one third of the Milan's number and value of transactions. All other Italian metropolitan cities run far behind these records. Other provinces with relatively high performance are: Sassari (thanks to the 600 million Euros spent by a Holding of Quatar in the hotel sector), Bologna (with around 500 million invested in the commercial/retail and logistics sectors), and Turin with almost 500 million Euros distributed mainly in the tertiary and commercial/retail sectors.
Milan is confirmed as the most active city in the Italian real estate market, based on both the number of real estate transactions and their value between 2012 and 2017.
According to the Green Building Council, Milan also enjoys a well-deserved reputation as Italy's green capital with more than 320 buildings certified or under certification by Green Building Rating Systems including LEED and BREEAM, certification, while in the Eternal City there are 90 sustainable building projects [16].
The Green city map show the evolution of the city and its urban layout allowing them a new perspective on the innovation of new buildings and the renovation of historic landmarks.

Research literature [17] [18] [19] highlights that major national and international corporations have chosen to locate or relocate their headquarters in urban areas that have been involved in massive renewal programs over the past years. New areas are emerging as alternative "centers" of the city, besides the traditional "Duomo". Above all, Porta Nuova and City Life District are emerging as the most vital urban and business hubs of the city.
Some additional clusters appear as outliers as they are placed in the outskirts of Milan, namely in the West side of the City and on the South-end. Rho-Pero, is going to be enhanced soon thanks to the redevelopment of the Expo site. This area host the new campus of the Milan State University and the science and technology park. Thus, this is candidate to become a cluster by itself in the years to come. Lastly, the cluster located in the southern part of Milan, comes together around Rogoredo-San Donato. In addition, the areas of the former railway yards that have long been abandoned (Farini, San Cristoforo, Porta Romana, Greco-Breda, Lambrate, Rogoredo and Porta Genova) will be transformed and

enhanced, giving life to new projects covering an area of about one million square meters with the 65% destined to green areas.

3. The Forgiatura Case Study

In this part will illustrate the case study of an important recovery project of “The Forgiatura” disused industrial area.
Located, in the North-Western part of Milan (Via Varesina), between Zona Certosa and Scalo Farini, The old Forgiatura factory, in the last hundred years or so it was a workshop that forged (by means of water power) steel components belonging to either submarines or electricity power stations. Then came the crisis in the iron and steel industry and it was abandoned.
The dismessed industrial building in the area of 19.000 sqm of land were fully regenerated and trasformed in a unique integrated campus, of more than 29,000 sqm of Gross Leasable Area GLA composed by 15,000 sqm of industrial requalification and 14,000 sqm of new buildings for a total of 7 buildings for office and showroom space.
The objective was to create a multipurpose center for the service industry and for leading consumer and B2B companies that arises from the culture and history of the original place marrying technology and natural environment, with a strong integration between architecture and landscape.

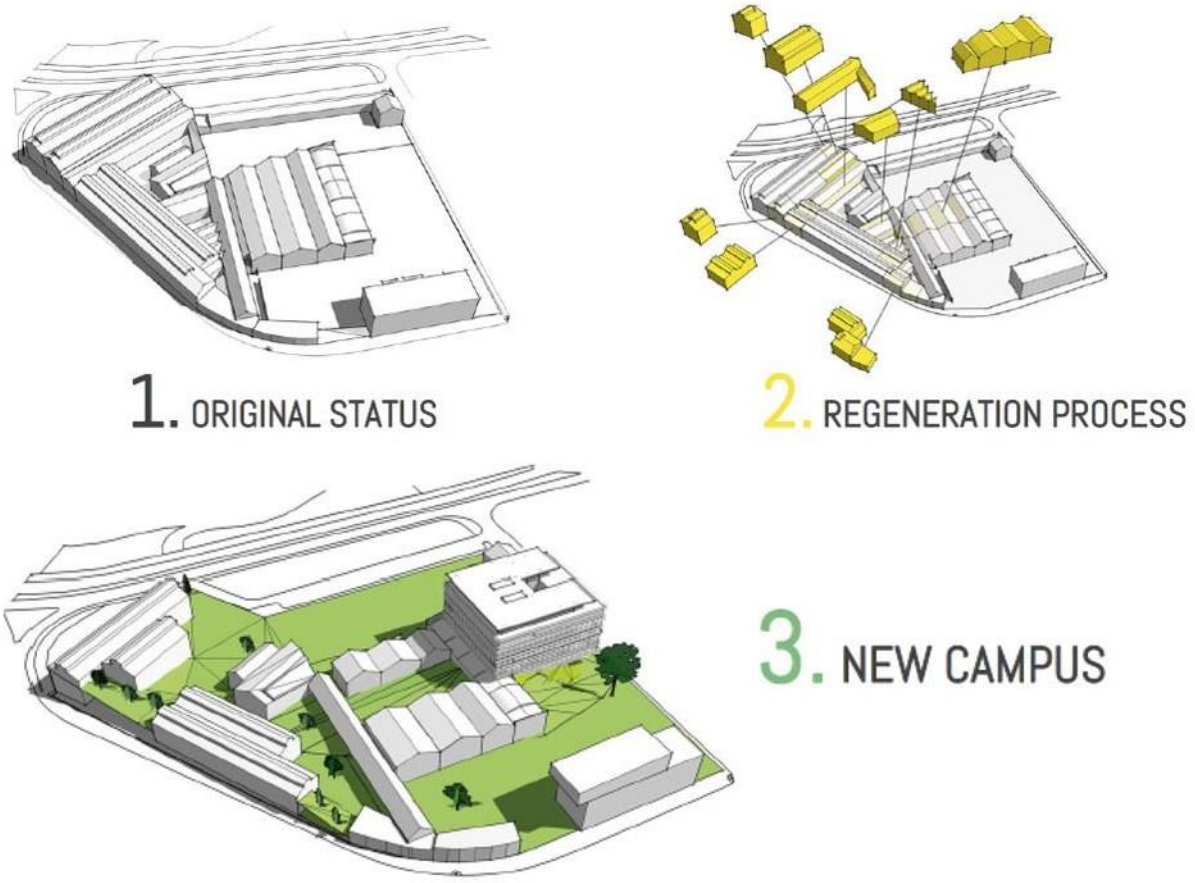

Fig. 1: Regeneration process of the industrial area “La Forgiatura”**.**

Now, the current tenants base of La Forgiatura is characterized by:
• Mainly Italian headquarters of leading multinational companies;
• Highly diversified industry mix;
• Strong financial structure and income generation;
• Secured leases with high residual life.

The regeneration project had opted for a combination of past history and present requirements in a project looking for a dialogue with the surrounding urban fabric. It represent an example of harmonic integration between a modern concept of spaces economy and last century industrial architecture.
The architect (Giuseppe Tortato) [20] [21] has, in fact, exploited the structural features of the old building with a careful eye for its industrial past, holding on to the original reticular structures while at the same time, where it is possible, focusing on the prefabricated construction; he has created a man-made hill (that is an integral part of the redevelopment of the La Forgiatura area) openly avows its being artificial and a metal structure).
He has worked on hollowing out empty spaces, ideally leaning the brand-new building on the little mountain while, in actual fact, it is supported by giant beams, which make it look as if it is suspended; he uses air, water, sunshine and soil drawing out their ancient potential and making them highly technological (for example, he has envisaged small photovoltaic cells, not just to send out a trendy ecological signal, but also to water the greenery).
The landscaped section of the hill conceals the technical features and air-conditioning systems in the underground garages. The transparent part is made of a glass skin covers an intricate prismatic-shaped steel structure of “spot-supported glazing system. [22]



Fig. 2: The innovative campus “La Forgiatura”**.**

Today The Campus is 100% Carbon Free and 3 buildings has the LEED Gold certification. The sustainability and the energy efficiency are guaranteed thanks to advanced technologiesand materials (i.e high energy class) and through the use of renewable energy: (i.e. geothermal heat recovery and

heat recovery from airconditioning systems; photovoltaic systems). The building management system (B.M.S.) combining all the management and computation functions of the individual buildings in one single interface.
The technical lighting design have been carefully conformed to the regulations set by the Lombardy Regional Council in terms of lighting pollution.
A real urban oasis, characterized by a three-dimensional development of the green landscape that incorporates old industrial structures joined smoothly to the new buildings. Thanks to the movement of the ground, in some cases real artificial hills eight meters high, you can access the buildings from various levels, including the roofs, enjoying a unique sensory relationship, given by the alternation of emotions: thanks to green patios, great heights, natural light, a unique relationship between interior and exterior greenery, old and new structures. [23]
The project has not just taken care over the construction design but also focused on materials; cars have been relegated underground and there are some gently winding pathways of varying widths serving emergency vehicles only.

The green and communal paths are 8,500 sqm and the underground parkings are 434 slots.



Fig. 3: The innovative campus “La Forgiatura”**.**

To underline the link with the past, the buildings that compose the new settlement, derived from the ancient production structure, are named after the processes and the activites hosted in the previous century: Meccanica, Uffici, Ingresso, Tempra and Tecnica.
The main building (Raimondi building) is 1,400 square meters floors without columns ensuring maximum flexibility for customisation:
• Continuous facade, comprising a sunlight control system obtained by means of aluminium lamellar strips;
• External maintenance of the crystal facade features an inspection walkway on each floor, hidden by the aluminium lamellar strips;
• Hill is designed to be self-supporting, made of metal beams hinged to each other, forming a single large triangular network dome;
• The building comprises 8 storeys above ground (two of which within the artificial hill).

The original steel structures of the Meccanica and Tempra and Meccanica buildings have been preserved and enhanced by interior patios and intermediate levels, while a particularly flexible beams-and-stanchions system provides variable lighting across the façade. [22]
The developer of the project is RealStep [24] (a SICAF, multi-sector real estate authorized by the Bank of Italy) which has as its objective the realization of specific real estate investment projects, with particular attention to the redevelopment of industrial areas, through the raising capital from institutional and private investors.



Fig. 4: The Raimondi Building



Fig. 5: The Astronave Building



Fig. 6: The Tempra building. The original metallic structure were preserved in this building

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A resilient and sustainable urban space: the Siemens factory in Santa Maria Capua Vetere (CE)

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Abstract
The paper proposes a reflection on the urban transformation of a partly disused industrial area located in Santa Maria Capua Vetere territory, a medium-sized municipality of Caserta Conurbation. In the Caserta Province the lack of a clear delimitation of industrial areas allowed, between 1955 and 1961, the construction of large industries such as Saint-Gobain in Caserta, Pierrel in Capua, Autelco in Marcianise, Texas in Aversa, Pozzi in Sparanise and Siemens in Santa Maria Capua Vetere, which was closed down in the nineties. A series of areas occupied by factories that have been partially or totally dismantled and that constitute problematic nodes in the contemporary territory. Siemens (later Italtel) was a factory located in a strategic place, along the Appian Way and bordering on the municipality of Capua. In the 1970s it employed 30.400 people and today it appears as a place (covering around 165.000 mq) of decay and neglect. The first part highlights some of the issues that lead to the abandonment of industrial areas through the analysis of Italian and foreign case studies. The second one analyses the de facto and de jure state of the area, the de facto through a detailed study that highlights its peculiarities and negative aspects and de jure from the comparison of the forecasts of the PTCP, the PRG and the PUC, recently adopted by the municipal council respectively. The third part proposes a meta-design hypothesis of resilient and sustainable regeneration.

Keywords: regeneration, sustainability, resilience, industrial disuse.

1. The abandonment of industrial areas: case studies

The expression industrial decommissioning means "that process of decommissioning, even partial, of urban or suburban areas, agglomerations or simple buildings, varied in size and characteristics, for which the recovery or conservation for a new function presents problems of various kinds" [1]. The causes of the phenomenon can be of various and different nature. The decommissioning of industrial areas began in the second half of the 20th century, coinciding with the decline of certain traditional manufacturing sectors. At present, disused industrial buildings make up a significant part of the building stock both in Italy and in the more industrialized countries. This is a building variegated by formal characteristics, typological, structural, technological, which, in most cases, not subject to maintenance, is in a state of very advanced degradation. In recent decades, due to the processes and changes taking place in the field of production activities, there has been a gradual abandonment of primary industrial activities, such as steel, chemicals, mining, etc. This problem has ancient origins and concerns all those "empty containers" or areas that have lost the function for which they were built. The presence of abandoned spaces and buildings within the urban fabric is not unusual and the need to recover them for new uses is not a new requirement, since "the phenomenon of disuse and the continuous adaptation and transformation of urban space belongs to that physiological process that is inherent in the evolution of uses and the form of the city itself" [2] and, in fact, the problem of reusing abandoned areas and containers has affected cities in past eras. There are two reasons that have led industrial plants to abandon their areas of origin, making them free and unused. The first is the relocation of industrial buildings in areas outside the city, with reduced costs of land occupation

and better accessibility to the area, free, therefore, from constraints related to the historicity of the place of first belonging. The second reason, linked to the globalization of markets and the search for more convenient production costs, consists in moving plants to more distant geographical areas, expanding the trade of production materials on a supranational scale. Sergio Crotti in 1990 emphasized how the term "divestiture" implies not only an interrupted relationship and the denial of a role, but also the occasion and possibility of the reception of a new function; this double meaning is identified by Crotti: "Like all commonplaces, it contains an ambivalence: on the one hand 'divestment' evokes the outcome of an active cycle (whether concluded, dismissed or interrupted) that alludes to a loss; on the other hand, and by symmetry, it postulates a compensation in the reuse of the areas made available for further activity". [3] The causes of divestment have to do with the area to the extent that it is no longer suitable for the imagined role, in relation to the specific productive function rather than to what is happening around it. By imagining solutions to these issues, a variety of possible combinations can be outlined:
whether the productive function of a given area is discontinued:
- the area may still lend itself to containing a productive function similar to the previous one: redevelopment;
- the area can be used for an alternative function: reconversion;
- no future destiny can be imagined for the area: abandonment;
if the area is no longer able to support that particular productive function:
- the productive function is moved elsewhere: re-location.
This schematization starts from the recognition that abandoned areas are not all equally disused: some are only potentially disused, some are recoverable according to multiple uses, others may have monofunctional or marginal uses, and still others must be considered unavailable in the short and medium term due to various factors. This distinction is useful in defining the tools and knowledge that can be used in dealing with brownfield sites. For years, disused industrial areas, having lost their productive function, have been identified as places that are extraneous to the urban fabric, veritable settlement ruins, without identity. "The question of urban voids, understood as places devoid of functions and roles that have lost their physiognomy due to the loss of the relationship with the history of the city, the physical appearance, the social character of activities and inhabitants, arises in the problem of their future functional destination. The single factory or any industrial building rarely appears as an artifact significant in itself: it illustrates not a product but a process of an important phase of our city's history, the industrial society of the early twentieth century" [4]. Over the years, attempts have been made to formulate a single definition of the theme, which is indispensable for defining the field of analysis and, therefore, of intervention. In fact, the more widespread expression "disused areas" has been used in many other ways, such as weak areas, underutilized areas, interstitial areas, reutilization areas, recovery areas, spaces for functional conversion, abandoned or underutilized buildings, negative spaces or urban voids. This is why, today, the abandoned city must be the object of a process of urban maintenance, in which the actions of transformation must interact with those of recovery, conservation and requalification. Starting in the 1980s, a real cultural debate began that is still of great interest and relevance today and, given the vast range of topics covered, involves numerous disciplines such as architecture, urban planning, technology, energy, economic and social sciences, with a view to an increasingly integrated approach to analysis and planning aimed at sustainable urban growth. Vittorio Gregotti affirms that "there is no new architecture without modification of the existing", every architectural operation is always an action of partial transformation, the same urban periphery is a place that seeks identity through modification. Starting from these premises, it is possible to construct an innovative approach applied to disused industrial buildings which, together with the various archaeological-industrial finds, such as plants, machinery and archives, represent a fundamental testimony to the vital processes that have animated Western society in the last two centuries. The need is for sustainable regeneration of the environment and the city, and so disused industrial areas can play a strategic role in the process of urban transformation. Creating a new piece of city within the city, it is clear then, sometimes compromises the destruction of the past and, sometimes, the preservation of the memory of what has been. Necessary it turns out to be, therefore, the distinction between the various experiences of redevelopment that have occurred over the years. There are those that recover the territory by disrupting the entire industrial layout and those that maintain the original layout of the industry, modifying its intended use by recovering the buildings of industrial archaeology. In Italy and in the world, the examples that maintain intact the layout of the old buildings are few, unlike those that disrupt the plant and demolish the historical memory that is represented by the former industrial buildings.

1.1 The Bicocca case in Milan

The first case study is the Bicocca district in Milan. This project for the new Bicocca district stems from the need to reuse the disused industrial areas of the Pirelli factories in order to create a pole of

centrality for the northern area of the city, characterized by the polarization of the urbanized and densely productive countryside, settled north of the Turin-Venice freeway.

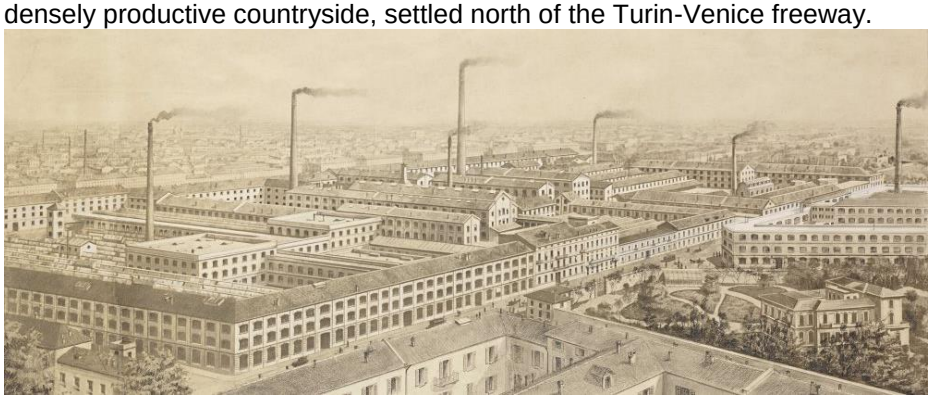

Fig. 1: View of the Pirelli plant in Milan, 1900 [Source: Pirelli Foundation]

In the intervention at the Bicocca the theme the designers had to deal with is that of a reformalization and re-functionalization of a periphery that by now had reached a historical consolidation, which included road layouts, urban clusters and images typical of the industrial periphery. [5] The design response that is given is to enhance this urban character of the industrial settlement by making it the center of the surrounding suburbs, the new design of the suburbs is based on the memory of the old industrial settlement, taking up the historical context, geographical and figurative as regards the structural aspects, without taking up the stylistic aspects. The principle that Gregotti and Associates apply in the project is that of reconstructing starting from the values of the formal and functional differences between the areas, typical of industrial zones. A mixture of functions coexist within it: buildings for the university, for public and private research institutions, for multinational companies and businesses, residences, offices, services, leisure complexes and commercial activities. All of this is integrated and supported by public green areas and infrastructures, organized starting from the original mesh of streets inside the factory and transformed into an urban mesh. The use of this structural pre-existence contributes to structure the urban complexity of the district together with the intertwining of the various functions, the scales of intervention and the spatial sequences of voids and closed spaces. These data delineate the Bicocca project as a true "historical center of the diffuse periphery" [6] or rather as a contribution to a polycentric vision of the Milanese metropolitan area. The Bicocca Project was born on April 26th 1985, thanks to the agreement between the Region, the Province, the Municipality and Pirelli Industries, with the aim of recovering the disused factory by building an integrated and multifunctional technological center. In July of the same year Pirelli launched the great international competition for the redevelopment of Bicocca, inviting twenty of the most important urban architects. On July 7th, 1988 Leopoldo Pirelli declared Gregotti Associati's project as the winner, justifying the choice as follows: "This project proposes for the Bicocca area architectural signs and urban spaces of remarkable expressive force within an external environment designed with great attention. More specifically, it reconnects the area of the Pirelli plant with the surrounding urban fabric, making it a reference element for a vast area of North Milan, a district in which it is reasonable to think that in the near future intense processes of productive, social and territorial restructuring will take place". [7]



Fig. 2: Gregotti's project for the Bicocca district in Milan [Source: PAST, University of Milan-Bicocca]

The administrative process of the Bicocca project has been very long, in fact the first concessions have been released after 8 years from the variant to the town plan of 1987 with which the municipality has defined the functional and quantitative elements of the project. During this period the project has undergone some adjustments but there have not been significant changes in the urban configuration of the blocks. The district is organized on a central longitudinal spine, which follows the planimetric layout of the area. The spine is divided into six quadrangles characterized by different volumetric configurations, the central quadrangle will include the entire Bicocca project, since it is located at the intersection of the two main axes that structure the sequence of public squares, with the large central square and buildings that serve the commercial functions, residences and residences; the square is then closed to the north by a building of university services and student residences, followed by a large urban park concludes the residential sector and for collective services. All central quadrangles are connected by a central pedestrian axis. Another part of the university hub is located in two pre-existing industrial buildings next to the central urban park. To this central spine are aggregated, beyond the side streets: laboratories, residences and the Arcimboldi Theatre to the east; residences with nursery school and church and the most significant urban park of the whole area, the "Cherry Hill", to the west. Further north of the latter is the area that Pirelli has designated for its headquarters; this also includes the historic Bicocca of the Arcimboldi building and the monumental cooling tower. Further west are sports facilities, which are also connected by a pedestrian overpass to the North Park.

1.2 The Sofer case in Pozzuoli

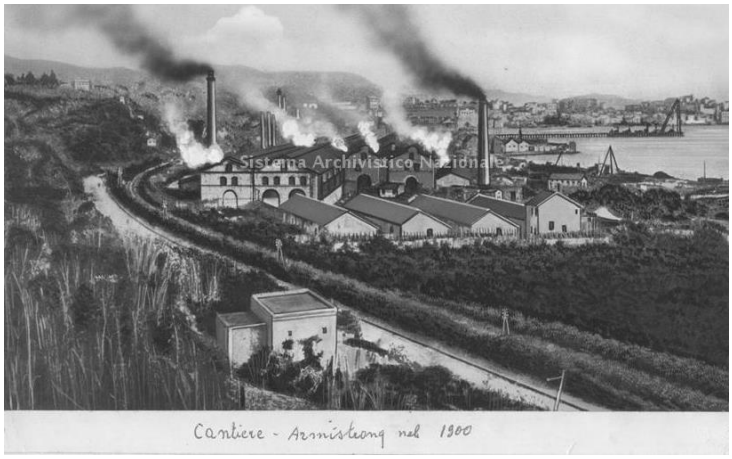

Fig. 3: Postcard reproducing the Armstrong Shipyards in Naples, 1900 [Source: National Archival System - SAN]

The metallurgical establishment of Pozzuoli was founded in 1889 by the Armstrong Company, a manufacturer of war material. The new production settlement, developed over the decades along the coast, occupied "the area where in ancient times, according to tradition, stood the Academy of Cicero". [8] The complex of the Artillery Arsenal, was acquired by Ansaldo Trasports in 1938, was then purchased by Aerfer-Imam and in 1967, following the separation of the company, was sold to Sofer, a company specializing in the production of material for locomotives, coaches, electric trains; the following year the property was acquired by Breda Ferroviaria. The plant of Pozzuoli, at the beginning gave to the city a great economic contribution, then went into crisis in 1993 and finally closed in 2003. The industrial reconversion project of the former Sofer Breda area has been elaborated by Studio Gnosis Architecture on the basis of the guidelines outlined for the relaunching of the city and the Phlegrean area in Peter Eisenman's master plan: it foresees the requalification of a long stretch of coast and "the recovery of some of the pre-existing buildings, representative of the memory of the site" [9], in order to allow also to give back the sea to the city. The regeneration of the former Sofer, promoted by the new owner company, Waterfront Flegreo spa, is a unique opportunity for Pozzuoli. For the first time in the history of the city, in fact, a large strip of waterfront has been affected by an intervention aimed at reconnecting it to the urban fabric, to allow the use of citizens. The objective was the realization of a new public space of high environmental quality and open to the city that can accommodate new functions, capable of stimulating economic and social development, and can relate with the testimonies of the past on the area and with the same old town, to merge the new architecture to the historical pre-existences. The entire area has been divided into functional areas - Service

Center, Hotel Complex, Arts and Crafts Pole - following the guidelines identified by the footprints left by the production structures, and is considered as entirely pedestrian. The project has also foreseen the realization of large parking lots, mostly covered, and the integration of pedestrian mobility, guaranteed along the entire coast by the board-walk, with a system of bicycle paths. At the end of the promenade, in proximity of the new port of Pozzuoli and in correspondence of the main pedestrian entrance, a wide green square will rise, the Square of the sail and it is characterized by the presence of a pre-existing building, operative center of the ex Sofer recovered and converted in public and private offices, and by the buildings that will welcome the Worship Center, the Nautical Club Savoia and the seat of the International Academy of the sail. This important sports facility would have become a well-equipped Olympic training center, available to sports federations, and would have been served by the adjacent nautical technology center that will house, in addition to research laboratories on new materials for boats and sails, residences for students and athletes and commercial activities related to boating. The promenade would end on Belvedere Square, stretching out towards the sea, with areas dedicated to commerce and catering, and spaces for leisure and sports activities; this complex would be developed on the imprint left by the long pre-existing warehouses in an area closed between the railway and the surrounding factories. At the center of the area, instead, it has been planned the realization of the buildings destined to the Arts and Crafts Pole and Hotel. The hotel complex would be an innovative hub with a functional hotel, a wellness center with a spa area. While the articulated bodies of the pole of arts and crafts, conceived according to the principles of sustainable architecture, were intended to accommodate craft workshops, professional studios, showrooms and lofts for fashion and design. This innovative settlement of tertiary activities, with its outdoor spaces open to the urban park, would be embraced by two large old buildings, the Canteen building and the Welding building, recovered and transformed respectively into a service plate, with commercial spaces and various offices, and into a system of workshops with laboratories and exhibition spaces, in a fascinating dialogue between industrial archeology and technological innovation, between ancient and modern, between conservation and renewal. Central to this was the theme of greenery and public spaces, which "represents a dominant motif in the genesis of the project, an integral and unifying element". [10]



Fig. 4: Project for Pozzuoli XXI [Source: Pozzuoli21]

The former Sofer area, in fact, has been transformed into a large park of 55,000 square meters, accessible on foot directly from the city center and designed as a long green ribbon that winds, parallel to the sea. The Pozzuoli XXI project, based on the public-private synergy, offers the possibility to give back to the city more than 130,000 square meters of public spaces and equipped green areas and is further qualified by the study for the use of eco-friendly materials and technologies and the adoption of renewable energy sources.

1.3 The Ruhr case in Germany



Fig. 5: Landschaftspark, contemporary air view [Source: Recycled landscapes]

The third case study is international and concerns the former large industrial area of the Ruhr, a historical German region of North Rhine-Westphalia, in the western part of Germany. This region, also known for its richness in coal and iron, has had, since the early nineteenth century, a significant development in the mining and metallurgical sectors. In the period between 1960 and 1980 the Ruhr underwent a period of decline, affecting all major mining and steel industries and producing a trail of destruction. Another legacy acquired from this period of decline, perhaps the most problematic of all, was the advanced and widespread state of pollution of the land, water and air, making the environment dangerous. The Emscher River, the backbone of the natural structure of the entire region, and its numerous tributaries became known worldwide for their level of pollution and their transformation into open dumps. The problem of pollution and neglect of the Ruhr area was addressed between 1989 and 1999 by the regional government of Nordrhein-Westfalen, the "Land", which, for the occasion, set up an exceptional intervention body called the Internationale Bauausstellung Emscher Park (IBA Emscher Park). The launching of the work program was initiated by the "Land" government, inviting the different social partners to submit projects, ideas and opinions concerning the area. The program was divided into seven lines of action [11], encompassing a wide range of issues, such as ecological rehabilitation of the Emscher river basin, work in the park, industrial archaeology as well as social and cultural aspects of leisure time.



Fig. 6: Landschaftspark Project [Source: Recycled landscapes]

The first guiding project has as its theme the Emscher landscape park, which is the main objective and theme of the whole project. The aim is the realization of a park along the Emscher river axis through an interconnected system of green areas and strips, nature trails, bicycle and pedestrian paths. The main objectives of the project are: rehabilitation of the landscape by decontamination of polluted waters and soils, creation of attractions for leisure, sports and culture. The second guiding project is based on the theme of ecological rehabilitation of the Emscher hydrological system. This project, has provided for the creation of new wetlands, articulated in a system of ponds, marshes and small streams, connected to each other. Particular attention has been paid to the ecological and naturalistic arrangement of the banks. The new renaturalized banks operate as effective biological filters, activated by the work of organic transformation through particular essences, suitable to trigger processes of phyto-purification. The Emscher River, which over the last 150 years has become an open sewer, is, within the project, the subject of a long-term recovery program, which can be summarized in three main objectives: to achieve, through more efficient treatment plants, a better level

of water decontamination; to separate wastewater from rainwater; to direct a portion of clean rainwater, collected separately, into waterways. The rehabilitation of the Rhein-Hern canal is the subject of the third lead project of the IBA Emscher Park. The primary function of this canal is to supply high-quality water to several large reservoirs located in the northernmost parts of the Ruhr area, which is particularly poor in water supplies. The canal, which today is an integral part of the Emscher Landscape Park, was built between 1906 and 1914. The canal, which was once used for river transportation of goods and various materials, has been re-functionalized in the last decade by IBA projects into a place for recreation, leisure and sports. The fourth guiding project refers to industrial monuments as historical testimonies. In recent years, the IBA has carried out a qualitative census of industrial buildings in order to include them in an innovative program of conservative restoration. Buildings, such as blast furnaces, machine rooms, pay rooms, warehouses and deposits for the storage of raw minerals, and infrastructures for the transport of materials, have been surveyed, examined and started to be partially or totally restored. The recovered industrial monuments have been re-functionalized, transforming them into modern post-industrial cathedrals, suitable to host cultural and artistic events as well as new economic and productive activities. The fifth guiding project has as its theme the action of working in the park. The objective of the IBA is therefore that of an aesthetic, ecological and functional renewal of living and working environments, to generate a spontaneous reactivation of productive, artisan, commercial and industrial activities. The sixth guiding project has as its program housing, neighborhood development and innovative forms of living. The housing project involves two types of intervention. The first type concerns the restoration and requalification of the old workers' quarters, populated by the families of miners at the beginning of the 20th century. The second type of intervention concerns the realization of new settlements that also include exemplary cases of garden-cities. Knowledge of bio-architecture has made it possible to design the new residential quarters. The priority objective of the IBA on living was to achieve a more concrete perceptual and functional integration between buildings, green areas and the surrounding landscape. The seventh and last guiding project concerns new proposals for social and cultural activities. The "operating philosophy" of the IBA has entrusted a role of the highest value to the many social and cultural aspects, present and potential, that constitute the characteristic of this territory. The entire project and the recovery of the former industrial buildings, has produced a series of premises suitable to host all kinds of activities, such as theaters, exhibition spaces, sports centers, concert halls, equipment for cultural and social activities. The change in quality is also noticeable in the interventions on the environment and landscape through the creation of an organic and widespread network of trails, bicycle paths, roads and walks, which connect the many parks created, joining them to the natural areas, the new woods and recreational stations, along the banks of the river Emscher and its channels.

2. The Siemens factory in Santa Maria Capua Vetere: de jure and de facto state of the area analysis

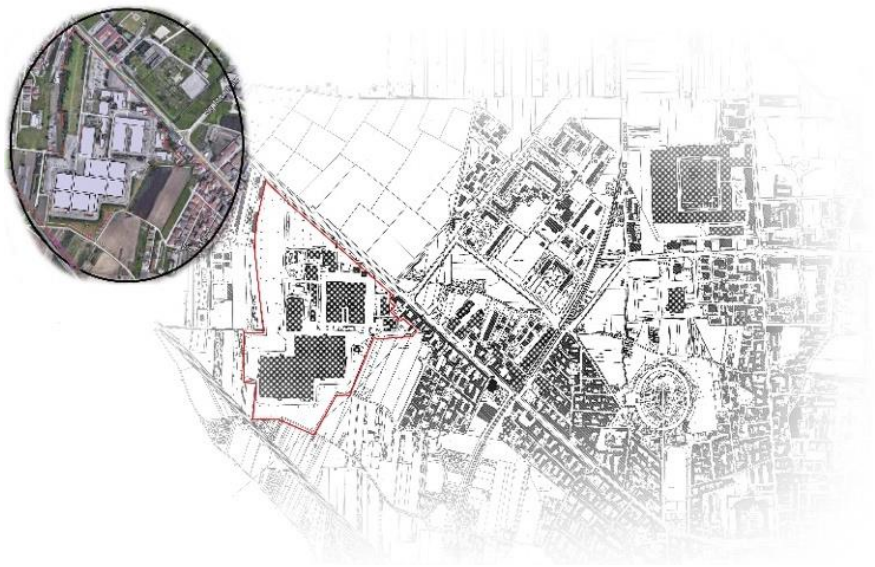

Fig. 7: The area under study, former Siemens [Source: elaboration by Dott. Raffaella Santillo]

The city of Santa Maria Capua Vetere is located where once stood the ancient Capua. It was here that the ancient Capua stood, as attested and confirmed by the numerous monuments of the Roman era

as well as by the etymology of today's toponym ("Capua Vetere", from "Vetus, veteris", a Latin adjective meaning "Ancient", therefore "Capua Antica"). The area under study, the former Siemens of Santa Maria Capua Vetere, is located along the ancient road axis initially called Via Appia, today called Via del Lavoro, with an area of 165.000 square meters. Main road connecting Santa Maria Capua Vetere and Capua. Before entering into the details of Siemens, it is important to remember that Caserta's industry grew a lot from 1951 to 1963 and, after a period of stall, had its maximum increase between 1970 and 1977. From the mid-sixties to the eighties, there was a growth in the industrial sector throughout the South and, therefore, also in the province of Caserta, which flanked and, in some cases, replaced the agricultural sector. The national politics of aid to the industrial development, with the institution of the Cassa del Mezzogiorno, make that at the end of the seventies (1978) the occupation in industry grows in Campania of the 18%. [12] The municipality of Santa Maria is part of the Marcianise-Caserta Conurbation which includes the territories of Capua and Maddaloni. In Santa Maria, the activity of SIEMENS - born with the name SIT- Siemens Spa in 1960- began in 1964 with the realization of a first plant, to which another was added in 1972, since at the beginning of the seventies the company had exceeded the number of thirty thousand employees. In the 1980s, the plant became autonomous with a plan that included research, design, production and marketing all at the local site. As Pignataro writes, "the company carries out autonomous research activities (together with design and production activities), and is therefore a true innovative unit". [12] Despite these premises, in addition to the industrial crisis of the late eighties, much has weighed on the specific situation also "the absence and / or inadequacy of infrastructure ... such as to favor the industrial settlements that thrive only in the presence of such assumptions". [13] The layoffs began, the reduction of workers, and little by little, the area was sold off. We went from more than 5000 employees in the seventies, to just under 2000 employees in the nineties. [14] Nowadays we have an area partially used as an ecological island and the rest is abandoned.

2.1 Analysis of the PTCP

The Territorial Plan of Provincial Coordination, approved by resolution of C.R. n. 26 of 27/04/2012 is the main instrument of government available to the provincial community and is the planning tool that outlines the objectives and the fundamental elements of the structure of the provincial territory, consistent with the guidelines for socio-economic development. The PTCP defines the purposes through the guidelines and directives that establish the objectives, contents and methods for the formation of municipal urban plans, sector plans and other acts of provincial planning or programming; they identify the constituent elements of the provincial territorial heritage, with reference to the characteristics and values of nature, landscape, rural, historical-cultural, settlement and infrastructure, and define the methods of use and maintenance to ensure the protection, redevelopment and sustainable development; identify the areas in which it is opportune to establish the protection of new natural areas of provincial and/or local interest; indicate the territories to be preserved from settlement and infrastructural transformations; determine the criteria and guidelines for the identification of admissible settlement loads; define the initiatives to be adopted for the prevention of risks deriving from natural disasters; the infrastructural interventions and the mobility network to be implemented. From an analysis of the thematic tables of the PTCP referred to the territory of Santa Maria Capua Vetere it emerged that the city belongs to the Sts D4 - Urban System Caserta and Ancient Capua, to the Settlement Environment n.1 - Plain Campana and has a dominant urban territorial. While, with regard specifically to the former Siemens area, it belongs to the urban fabric predominantly non-residential with a productive dominant. In the territory there are 93 denied sites. Following an analysis of the data on the surface area of the areas denied open space and quarries and a comparison with the surface area of open space in each municipality, it emerged that the municipality of Santa Maria Capua Vetere is most affected by the weight of these areas, with a percentage of 11,2% compared to the surface area of open space. The PTCP provides precise indications in this regard, calling for the priority transformation of the neglected areas, i.e. those uncultivated, degraded and abandoned areas spread throughout the territory. These areas have been classified as areas of "integrated transformability", meaning areas in which the residential, commercial and tertiary functions, connected by a pervasive public space conferring urban quality, guarantee the vitality of the neighborhood and the functional and social mix. The areas of integrated transformability are located in free areas, containing "denied areas", in need of urban reconnection. These interventions aim at defining an appropriate mix between public green areas (preponderant on the others), the slow bicycle and pedestrian road system, the presence of services and a reduced part intended for housing and commercial buildings.

2.2 Analysis of the PRG

The PRG is the main instrument of urban planning at the municipal level the plan must contain: the network of main roads and their facilities, the division into areas of the municipal territory, indicating the areas intended for urban expansion and the determination of the constraints to be respected in

each area, the areas to be reserved for public buildings or public use and the works and facilities of collective or social interest, the constraints to be respected in areas of historical, environmental and landscape, the implementation rules of the plan. The PRG of the municipality of Santa Maria Capua Vetere was approved by Resolution G.R. 22/10/1983 and divides the municipal territory into 7 areas of gravitation: Area 1 - Northeast of the town up to the border with the town of San Prisco; Area 2 - All the central area east of Corso G. Garibaldi up to the border with the town of Curti; Area 3 - The northern area of the inhabited area, developed substantially along the artery of via Galatina on the slope bordering with the territory of the municipality of Capua in the fraction of S. Angelo in Formis; Area 4 - Including all the central area west of Corso G. Garibaldi; Area 5 - The south-west area, i.e., part of the district "S. Erasmo" and the areas that go under the toponyms of "14 bridges" and "Colonna bridge" along the direction that leads to the municipality of San Tammaro; Area 6 - The north-west area including the districts "Sant'Agostino", "Fornaci" and the remaining part of the district "S. Erasmo", along the direction with the municipality of Capua; Area 7 - The southern area of the town beyond the railway line, including the whole "Sant'Andrea dé Lagni" district. The study area is located in the area 6: The north-west area including the districts "Sant'Agostino", "Fornaci" and the remaining part of the district "S. Erasmo", along the direction with the municipality of Capua. At the time of the drafting of the PRG, outside this perimeter, there were two industrial nuclei. The first one was constituted by the complex of the ATI (Italian Tobacco Company) more commonly called "Tabacchificio", placed north along Galatina street and the second one was constituted by the complex "Italtel" or "ex Siemens" placed west along Appia street in direction of Capua. From the PRG it is clear that the study area falls in zone D, that is, in a productive zone with an industrial-craft vocation for direct intervention where urban standards are foreseen such as areas destined for yards and parking lots for employees of not less than 7,5 square meters, areas of public use for greenery and public equipment of common interest. The current PRG of the City of Santa Maria Capua Vetere identifies "commercial areas" and "production areas" distinguishing between them in terms of uses and urban discipline. The SIAD Plan regulates all the directional interventions, tertiary and in zone D of the PRG in force of the Municipal Territory. From the rereading of the SIAD, it is clear that the commercial vocation of the Municipal territory is particularly diffused and mostly concentrated in the area towards the North, Sant'Angelo in Formis in the Municipality of Capua. During the period in which the P.R.G. has been in force, not all the plan's forecasts have been implemented. In fact, some industrial areas, in particular the former Siemens complex itself, have now become a disused industry, not yet possessing a new dimension of transformation and urban requalification.

2.3 Analysis of the PUC

The Municipal Urban Plan is the central instrument of planning in the Campania region, it replaces the PRG by virtue of LR n. 16/2004. For the territory of Santa Maria Capua Vetere, the PUC Proposal was adopted in September 2020. The urban planning tool replaces the previous PRG dating back to 1983, as the new environmental demands, territorial resilience, the fight against climate change, urban regeneration, the redevelopment of historical fabrics, the enhancement of archaeological and cultural heritage, new forms of sustainable mobility and, finally, the need to activate processes of social participation in the construction of collective goods have imposed the revision of an inadequate tool, not only from the regulatory point of view but especially to be able to give answers to contemporary socio-economic needs. The project for the urban plan of Santa Maria Capua Vetere is based on the definition of Elementary Homogeneous Territorial Units (U.T.O.E.). In the U.T.O.E. 4- Sant'Agostino: residential and productive vocation, falls the disused productive area of Italtel. The main objectives for this territorial unit are to define a new role for the area by increasing its functional complexity, reinforcing the city effect, redeveloping the existing building stock and hierarchizing the system of mobility and public spaces. The potentialities linked to the relaunching of the use of these disused areas (ex Italtel, ex Fintek) represent a great opportunity of urban transformation that would characterize the city also in consideration of the public conveniences to be translated into spaces given for free by the owners when formulating a project proposal for the reuse of the sites. The Plan sets out 5 strategies for the city and they are: 1 - The historical center and archaeological resources, 2 - The transport infrastructure networks, 3 - The territorial endowments and centralities, 4 - The areas of transformability and 5 - Environment and green infrastructure. The study area is included in the strategic project n.4: The areas of transformability - recovery and urban regeneration. The reduction of land consumption and the opportunity to regenerate brownfields as well as the urgency to redevelop neighborhoods and degraded areas guide this strategy. The potential linked to the reuse of this area is of great importance. The former Siemens is included in the plan in the A.T.P. 1 (Areas of Productive Transformation) and for it are planned interventions of urban regeneration with demolition of industrial volumes and relocation with tertiary-commercial function. Specifically, it is expected to create a commercial and tertiary area overlooking Via del Lavoro and in the innermost part of the area with attached integrated services, through the construction of new factories and the redevelopment of existing structures. The new buildings will be inspired by the principles of bio-architecture to meet high

performance standards with low consumption. The intervention also includes a public green parking for maximum permeability of the soil, as well as areas of public green equipped and a public building with cultural function. The re-functionalization of existing buildings in the center of the area will result in the definition of an area with a commercial vocation; in addition, there will be an area destined to the craft-productive function.



Fig. 8: Project sheet for ATP 1 [Source: Programmatic Framework, PUC Santa Maria Capua Vetere]

The western and southern parts of the lot will be destined to a green area to be opened to the public and equipped with outdoor sports fields, skating rinks, bike paths, equestrian center and light and removable structures and ponds, providing measures to support urban drainage and the principle of hydraulic invariance. Finally, it is expected, in the eastern part of the area, the construction of a road link that cuts across the area.

3. A Meta-design hypothesis of resilient and sustainable regeneration

The Project for the former Siemens comes from the idea of wanting to redevelop the area by identifying new functions based on sustainability and resilience. The problems for this area concern, on the one hand, the search for solutions for the abandoned and disused industrial buildings, decreasing the overall state of degradation, and on the other hand, the need for resilient choices. The theme of resilience is of considerable interest, as being resilient for cities means not only designing homes and buildings that are able to withstand natural events but also, and above all, the ability to quickly recover from a crisis situation. Resilience, therefore, is not only related to natural phenomena but, in general, a system can be defined as resilient if it is flexible and has a high capacity to adapt to crises while maintaining the same basic structure and functions. Urban planning, to date, does not yet allow for this speed. Urban resilience has three implications. The first is the ability of cities not only to adapt but to self-organize, so as to be centers of knowledge and innovation with an adaptive system of government. Second, it is about the big picture; resilience is not tied to a single aspect but rather to the entire urban context. The third implication is that resilience does not end within the boundaries of the individual city but closely involves the network of cities. It is an integrated system. [15] The intervention for the former Siemens aims to become, a green junction for the city that connects Santa Maria Capua Vetere to Capua. A hinge between the two urban areas. The main objective is the recovery of the building heritage and the enhancement of the existing. For this reason new functions have been foreseen for the existing buildings, such as research center, laboratories and exhibition centers also serving the University, as well as bars and restaurants. This area will play a hinge function with the creation of large green areas also designed as barriers to smog that, in fact, will surround the entire area, with a choice of vegetative species capable of playing this role of barrier. There will be several access points to the area and it will be possible to access it through sustainable urban paths. The mobility within the area, in fact, will be totally sustainable, with green and red paths. These paths are a real system dedicated to a non-motorized circulation able to connect people with the resources of the territory (natural, agricultural, landscape, historical and cultural) and with the centers of life. They will be pedestrian and cycle paths, totally green, with areas of bike sharing but also car sharing, as it will be possible to travel the area with electric cars. Both social housing and free

building interventions will be foreseen, in order to guarantee an adequate social, functional and building mix. Building and functional mixitè is a useful tool for the elimination of social and economic distinctions.[16]

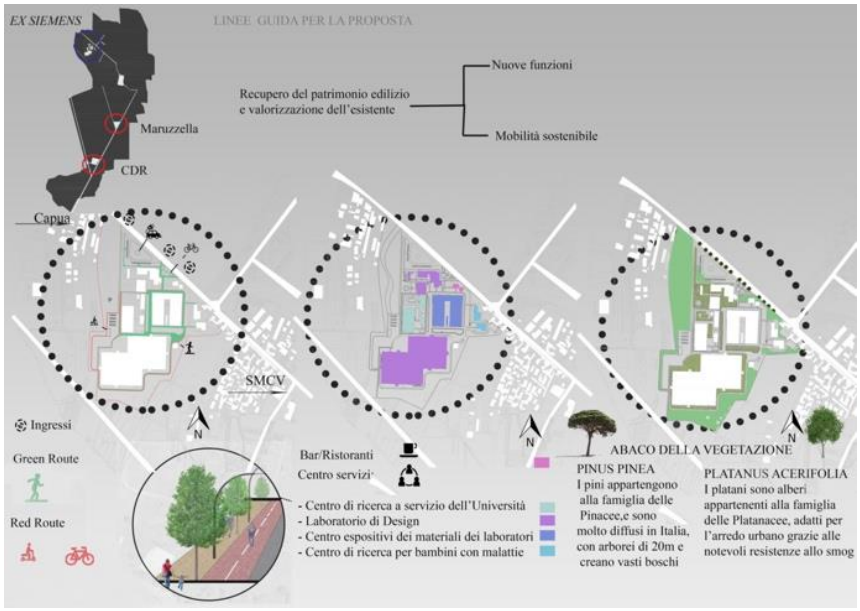

Fig. 9: The Regeneration Project for the former Siemens [Source: elaboration by Dott. Raffaella Santillo]

The objectives of the project are, also in adherence with those prepared by the proposed PUC, therefore, related to environmental sustainability linked to the search for flexibility and resilience; the experimentation of a new idea of urban regeneration through the use of innovative tools; the maintenance, reuse and re-functionalization of abandoned industrial buildings; the enhancement of services on an urban scale that aim at social inclusion (for example with the provision of forms of co-housing and social mixitè).

Attributions: The paper resulting from joint work, sees the attributions as follows: Paragraph 1 and 1.1 Salvatore Losco, Paragraph 1.2 and 1.3 Irene D'Agostino and Paragraph 2 (2.1, 2.2, 2.3) Claudia de Biase. Paragraph 3 is the result of the joint processing of the three authors.

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Cultural access of people with disabilities. The Italian case

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Abstract
Not everyone has equal access to culture: significant barriers exist for consumers, amateurs and professional contributors. People with disabilities may face barriers due to the inaccessibility of cultural premises, venues or contents. People in wheelchairs for instance cannot attend a concert if the only way into a hall is up a flight of stairs. Lack of access to cultural sites reduces the ability of people with disabilities to enjoy them fully. According to the approach first proposed by Sen (1999), capability building causes individuals to improve their level of self-determination, with a positive impact on health-serving habits and practices. Both cultural access per se and capability building – which is naturally associated to it – contribute to subjective well-being in a positive way. While this by-product of cultural participation is mostly unintentional, it may however be turned into a new instance of the welfare policy once properly recognised as a systematic spillover effect of cultural participation on individual and social health. Using ISTAT data for 2016, this work provides a measure of the degree of exclusion of people with disabilities from theatres and museums in Italy. Finally, it provides economic policy recipes aimed to reduce architectural, environmental, and social barriers hindering cultural access.

Keywords: cultural consumption; disability; accessibility; cultural venues.

1. Introduction
Accessibility is one of the foundations of equality and freedom of movement. As such, it is guaranteed by the Declaration of Human Rights and the Italian Constitution, as well as by the United Nations Convention on the Rights of Persons with Disabilities, ratified in Italy by law n. 18 of March 3rd 2009.
'Accessibility', 'usage' and 'architectural' barriers are key terms contemporary society has had to confront and clash with. These notions are especially relevant with respect to cultural venues, which generally represent places of memory or "precious spaces" of major interest for the community. As far as cultural venues are concerned, the problem of accessibility mainly consists in overcoming the difficulties posed by the structural historicity of ancient buildings. This problem is tackled by the Code of Cultural Heritage, which states: "The assets of the cultural heritage belonging to the public are intended for use by the community, compatibly with the needs of institutional use and provided that there are no reasons for protection" (Paragraph 4 of DL 24 of January 22nd 2004).
While 'accessibility' is explicitly defined by the law, 'usability' refers to the actual possibility of using an environment or equipment on part of people with disabilities, even in case such resource is not designed for this purpose. Environments or equipment, though not accessible by law, may indeed be still usable, if they feature the dimensional and typological characteristics of reachability and usability. That is to say

that usability is not strictly anchored to the legal provisions that specify the spatial dimensions (height, width, elevation, depth, etc.) of the environments and the necessary equipment to make them accessible to people with disabilities, but is more linked to ingenuity and the creativity of man and the possibility of arranging environments and creating objects, which by their very nature are predisposed to an extended use. Therefore, those who design structures and goods need to proceed while taking into account everyone's comfort.
Using ISTAT microdata referring to 2016, this work evaluates whether the probability of usability of a given cultural consumption structure (museum, theatre, opera) is negatively affected by the presence of disability. The paper is organised as follows: in section 2 we present the empirical method proposed, in section 3 we introduce the data used in the empirical analysis, in section 4 we present the results and discussions, section 5 concludes.

2. Method

This study aims to determine whether socioeconomic and demographic factors and the degree of disability (i.e. the different severity of the disability) influence consumer decisions on whether to go for cultural consumption. Given the dichotomous nature of the consumer, a qualitative response model is appropriate. Qualitative response models relate the probability of an event to various independent variables. Such models are often useful when assessing consumer characteristics that are associated with purchasing decisions (Khan, 2002). In order to provide a detailed analysis of consumer choice on a specific item of cultural consumption, we apply a probit model for binary (yes, no) choice.
The probit model is a statistical probability model with two categories in the dependent variable (Liao, 1994). Probit analysis is based on the cumulative normal probability distribution. The binary dependent variable, Y_i, takes on the values of zero and one (Aldrich and Nelson, 1984). The probit identifies the regressors that increase or decrease the probability of choosing cultural consumption.
In the binary probit model, the preference for a certain cultural consumption was taken as 1, zero otherwise. It is assumed that household i obtains maximum utility, preferring cultural consumption.
The probability of choosing any alternative over not choosing it can be expressed as in equation (1), where $\Phi(.)$ represents the cumulative distribution of a standard normal random variable (Greene, 2000):

$$p_i = Pr[Y_i = 1|X] = \int_{-\infty}^{x_i'\beta} (2\pi)^{-1/2} exp\left(-\frac{t^2}{2}\right) dt = \Phi(x_i'\beta) \quad (1)$$

The relationship between a specific variable and the outcome of the probability is interpreted by means of the marginal effect, which accounts for the partial change in the probability. The marginal effect associated with the continuous explanatory variables x_k on $Pr[Y_i = 1|X]$, holding the other variables constant, can be derived as follows (Greene, 2000):

$$\frac{\delta p_i}{\delta x_{ik}} = \phi(x_i'\beta)\beta_k \quad (2)$$

where $\phi(.)$ represents the probability density function of a standard normal variable.
The marginal effect of dummy variables should be estimated differently from continuous variables. Discrete changes in the predicted probabilities constitute an alternative to the marginal effect when evaluating the influence of a dummy variable. Such an effect can be derived from the following (Greene, 2000):

$$\Delta = \Phi(\bar{x}\beta, d = 1) - \Phi(\bar{x}\beta, d = 0) \quad (4)$$

The marginal effects provide insights into how the explanatory variables shift the probability of cultural consumption. Using the econometric software STATA, marginal effects may be calculated for each variable while holding other variables constant at their sample mean values.

3. Data

The analysis is based on data gathered from the latest sample of the annual “Aspects of Daily Life” survey, referring to 2016, conducted by the Italian National Institute of Statistics (ISTAT). It is a multipurpose survey of 18,864 households and 44,984 individuals aimed at collecting fundamental information on their habits and the problems that they face in everyday life. Several dimensions are considered, such as economic status, education, lifestyle and participation in cultural activities (visiting museums and going to theatres).
Participation in cultural activities or cultural consumption represents our dependent variable. Furthermore, among the previous ones listed above, we consider the degree of limitation as a proxy for

disability. The definition of disability can be tackled from several angles. One perspective is based on the International Classification of Functioning, Disability and Health (ICF, WHO 2001), which identifies the social or inclusive model of disability, based on the capability approach. In this respect, a person with disabilities is one whose autonomy is limited because of the characteristics of the context where she lives and operates (this is the approach advocated by the European Disability Forum). An alternative and strictly institutional approach counts as persons with disabilities only those who have been certified as such by the system. A third approach, based on self-reported status, defines disability in terms of how people perceive their own limitations with respect to daily activities. In our case, the annual "Aspects of Daily Life" survey provides the polytomous variable "limitations" that takes on value 1 for severe limitations, 2 for non-serious limitations, and 3 if there are no limitations at all.
Table 1 and **Table 2** respectively report the definition and the descriptive statistics of the variables used in the econometric analysis.
Table 2 shows that 33% of the respondents declare that they go to the museum at least once a year, while only 22% the respondents declare they go to the theatre at least once a year. As far as the disability proxy is concerned, it emerges that the majority of the sample declares no limitations (the average value is 2.75 and is close to 3, which is the value associated with the absence of limitations). Finally, Table 2 shows that males constitute about 48% of the sample; more than 27% of the respondents are over 64; 12.8% of the respondents hold a university diploma.

Dependent variables	
museums_exhib	Museum attendance over the last 12 months. 1 = At least one time. Reference group: never.
theatre	Theatre attendance over the last 12 months. 1 = At least one time. Reference group: never.
Regressors	
limitations	Degree of disability of the respondent. 1 = f non-serious limitations; = 2 no limitations. Reference group: severe limitations.
gender	Gender of the respondent. 1=male
age35_44	Age of the respondent. 1 = age between 35 and 44. Reference group: 18-34
age45_54	Age of the respondent. 1 = age between 45 and 54.
age55_64	Age of the respondent. 1 = age between 55 and 64.
age64_	Age of the respondent. 1 = age > 64.
econ_stat_good	Availability of economic resources for the needs of the family. 1 = Excellent or adequate. Reference group: scarce or totally inadequate.
university	Education level of the respondent. 1 = University degree or postgraduate education

Tab. 1: Data and Variable Definitions

Variable	Obs	Mean	Std. Dev.	Min	Max
Dependent variables					
Museum	32,085	0.3370	0.4727	0	1
Theatre	32,085	0.2191	0.4136	0	1
Sociodemographic variables					
Limitations	30,319	2.7589	0.5141	1	3
gender	37,426	0.4780	0.4995	0	1
age35_44	37,426	0.1736	0.3787	0	1
age45_54	37,426	0.1902	0.3924	0	1
age55_64	37,426	0.1583	0.3650	0	1
age64_	37,426	0.2742	0.4461	0	1
econ_stat_good	37,192	0.5382	0.4985	0	1
university	37,426	0.1277	0.3338	0	1

Tab. 2: Descriptive Statistics

4. Results

Table 3 shows the results of the empirical analysis. In particular, in the first column we report the estimates when the dependent variable is theatre attendance, while in the second column we report the results related to museum attendance. In general, we observe that men are less accustomed to going to cultural consumption than women. Moreover, access to theatres and museums decreases with age and this is not due to a reduced interest, but rather to the relation between old age and some types of (motor) disabilities that generate difficulties in the fruition of certain cultural consumption item. In addition, a good education and a good economic status increase the likelihood of going to the theatre and visiting museums.

Furthermore, the results show that for both types of cultural consumption (theatres and museums), the absence of disabilities (limitations) increases the probability of choosing theatrical and museal activities. In particular, the absence of limitations increases the probability of participation in museum and theatre visits by about 30%. This is a very significant result that confronts us with the problem of reduced access and therefore fruition of some cultural consumption items on part of people with disabilities. In general, accessibility to the places of culture may not be assessed simply by counting the number of obstacles that deter entry, but other relevant characteristics must be considered, such as the presence of suitable bathrooms, the ease of access to the ticket offices and bar counters, and the number of reserved parking slots, in the vicinity of the cultural venues themselves. Not to mention the fact that very often the help of a companion is needed just to open the doors.

Ensuring the accessibility of museums and theatres to disabled people means taking into account a multiplicity of factors that have gradually accumulated over time according to the evolution of museal and theatrical purposes and organisations. The usability of the access (transport systems, parking facilities, being able to access and visit the exhibition spaces without barriers) and the fittings vary from exhibition to exhibition. Another relevant dimension is constituted by the possibility of using information and teaching aids (audio, video, paper) and the services attached to the facilities (toilets, catering, bookshops, classrooms, etc.). Last but not least, the issue of the possibility for the blind to enjoy the works of art through audio or braille aids, but also through tactile works, represent a significant dimension of accessibility.

Usage rather than access is conditioned not only by disability in its broadest and most generic sense but above all by the type of disability (motor, sensory, etc.). This problem erases the possibility of single catch-all solution to fit every need. In order to make the matter clearer, let's consider the case of a person with visual impairment and the limitations associated with visiting a museum.

A work of art is a manifestation of human ingenuity and by its nature it sparks emotions, wisdom and culture; it is perceivable mainly through the sense of sight. Therefore, in the case of visually impaired people, the problem of accessibility arises from the very nature of the artistic artifact, which for many still remains a mere object of artistic contemplation, and not of aesthetic participation in itself. Therefore, blind people are strictly barred from a full fruition of visual arts. For a blind person, the other four senses must be able, through stimulation and continuous training, to compensate for the deficiencies caused by visual impairments; in particular, touch takes on a predominant role in the experience of reality.

The sensitivity and interest in the problems inherent in the usability of museums by people with visual impairments was born with Ministerial Decree 236/1989, where sensory disability becomes the object of attention, considering fundamental concepts such as accessibility, usability and adaptability of museums. Designing the accessibility of a museum means making it a safe, comfortable and qualitatively better place for all potential users, ensuring free access to communication and information so that the museum itself carries out its social role. The solutions adopted to best express the objective proposed were essentially two: the creation of "special museums" with casts of original works, and the establishment of paths designed for a public with visual disabilities within "normal museums". In both cases, the fundamental element for the success of a visit is the presence of qualified and trained personnel who guide the blind person during the visit and carefully select the words to be used during the explanation.

In Italy there are two important museums created for an audience of people with visual impairments but open to any user: the Anteros in Bologna and the Omero in Ancona. The first collects tactile reproductions of paintings inside, the other instead presents a collection of plaster copies of sculptural works as a central nucleus. These institutions, born essentially as places of culture accessible both in form and content, however, have a downside: they could in fact turn out to be ghettoising places where people with the same disabilities can be relegated (just as happened in institutions for the blind) and therefore fail to fulfil their socio-cultural function. There are also "normal museums" which, thanks to the sensitivity of their directors, manage to welcome and assist the blind visitor through practices and measures designed for a wide audience, which also includes people with disabilities. Some important national museums have already set up tactile paths for some time that allow visually impaired people, guided by suitably trained museum staff, to explore, wearing latex gloves, the original works kept inside

the exhibition spaces. Attention to the issue of usability has grown considerably in recent years. While visiting a museum indeed it is not uncommon to come across new-generation aids designed to increasingly meet the needs of the public with visual impairments.
Several museums are nowadays equipped with:
Talking signs: a receiver, similar to a remote control, by capturing infrared signals emanating from repeaters placed in each room, acquires descriptions of the environments and objects that can then be listened to thanks to the headphones or live-voices;
Walk assistants: a copper wire applied to the ground, reacting to a magnetic field, makes the stick, which the visitor is equipped with, vibrate in different ways according to the different needs of the route (it will indicate, for example, having to stop to touch something, or to listen to explanations);
Audio guides: audio devices have been improved thanks to the use of a more careful terminology that is closer to the reality of people with visual difficulties and enriched with historical-anecdotical contents;
Maps and tactile signs: valid and effective aid to mobility in a museum, these somewhat devices allow people with impaired vision to find orientation inside a museal building. The former, made in relief with strongly contrasting colours, for use by visually impaired people, report various information ranging from the floor plan of the environment to the possible tactile path on the ground, up to the main information, reproduced in both braille and black, on this which contains the room visited. Tactile maps allow everyone to know where they are and what there is to "feel or touch" nearby. Tactile signs, on the other hand, also with braille and black characters, describe what is on display and provide information on the services offered.

Explanatory Variables	Dep. Variable: **Theatre**	Dep. Variable: **Museum**
non-serious limitations	0.2723***	0.2996***
	(0.0539)	(0.0488)
no limitations	0.3011***	0.3223***
	(0.0508)	(0.0459)
Sociodemographic variables		
gender	-0.0499***	-0.0780***
	(0.0175)	(0.0146)
age35_44	0.140***	0.0197
	(0.0241)	(0.0241)
age45_54	-0.237***	-0.0387**
	(0.0182)	(0.0283)
age55_64	-0.321***	0.0615**
	(0.0243)	(0.0404)
age64_	-0.528***	0.0691**
	(0.0129)	(0.0269)
econ_stat_good	0.0449***	0.2119***
	(0.00921)	(0.0102)
		(0.00596)
university	0.4613***	0.4621***
	(0.0123)	(0.0174)
Observations	29,022	29,022

Tab. 3: Regression Results. *Note: Standard Errors in parentheses, ***p<0.01 **p<0.05 *p<0.1*

5. Concluding Remarks

In this paper we studied how access to museums and theatres is limited by the presence of disabilities. In particular, using ISTAT microdata on the “Aspects of Daily Life” referring to the year 2016, we have verified that serious limitations reduce participation in theatre and museum activities by about 30%. Furthermore, we have highlighted that considering disability in its most general sense does not allow to solve the problem of accessibility and usability of a given cultural consumption item. The type of disability and the severity of the disability must be taken into consideration.
Participating fully in cultural life means being an active component in the flow of societal fabric. This is the ultimate goal of promoting disabled people in the world of culture. Disability is not an anomaly, but

only one of the many variants and aspects of the human being. And the variety of human beings becomes a winning factor when everyone's skills and potential are used appropriately and effectively - also and above all in culture.
In order for this variety to express its full potential, people with disabilities must actively participate in the cultural life and in the cultural policy debates, while being listened to. This applies to all areas of cultural supply and not just to those that deal with disability. Another essential point relates to the link between experts and interested parties. People who work in the world of culture, specialised personnel of help and self-help for disabled people, operators of cultural promotion and mediation and the service sector, but also the media and not least the population concerned must be called into question.

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Does culture tear down barriers? The effect of cultural consumption on mental disability in Italy. An empirical investigation.

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Abstract
As in most EU countries, the role of the cultural policy within the broader scope of social cohesion has traditionally remained marginal in Italy. Relying on rational addiction theory, some recent contributions argue that widening access to cultural consumption may produce persistent positive social effects. This strand of literature challenges the traditional idea that the cultural policy should mainly subsidise merit goods – whose diffusion ideally represents a social goal per se – and calls for a reconsideration of the positive spillovers that may derive from cultural consumption. One significant social category that generally lacks access to cultural goods is represented by people with disabilities, who also feature lower labour market participation rates, lower electoral turnout rates and a higher probability of facing poverty and social exclusion. Cultural consumption may thus represent a channel to foster the social participation of people with disabilities and to remove the barriers that tend to isolate them.
Based on the above, this work exploits recent official data on disability (i.e the share of people with mental disabilities) and cultural consumption in order to establish a causal relation between the two variables at the regional level in Italy. Using observations drawn from ISTAT, this work implements a dynamic panel regression covering the 2005-2019 timespan. The results of the analysis provide insights on the tools and levers that the cultural policy may resort to in order to play a more central role in the definition of social outcomes, including health, wellbeing and social inclusion for the citizenship as a whole.

Keywords: cultural consumption; mental disability; dynamic panel; cultural policy.

1. Introduction
About 15% of the world's population suffers from at least one disability (World Bank, 2016). Overall, Europe counts 80 million people with disabilities, i.e. one citizen out of six. In Italy, disability affects 6.7% of the population (WHO, 2016). Due to the ageing of the population, which typically exposes people to a wider range of disabilities (WHO, 2011), these figures are expected to grow in the near future. As a result, the share of people with disability is projected to reach 10.7% in 2040 in Italy (Censis, 2012). While common sentiment often identifies disability with physical limitations, a significant share of the people with disabilities feature in fact mental disabilities. Approximately 8% of the world's population is affected by mental disabilities (Burns, 2009), which means people with mental disabilities slightly outnumber those with physical disabilities. Given the demographic size of the phenomenon and its increasing trend, it is no surprise that governments take an active part in the struggle for the inclusion of people with mental disabilities (see Agovino et al., 2017). In Europe, the diffusion of national laws on the protection of people with disabilities in the last 25 years has been astonishingly rapid (Vanhala, 2015) and a significant share of public expenditure has been devoted to specific 'disability equality' measures. The Italian legal framework introduced such measures with Legislative Decree 216/2003.

Mental disabilities generate two types of costs in governmental budgets: 1) forgone earnings, related to decreases in productivity and fiscal revenues and 2) treatment and adaptation expenditures. On the one hand, people with mental disability accrue lower levels of human capital, are less likely to participate to the labour market, work fewer hours, and received lower wages (Scheid, 2005; Mitra, 2009; Frank et al., 2019). On the other hand, many types of mental disabilities require constant medical care and/or ad-hoc devices and professional skills. The government typically bears a large share of the economic burden associated to these costs. Reducing the incidence of mental disability thus not only represents a step towards along the path to social progress, but also entails significant budget savings for the government. Effective social policies in this view yield positive fiscal spillovers.
Within the broader scope of social policy, little attention has traditionally been devoted to cultural policy (Ferraro et al., 2019). Several decades of economic and social development however have induced significant changes in the status of cultural consumption. Despite representing an archetypical example of luxury goods in the early 20th century, cultural consumption items have progressively made their way into the average consumer's basket. Museum visits, theatre shows, cinema movies and concert tickets are largely featured in the monthly budget of most European families. About 3% of the total consumption expenditure by EU households indeed was devoted to cultural items in 2005 (Eurostat, 2019). The sociological literature describes the consumption of cultural goods as a necessity rather than a whim (Van Eijck & Van Oosterhout, 2005; Sullivan & Katz-Gerro, 2007). The recent literature shows that the consumption of cultural goods may produce positive social effects in several domains, including social inclusion, environmental behaviours and political participation (Hassan et al., 2015; Agovino et al., 2019). Cultural consumption contributes to determination of values and behaviours (Katz-Gerro, 2004; Lizardo, 2006; Turel et al., 2010)[1]. More broadly, cultural consumption plays a role in shaping consumer identity and social outcomes (Katz-Gerro, 2002; Alexander, 2003).
Based on the above, this work aims to investigate empirically the relation between cultural consumption and one particular social outcome, i.e. the incidence of mental disabilities. Using official data on Italian regions between 2005 and 2019, we run a dynamic panel regression based on the GMM-SYS version of the Arellano-Bond estimator.

2. Method

In order to investigate the effect of cultural consumption on the diffusion of mental disability across Italian regions, this work proposes a dynamic panel regression. Contrary to standard panel models, that are static by their own nature, dynamic panel models include an autoregressive component that allows to control for persistency patterns in the dependent variable (Arellano & Bond, 1991). Including the time lag of the dependent variable among the covariates raises an issue of endogeneity, which must be addressed by resorting to suitable instruments. In particular, the deeper lags of the dependent variable have been proved to be exogenous and valid instruments (Arellano, 1989), which may be taken both in first differences and in levels to expand the instrument set and improve efficiency. This approach consists in implementing the GMM-SYS estimator (Arellano & Bover, 1995; Blundell & Bond, 1998; Hayakawa, 2007). To avoid the loss of time periods generated by the introduction of further lags, the missing values in the instrument matrix may be replaced with zeros (Holtz-Eakin et al., 1988). The equation to be estimated looks like follows:

$$Y_t = \rho Y_{t-1} + X_t \beta + \varepsilon_t \qquad (1)$$

where Y_t is an $NT \times 1$ vector of observations relating to the dependent variable at time t (in our case the share of citizens featuring mental disabilities at the regional level), Y_{t-1} is a conformable vector of time lags, X_t is $NT \times K$ full-column rank matrix of covariates, ε_t is an $NT \times 1$ column vector of error terms, ρ is a scalar parameter that measures persistence and β is a $K \times 1$ column vector of parameters that capture the marginal effects of the covariates.
The endogenous nature of Y_{t-1} requires the introduction of an instrument set that includes both the levels and the first differences of the deeper lags. The instrument matrix Z contains different instruments for each period.

[1] For example, attendance to classical music concerts is associated with lower smoking levels (Pampel, 2006)

$$Z = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ y_{t-4} & \Delta y_{t-4} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & y_{t-4} & y_{t-3} & \Delta y_{t-4} & \Delta y_{t-3} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & y_{t-4} & y_{t-3} & y_{t-2} & \Delta y_{t-4} & \Delta y_{t-3} & \Delta y_{t-2} \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} \quad (2)$$

Every period of equation (1) identifies a different equation. The columns of matrix Z represent the instruments available for each equation. In the presence of six time periods for instance, the structure of the instrument set is summed up in equation (2). The first-differencing procedure removes one period, leaving in the earliest period $t-5$ only one lag is available (y_{t-4}, which can be taken both in levels and in first-differences, hence the first two columns of Z). It is interesting to notice that this estimation method is exactly a system estimation technique, which allows the instrument set to vary across equations, according to the number of lags available in the data set. The user-written *xtabond2* command implemented in the econometric software STATA, allows to run the GMM-SYS estimator (see Roodman, 2009).

3. Data

The dataset employed in the empirical analysis combines information gathered from the 'Health for All' database and data drawn from the 'Aspects of Daily Life' survey, both published by the Italian National Institute of Statistics (ISTAT). The Health for All database contains 4,000 indicators related to health in the broadest sense, while the Aspects of Daily Life survey is a multipurpose investigation of 18,864 households and 44,984 individuals aimed at collecting information on their habits. Several dimensions are considered, including the extent of participation in cultural activities (such as visits to museums, archaeological sites, theatres and cinemas). Our dataset covers the 2005-2019 timespan.

The regional level estimate of the incidence of mental disabilities represents the dependent variable of the analysis. While the issue of disability may be tackled from several angles, we follow the proposal presented by the European Disability Forum, which is based on the International Classification of Functioning, Disability and Health (WHO, 2001). This conceptual framework, pertaining to the social or inclusive model of disability, which identifies disability based on the capability approach. An individual is in other words considered as featuring a disability if her autonomy is limited because of the characteristics of the context where she lives and operates. Alternative approaches exist, including the 'institutional' definition, which is based on the legal certification of disability and the 'subjective' approach, which relies on self-perception. The other variables in our dataset capture the regional level diffusion of cultural consumption, distinguishing among six items. Each variable is defined as the share of residents aged 6 or older that have at least once during last year attended to the specific cultural consumption venue.

Table 1 sums up the main features of our dataset from a statistical point of view. In particular, *Mental Disability* is defined as the percentage of the resident population that features mental disabilities. A value of 5 for instance indicates that the regional incidence of mental disability is 5%. Similarly, a value of 10 for the *Theatre* variable indicates that 5% of the residents aged six or older have visited a theatre at least once over the last year.

Variable	Obs	Mean	Std. Dev	Min	Max
Mental Disability	300	4.354783	1.376174	1.809683	9.327533
Theatre	300	18.27608	4.568582	7.608928	31.15782
Cinema	300	45.56452	4.670179	33.50266	58.75198
Museum	300	8.901803	1.917664	4.220093	14.85092
Opera	300	19.40462	3.152177	12.40025	29.22193
Concert	300	21.42866	5.69606	9.325173	33.47712
Archaeology	300	4.354783	1.376174	1.809683	9.327533

Tab. 1: Descriptive Statistics

While a wide range of heterogeneous activities typically fall within the label of cultural consumption (Goldberg et al., 2016; Noble and Ang, 2018), cultural goods may be broadly classified in two categories: fine arts and popular arts (Alexander, 2003; Lizardo & Skiles, 2008; Alexander and Bowler, 2014). Elite artistic forms like classical music, opera and visual arts belong to the former category,

while massified artistic expressions, such as cinema and pop music, belong to the latter. Over the timespan under analysis, the most popular cultural consumption item was represented by cinema tickets, followed by music concerts (including pop, rock, jazz, etc). The latter two items have been described in the literature as popular consumption items, since they are easily accessible to a broad range of consumers – which by the way explains their popularity (Ferraro et al., 2019). Other items, such as visits to museum and archaeological sites or theatre and opera performance tickets, are definitely less popular. Their lower fortune is related to the high cultural level that is required to fully appreciate these consumption goods, which may thus be seen as examples of elite consumption items (Alexander & Bower, 2014; Agovino et al., 2019). These cultural goods are typically consumed persistently by citizens that learn to appreciate them, through a mechanism of rational addiction (Castiglione & Infante, 2016). The marginal utility of the consumption of these goods increases with the number of visits.

4. Results

The results of the empirical analysis are shown in **Table 2**. The first piece of evidence that is worth highlighting relates to the extent of persistency in the dependent variable, that turns out to be strong. The coefficient associated to the autoregressive component is indeed positive, significant and very high (0.86), implying that the regional level incidence of mental disability features considerable inertia. This is not surprising, since mental disability may hardly be eradicated *tout court* from one year to the next.

Attendance to concerts and cinemas seems to stimulate the diffusion of mental disabilities. The coefficients associated to these variables are both positive and significant, although at different levels: while the marginal effect of cinema attendance is significant at 1%, the marginal effect of concerts is significant only at 5%. Both items pertain to the category of popular consumption goods and share some relevant characteristics. The previous literature indeed claims that exposure to popular cultural consumption goods may orient individual values towards materialism, disseminating and reinforcing a cultural humus of indifferent towards social issues. Movies often portray the so-called trappings of materialism (i.e. opulence, riches and luxury) in a positive light, exalting material possessions as symptoms of success and highly desirable achievements (Lee and Shrum, 2012; Solomon and Lowrey, 2017). Similarly, most mainstream music genres make frequent references to status, luxury goods and material/sexual success, spreading materialistic values (Anderton, 2011). Some popular music genres, like hip-hop and rap, are associated with various forms of anti-social behaviours (Miranda and Claes, 2004; Diamond et al., 2006; Leung and Kier, 2008). Analogously, rock and heavy metal often contain references to rebellious and anti-social conducts (Weisskirch and Murphy, 2004; Leung and Kier, 2008). All these genres may be very broadly classified as popular music and they tend disseminate and reinforce a somewhat materialistic attitude. Overall mainstream movies and music genres may cause psychological distress in consumers through two channels. First, both items typically display highly attractive performers, that tend to set the aesthetic standard of beauty in society. Failure to meet this idealised standard may cause psychological distress in viewers. Second, the materialistic values that come with both items may reduce the availability on part of the citizenship to act inclusively, thus marginalising and discriminating socially fragile individuals, who may in turn develop mental disturbs.

Back to table 2, attendance to museums and archaeological sites produces a decrease in the spread of mental disabilities. The coefficients associated to the two covariates are both negative and significant, although at different levels: the marginal effect of museums is significant at 1%, while the marginal effect of archaeological sites is significant at 5%. Visits to both venues in other words contribute to the creation of a collective social identity that fosters inclusivity at the community level and ultimately offers solid roots upon which socially fragile individuals may stand (Curtis, 2011; Lizardo and Skiles, 2015). The beneficial effect of these cultural venues translates into a strong sense of community and makes mental disorders less likely to occur. In this sense, monuments represent the architectural dimension of local identity, which reinforce the sense of belonging to a certain community foster tolerance and fight prejudice (Sandell, 1998; Janes, 2011).

The geographical dummies are both positive and significant at 5%, implying that a certain degree of heterogeneity characterises Italian regions. In particular, the South of the country features an overall significantly lower incidence of mental disability with respect to the rest of the country. The North instead is the area that is most affected by the problem. The time dummies (not displayed in the table) are all significant and negative, drawing a pattern of gradual reduction of the incidence of mental disabilities.

Finally, the diagnostic tests confirm that the model specification is adequate and that the instrument set is reasonable.

	Mental Disability
Time Lag†	0.862

	(0.020)***
Cinema	0.022
	(0.005)***
Concerts	0.018
	(0.007)**
Museum	-0.021
	(0.008)***
Theatre	-0.002
	(0.007)
Opera	-0.025
	(0.018)
Archaeology	-0.019
	(0.008)**
North	0.2124
	(0.100)**
Centre	0.1687
	(0.078)**
Time Dummies	Yes
_cons	0.623
	(0.254)**
Sargan Test	9.701
	(0.191)
Hansen Test	3.214
	(0.879)
AR(1)	6.45
	(0.000)***
AR(2)	1.01
	(0.316)
AR(3)	0.90
	(0.368)
N	280

* $p<0.1$; ** $p<0.05$; *** $p<0.01$, †Endogenous variable, suitably instrumented

Tab. 3: Regression Results.

In most developed countries, the government is involved in direct provision of cultural services and in financial support to cultural activities and goods (Katz-Gerro 2002). The Italian government is no exception, and it intervenes in the domain of culture through the national Ministry of Cultural Goods (MiBACT). Despite a consolidated tradition of direct patronage, MiBACT has modified its policy bundle over the last 30 years, shifting progressively from hard measures – such as direct subsidies on the provision of cultural goods – to soft measures, i.e. to actions targeting the incentives of economic agents. For instance, the budget of FUS (Fondo Unico per lo Spettacolo – Single Fund for Entertainment), which has ever since represented the main funding instrument for cultural goods, was cut by almost 60% between 1988 and 2012 (Castiglione and Infante 2016). On the other hand, the ministry has introduced free Sundays and provided fiscal incentives for private donations to cultural institutions.

Free Sundays consist in exceptional openings of cultural venues, such as archaeological sites and museums, which were made accessible for free on the first Sunday of each month, to the benefit of the general public. This measure was designed in order to widen access to cultural venues, allowing all citizens to enjoy cultural goods without paying for tickets, but also accustoming them to cultural consumption, thus possibly triggering a mechanism of rational addiction. Fiscal incentives for donor are meant to increase the role of private citizens in providing support to artistic and cultural institutions. The lack of public funding has been jeopardising the maintenance of the national heritage for years, calling for alternative funding sources. In this view, Law 106/2014 introduced a tax credit for citizens who decide to make donations to cultural institutions. Taxpayers may thus devote 0.5% of their income tax to MiBACT (Buzzi 2017). These mechanisms of 'new Mecenatism' and crowdfunding have been highly appreciated by taxpayers (Marchegiani 2018) and now represent the cornerstone of a new line of policymaking in the field of culture, featuring a bottom-up approach that leverages and capitalises citizens' sensibility. In this sense, the Italian cultural policy may be seen as a benchmark for all the countries in the EU.

5. Concluding Remarks

To our knowledge, this work represents the first attempt to evaluate empirically the effect of cultural consumption on the diffusion of mental disabilities in Italy. Using official data at the regional level for the 2005-2019 period and controlling for autocorrelation in the dependent variable, we find two different effects: 1) popular consumption goods increase the spread of mental disabilities, while 2) elite consumption goods generate a drop in the diffusion of mental disabilities. These results may be justified in light of the sociological literature. In particular, popular consumption items are related to materialistic and anti-social values, which contribute to the creation of a stressful, competitive and all but inclusive social environment. Socially fragile individuals thus are more likely to end up being marginalised and to develop mental disabilities. Elite consumption items instead reinforce the feeling of belonging to a certain community, corroborating social identity. As a result, they contribute to establishing a more tolerant and cohesive environment, which ultimately reduces the probability that socially fragile individuals develop mental disabilities,

These results represent a further step in the analysis of the role of the cultural policy, which may produce positive spillovers in several domains of social life, including social inclusion and mental health.

Some limitations need to be highlighted. First, the lack of publicly available micro-level data has led us to use administrative regional level (NUTS-2) data. Inevitably, administrative data fail to capture several individual characteristics that may contribute significantly to explaining mental disability. Second and related to the previous point, the lack of a suitable set of covariates may generate an omitted variable bias. While our model manages to remove any source potential unobserved heterogeneity as long as it is constant over time, time-varying effects are not properly controlled for.

Future studies may resort to micro data – as well as to wider dataset covering relevant covariates – to confirm the validity of our results.

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Forgotten architecture: the “Real Casino della Lanciolla”

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Abstract
During the reign of Carlo di Borbone and then of Ferdinando IV, a large amount of land intended for agricultural and livestock production and hunting activities became Royal Sites. Some of them played a role of greater importance and relevance; others, on the other hand, of lesser importance, nevertheless played a non-secondary function as a place of hunting entertainment so loved and appreciated by the Bourbon kings. Among the places destined to the pleasure of the royal family - also known as “Reali Delizie” - it is possible to include the “Real Casino della Lanciolla”.
Almost completely unknown to historiography, the “Real Casino della Lanciolla”, built in 1779 for the hunting diversions of Ferdinand IV of Bourbon, presents a singular articulation in the planimetric layout and in the relationship with the territory. In fact, it rose in the center of a small lake basin, surrounded by woods. The site of the Lanciolla, today, is in a state of absolute decay.

Keywords: History of architecture, XVIII century, Real Sites, Lanciolla

In the area near the Royal Palace of Caserta, in the countryside of Terra di Lavoro, it is not difficult to find villas and residences built in the 18th century and destined for the Bourbon royal court.
Structures of lesser architectural importance, connected to a "courtier" use of the territory, were endowed with structural and functional characteristics that qualified them as residences of pleasure and representation. Usually surrounded by parks or gardens, the places of pleasure were generally composed of modest buildings, though excellent, with few rooms and sometimes some loggias that emphasized the osmotic relationship with the surrounding landscape. There are not only amusements, entertainment and hunting trips at the basis of the construction of these complexes, but a complex strategy of redraw the territory that has given the countryside surrounding the Royal Site of Caserta, dominated by the imposing royal palace, a configuration related to the concept of “territory-garden”, an adequate space to host the royal court and its entourage, functional to the celebration of dynastic prestige. Examples of residences built by the king or for the king in the Caserta area were the “Casino del Re” in Castel Volturno or the “Casino Reale” in Sparanise. The Royal Hunts of Caiazzo, the Selva of Alife, the Spinosa and the Cerquacupa were also part of that system. Other reserved hunts in Terra di Lavoro were that of Montecaro, between Casertavecchia and Maddaloni, the hunting of Montelongano, between Maddaloni and Sant'Agata dei Goti, the Carbone reserve between Marcianise and Carditello, property of the Duke of Bovino, the forest of Calabricito near Acerra, and the forest of Sant'Arcangelo, near Caserta. The large wooded areas were mainly intended for hunting activities.
The Caserta area thus became the field of application of the Bourbon Enlightenment policy which, with the creation of "real sites", aimed not only at providing itself with suitable places for leisure, but at pursuing precise objectives of economic rationalization to increase investments in agriculture and manufacturing and to ensure protection and prestige to the monarchy [1]. In choosing the "royal sites", the Bourbons obviously considered the abundance of game, but they also evaluated the productive resources of the land, the presence of water and woodland, favoring the renovation and revitalization of the pre-existing resources of the territory, the improvement of the network road, the construction of bridges, canals and aqueducts, as well as the drainage of swampy areas [2].

The great passion of the two Bourbon kings for hunting was well known to diplomats and visitors, who talked about it in their correspondence or in their memoirs [3]. The interest of the Bourbon kings for hunting enterprises, which to many appeared immoderate, was such as to mark the timing of government activity, to influence the political commitments, to condition the customs and tastes of court society. But the hunt also represented a moment of a more articulated strategy with which the kings tried, through the multiple tools of courtly sociality, to reconcile the nobility. The practice of hunting, in fact, was part of that disciplinary process aimed at regulating the customs of the aristocracy of the Kingdom, formalizing itself in a ritual in which, through the game of priority, the king could strengthen or modify the social and political balance[4]. Hunting was, together with offices, honors, ceremony and dwelling, an element of court life, a strategy of disciplined, formalized and ritualized ostentation, an instrument of representation of power and the court system, as well as one of the forms of territorial control.
The expansion and multiplication of areas reserved for royal pleasure and the entertainment of the kings was a direct consequence of this. Large rural and woodland areas, territory of the province of “Terra di Lavoro”, were destined for the king's hunt. Some territories derived from the practice of reserving hunting for the king in areas that continued to be owned by noble families, cultivated and inhabited by local populations, playing an important role in the transformation of the agricultural landscape. The royal villas and hunting lodges were sometimes built, at other times they derived from extensions or rebuilding of existing old buildings, but generally they were often modest buildings where the king and his entourage went at certain times of the year depending on game to hunt. Following the example of the king, the local nobility also began to build villas and country houses in the territories they owned to be used for hunting and pleasure craft.
The "Real Sito della Lanciolla" belongs to the latter type, built by Ferdinand III de Cardenas, who became Count of Acerra in 1753 following the death of his father Alfonso and his eldest brother Carlo. The construction by de Cardenas of a building expressly intended for the hunting of Ferdinand IV implies political and representation purposes, a moment and a space for meeting the king and the members of courtly society, an instrument to give social prestige to the family of the Count of Acerra.
The new count, in fact, choose Acerra as his residence, expanding and increasing the comfort of the castle where he usually resided and inviting Neapolitan nobles and aristocrats to parties and banquets. Among his guests was often Ferdinand IV of Bourbon, a notorious enthusiast of hunting. The king was attracted to the game in the Calabricito woodland, near the baronial castle of Acerra, rich in water birds, wild boars, fallow deer, deer, hares, foxes and wolves [5].

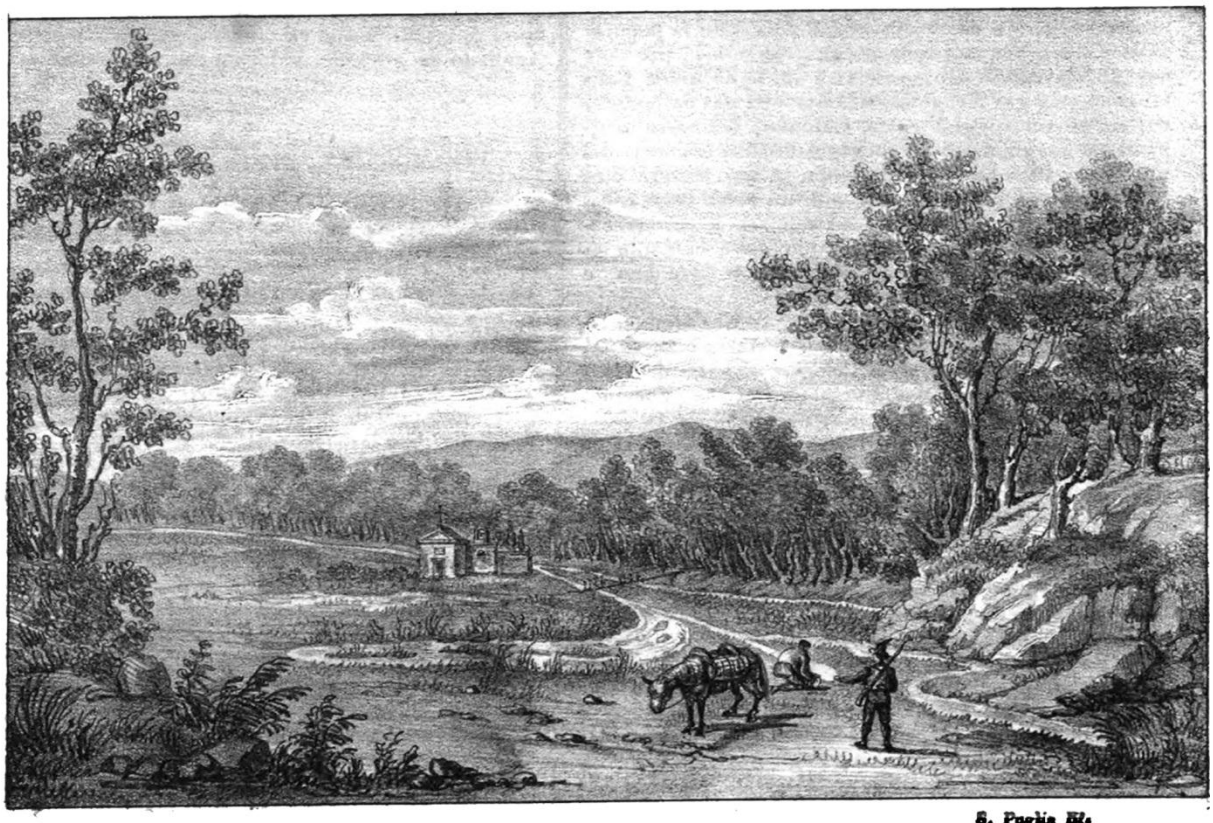

Fig. 1: The woodland of Acerra, in “Poliorama Pittoresco”, IX, I, Napoli 1845.

The Calabricito woodland was, in fact, a very vast wooded area, of about 800 moggia, with a dense presence of wild trees and rich in game. It was an area reserved for her Majesty's hunting, in the perimeter of which there was only a small wooden structure [6]. To offer King Ferdinand a hospitality worthy of a sovereign, Ferdinand III de Cardenas had a noble Casino in the woods built in 1778, known as Casina Spinelli [7]. But since for winter hunting it was necessary to enter the dense vegetation, the Count had another smaller Casina built in Lanciolla or Langiola [8]. Thus, in 1779, the "Real Casino della Lanciolla" was built, immersed in the woods along the east-west embankment of the course of the Lagno. The choice of the site was not accidental. The site was suitable for the characteristics of the place, surrounded by curly woods of game and in the center of a small lake basin, populated by fish fauna. It was also easily accessible from the royal palace of Caserta and was therefore suitable for short-term excursions.
In the secret diary of Ferdinand IV of Bourbon, it is reported on Wednesday 28 December 1796: "Mi sono alzato alle sei del mattino. Dopo aver trascorso una notte molto inquieta, mi sono vestito e ho ascoltato la Santa Messa. Ho scritto così questi primi righi del mio diario. Fattesi le nove del mattino, sono andato a caccia al Fusaro di Maddalona. Lì presso la Lanciolla mi sono ben divertito" [9].



Fig. 2: Jakob Philipp Hackert, Ferdinand IV hunting coots on Lake Fusaro, 1783.

The locality "Lanciolla" is already indicated in the map of Antonio Bulifon Campagna Felice of 1692 and in the map of Alessandro Baratta Campaniae Felicis Typus of 1616. The site of Lanciolla, with nearby the fusari of Aurno and Sanguaniello, stood in the western vertex of the triangle formed to the north by the canal of Sagliano, called Lagno Nuovo, to the west by the "Lagno dell'Inferno", also known as the Old, and by the canal of Lescaro to the east. This triangle rose at the height of the "Fusaro di Maddaloni", along the east-west embankment of the "Lagno Nuovo di Sagliano", around which were both the "Bosco di Aurno" and the woodland of S. Arcangelo and finally the woodland of Calabricito. The structure was originally surrounded by the water of a lake basin and by woodland with an undergrowth rich in wild boars, hares and foxes and by a vegetation typical of the swampy areas populated by ducks and pheasants, with a relationship with the surrounding landscape similar to that of the "Casina Vanvitelliana del Fusaro".



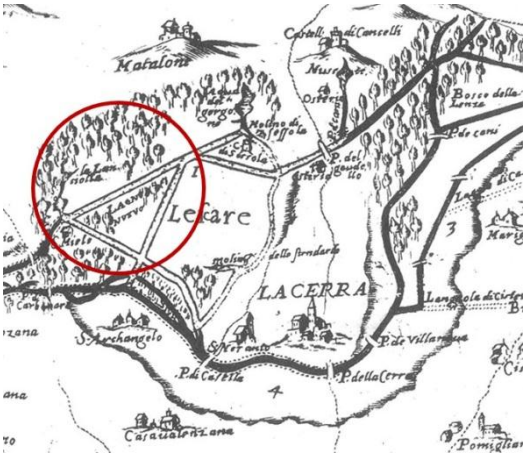

Fig. 3: A. Bulifon, F.Cassiano de Silva, Campagna Felice, 1682. Detail of the Lanciolla area.
Fig. 4: A. Baratta, G. Barrionuevo, Campaniae Felicis Typus, 1616. Detail of the Lanciolla area.

The structure, consisting of three separate buildings, was intended to house a bedroom for the king in the larger central building, and in the two smaller side buildings the rooms for servants and the royal guard. Still visible traces of the original plaster document that the external elevations and internal walls were plastered in Pompeian red. The moldings of the façades, cornices and edges were covered with light yellow plaster. In the largest octagonal structure, four large iron rings were fixed to the ceiling to support the King's bed, still visible today. They suggest that they were used to keep a plank suspended from the floor, on which the bed was probably located.
The two lateral buildings are simple compact blocks with a square plan at a single level and a double pitched roof covering. They were accessed from the elevated road to the north that ran along the Sagliano canal, while to the south the entrances were raised and opened directly onto the water. Even today it is possible to recognize the bricks that make up the base of the buildings, covered with lime and pozzolan-based material, used to waterproof the part that stood in the water.



Fig. 5: Photo of the “Real Casino della Lanciolla”. North side.

The articulation of the central body is more complex, covered with a four-pitched roof, surmounted by three chimneys. The external volume, with a square plan, encloses an octagonal room covered by a lowered counter-vault with eight sides, marked by stucco ribs converging in a central oculus of octagonal shape. The vault has alternately arched and straight moldings at the base. Outside the building was accessed via a central marble staircase, located on the south side of the structure which allowed direct access from the lake basin. On the external elevations on the sides of the entrances, circular moldings with hooks for mooring boats are still visible. A sundial was placed on the entrance. Inside, the flooring was brick with bricks arranged in a herringbone pattern. The internal hall was decorated with simple moldings that emphasized the geometry of the volumes. Two large fireplaces were arranged on the south-east and south-west sides of the room, while on the opposite sides were a wood stove and a toilette.
In line with the entrance and on the east and west sides of the octagon there were the entrance rooms, surmounted by a supporting structure with arches. These rooms, towards the canal to the north, were raised from the ground level by about one meter, probably due to the presence of the swamp water. The entrances were, therefore, placed almost on the water, allowing the docking of small boats, used at the time to move in the swamps.

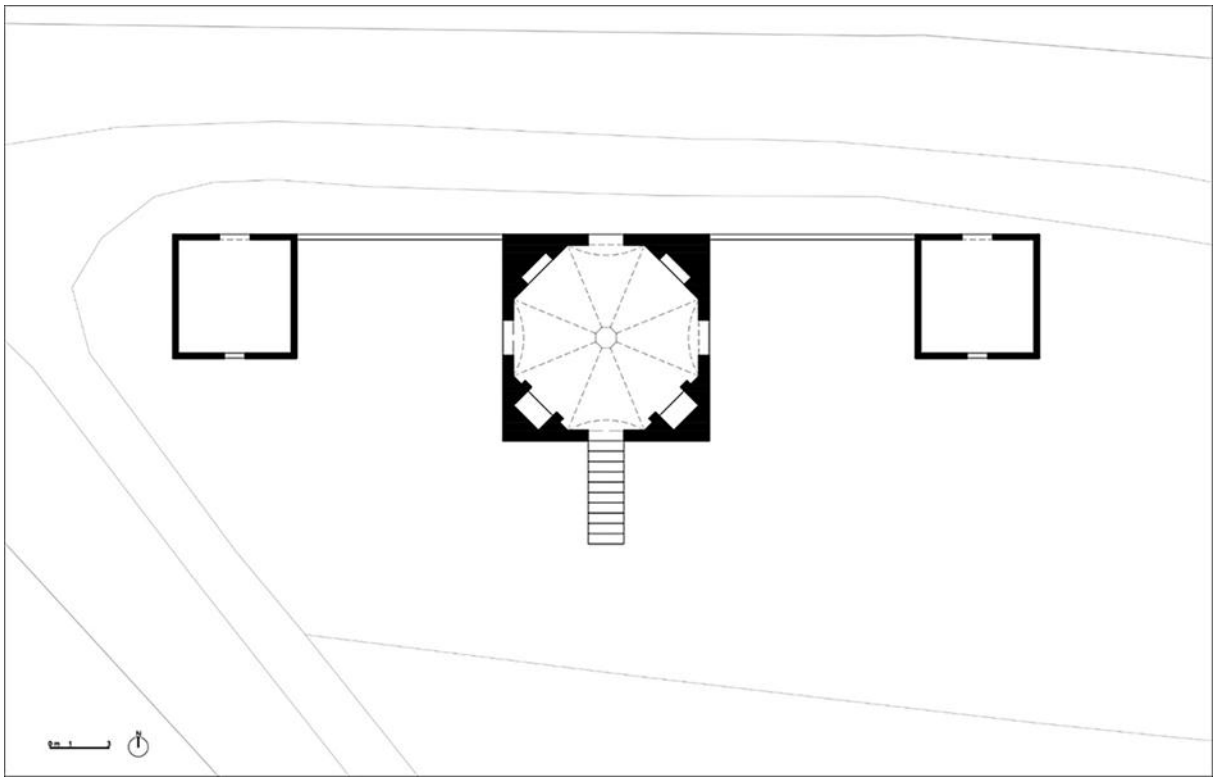

Fig. 6: Plan of the “Real Casino della Lanciolla”.



Fig. 7: Photo of the “Real Casino della Lanciolla”. South side.



Fig. 8: Photo of the “Real Casino della Lanciolla”. The interior space with the two fireplaces.



Fig. 9: Photo of the “Real Casino della Lanciolla”. The vault with hooks to hang the bed.



Fig. 10: Photo of the “Real Casino della Lanciolla”. The side building with hooks for mooring boats.

In the seventeenth century, the entire territory of Acerra was subjected to a vast reclamation work commissioned by the Viceroy Count of Lemos, who built a system of embankments and canals for the collection of stagnant water and to prevent the formation of swamps. This work also involved the rebuilding of the bridge located in the Lanciolla carried out between 1634 and 1636.
Alfonso de Cardenas in 1722 began a work of reclamation of the low lands to make them suitable for agricultural exploitation. The architect Giuseppe Gallucci then went to the places to check their status and draw the plan of the entire Pantano. The project involved the construction from east to west of orthogonal road flanked by canals lined with poplars that delimited 24 large square areas, called Parks. The work was finished in 1723 [10]. However, it was the Bourbons who carried out regular maintenance of the “Canale dei Regii Lagni”, and under their government it can be said that the work was perfected.
During the nineteenth century the marshland and malaria devastated much of the Caserta plain and the countryside in particular, making fields and roads impracticable. It was the responsibility of the general administration of the Bridges and Roads, called “Direzione Generale dei Ponti e Strade”, through a series of technical interventions, to restart the reclamation work, which continued between various difficulties until the second half of the nineteenth century. The nineteenth-century cartography already records the state of abandonment of the Lanciolla, marked with the words "Casino diruto della Lanciolla".
At the beginning of the twentieth century an observation station was created by the Society for the studies on malaria in Marcianise, near Caserta, directed by Dr. Giacomo Rossi. The territory under study extended over large areas up to the Regi Lagni and the Lanciolla or Lanciosa site. In fact, on the borders of the Lanciolla territory there was a system of canals and tanks for the maceration of hemp, whose cultivation was extremely widespread in the region [11].
Lanciolla is currently located on the border between the municipalities of Maddaloni, Caivano and Acerra. The Lanciolla site is heavily modified due to the territorial and infrastructural transformations that have profoundly changed its structure.
Accessing the Real Site of the Lanciolla is very complicated due to the construction of the “Autostrada del Sole” which irremediably interrupted the accessibility and practicability of the ancient road. There is no longer any trace of woodland of Aurno, Maddaloni and Calabricito. During the last century, many of these areas, including the Lanciolla, were in fact subjected to interventions to improve the water structure to avoid flooding of the funds and improve the agricultural performance of the land and crops.



Fig. 11: Ufficio Topografico del Regno di Napoli, Disegno originali della carta dei dintorni di Napoli, 1836-40. Detail of “Real Casino Diruto della Lanciolla”.

In conclusion, the royal residences of Terra di Lavoro constitute a singular architectural heritage today largely abandoned. These structures constituted a system of rural houses and country villas intended for court entertainment and connected to the most important royal sites in the area, such as Caserta, San Leucio and Carditello. In recent decades, the inevitable transformations of wooded and rural land, reclamation and deforestation, a consequence of modern processes of anthropization and urbanization, have led to a progressive abandonment of these minor real architectures, now deprived of their original function, which remain with the their ruins as evidence of a glorious past.

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WORLD HERITAGE and DESIGN for HEALTH
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Urban care and architectural heritage: the case study of the Sanità district in Naples between micro-mobility and emergencies

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Abstract
Starting from *Imperfect Health* exhibition, interesting considerations have been developed on the relation between health, architecture and environment. Urban design is called to consider its specificity in order to make a contribution to the rooting of a new idea of care and cure for the city. One of the interpretative possible directions focuses on public space as common good, opening to urban mixing and hybridization. In this sense, closed and monofunctional spaces, such as hospitals, schools, stations, tend to completely lose their peculiarity in order to be part of a healthier way of living the city.
There are two main elements that can be taken into consideration in this radical transformation. The first precisely relates to the overcoming of urban consolidated typologies. The other concerns a different idea of park, through the radical overcoming of its figure perceived as a fence, gradually replaced by an idea of urban connector with plots of paths and concatenations, for a profound renewal of pedestrian areas.
The paper investigates how a conception of cure becomes urban, in strong consideration to the time the whole world has been going through. Covid-19 pandemic, climate change and other environmental issues are aspects that urban design have to deal with, in order to restore vital cities to people, starting from the architectural rethinking of facilities and urban spaces.

Keywords: Urban care, architectural heritage, design and health, city micromobility, architectural emergencies

1. Introduction
Health and well-being can profoundly influence the structure of the contemporary city according to a double mechanism. On the one hand, through a direct relationship between therapeutic activities, and urban and architectural textures of the city. On the other hand, the same spatial structure and urban uses, both in the existing and new parts, can to some extent favor the care of citizens, preventing the onset of pathologies in advance. The latter case is for many reasons more interesting, as it places city and architecture studies at the center.
Taking into consideration the large urban open spaces, which moreover may be correlated with buildings' interiors, in the exhibition "Imperfect Health. The Medicalization of Architecture" at the Canadian Center for Architecture, curated by Giovanna Borasi and Mirko Zardini in 2012, interesting considerations were developed on the connections between health, architecture and environment [1]. The research and the exhibition did not simply produce an overview on the issue. It actually selected projects through which it is possible to highlight uncertainties and contradictions traceable in the ideas of health and healthcare that have been emerging in Western countries during last decades. In this sense, the exhibition constituted a critical and useful tool for some investigation themes developed during the PRIN 2015 Research Project "The City as Cure and the Care of the City". In particular, the topic about the role of architectural design for a healthy city has been widely explored [2].



Fig. 1: Manifesto of the *#Curacittà Napoli* project (PRIN 2015 Research "The City as Cure and the Care of the City" DiARC, Unina) (drawing by P. Miano, A. Bernieri, 2020)

The city can, indeed, treat in different ways. Through a diversified and widespread offer of health facilities which operate in a traditional way for the health of the inhabitants. It can cure, as well, by means of a wide range of "attentions" to citizens, in addition to health services. They can be especially related to public facilities such as schools, sport courts and areas, places of culture. Yet, with the presence, functioning and maintenance of parks and public spaces. Also, with the promotion of pedestrian and cycling routes and therefore with a forward-looking perspective on public transport system. In this way, citizens are presented with the opportunity to take an active interest in the cure,

prevention and well-being of their own health, thanks to the city and through the city. In this viewpoint, the two typologies of care, the traditional kind and the active one, are not opposed, nor do they work independently, but rather tend to collaborate for a collective salubrity.
These considerations appear particularly significant in historic urban areas. Here it becomes urgent to rethink the enhancement and conservation of the built heritage and the system of open spaces with a view to sustainability and health on a citizen scale. In this sense, the work on the city of Naples as part of the PRIN research stands as experimental from the point of view of the thematic development of the project [3].
In the case study of the Sanità district, in particular, prevention strategies are proposed for the health of citizens starting from urban criticalities. These are: lack of green space and healthy air and at the same time restricted accessibility to the large landscape systems of the hilly area; little or no maintenance of the numerous climbing routes between Colli Aminei and Sanità districts; insufficient interaction between the “street landscape” and the large, monumental complexes that characterize the area. The latter, in particular, embodying the most distinctive identity of the entire neighborhood, represents the most significant challenge for a “city of care” in which even the historical architectural heritage is subject to typological rethinking, especially in its relationship between inside and outside. To deep urban systems conditioned by distances, fences, barriers, we respond with a system of relationships that aim at the creation of a city that can be finally defined as open [4].
Above all, these are interventions whose relevance is significant for the role that open spaces and connections undertake in the city of the Covid-19 pandemic. This unexpected event has indeed brought attention back to the relationship between urban and health. Anticipator in this sense is the philosopher Nicola Emery who already in 2010 explained, in very effective terms, that the most immediate effect of the cure is to free up space rather than occupy it [5]. This statement calls public space design to operate in a decisive way, especially in light of today’s difficulties, no longer as something completely separate from the functioning and movement of our own bodies [6].
From this point of view, the issues explored in this contribution can be traced to two main areas of study. On the one hand, the theme of urban micromobility, a way of understanding, in architectural terms, connection devices that form a network in favor of active and soft movements for people. This also shows a view in reducing urban pollution. On the other hand, the theme of the reinterpretation of monumental complexes as care facilities, architectural emergencies at the service of the city and citizens. They can be understood in a broad sense and not strictly connected to rehabilitation and illness yet according to an attitude of prevention and higher level of life quality.

2. Movement and micro-mobility: a rediscovered accessibility

Accessibility becomes a key topic especially to the extent that, in terms of design, open spaces are not linked to their specific definition yet to the clarification of the relationships which occur among them. The idea of a widespread urban system for wellbeing responds to the logic of therapeutic connections. The attempt is to involve different types of places and uses according to a mechanism aiming at building new interaction maps. These specifications are based on considerations at different scales which combine the “human factor” with the “urban factor”, and articulate different fields of investigation through the relationship between man and community.
Through the deepening of these design schemes, direct interrelationships between care, connective space and man can be considered in a transversal manner. The main objective is to unhinge a way of conceiving well-being places as an archipelago of autonomously functioning islands in relation to the city. This logic is essentially based on a revision of the category itself, through promoting a vision of continuous and bijective cure as an improvement of the quality of life of citizens and, eventually, of the city itself. A logic that assumes the grafting in the city of a dynamic of filaments of different sizes, structuring greenways within the city, capable of giving a new meaning to the very dense patterns of urban concentrations.
The theme of urban mobility is linked to this issue, in a broad and wide sense, with the aim of encouraging the insertion and integration of public transport lines, reinterpreted as lines of well-being that cross and connect congested urban spaces.
These considerations can therefore be referred to two major fields of contemporary urban and architectural design research. They explore, on the one hand, the modal interchange strategic nodes, with the purpose of shaping new public spaces. On the other hand, sustainable mobility, to be developed in terms of networks and innovative lines. It is a question of implementing a great and epochal transition, from the monofunctionality of transport systems to their hybridization, from the rigidity of stations and stops, to a widespread and intertwined system of accessibility.
A further, innovative, field of application and line of design research is represented by interventions in the field of urban micro-mobility. Vertical and inclined elevators; mechanized ramps and stairs; pedestrian bridges and cycle crossings: elements that bring the relationship between mobility and movement, between active care and territory, back to the scale of the architectural artefact. These are completely new typologies for the city, or rather, elements whose mechanical and engineering

functioning has almost always prevailed over aesthetics and contextual addition. In the contemporary city, which is struggling to reduce CO2 emissions and at the same time to encourage soft mobility, micromobility architectures become the subject of a new rethinking, with a view to architectural reinterpretation of the concept of accessibility itself.
With these assumptions, starting from the recognition of the identity elements of the Sanità district, not only monumental complexes but also climbs and stairways that characterize its morphology and in a certain sense its urban functioning, a careful reading was conducted about the plot of paths and open spaces that climb, to the East towards the Moiariello hill and towards the Park of Capodimonte, and to the West towards Colli Aminei and the hilly areas. In fact, there used to be many ascents that led from the historic city to the agricultural territory of the hills [7]. Today, none of this is practicable, due to interruptions or failures, or as a consequence of privatization of entire areas that have occurred over time and without a real control of the territory. Nevertheless, it represents a great urban heritage, characterized by a succession of natural ravines, watersheds and old riverbed roads that extend from the hills into the historic city. The areas included in this sequence of spaces are marked by caves, underground paths and large architectural complexes, mostly catacombs and religious. A system, therefore, with great potential in terms of accessibility and reuse of existing assets.
The design proposal starts with the creation of a dense system of cycle and pedestrian paths which in most cases conform to the morphology of the existing territory, softening the steep slopes or opening up to new panoramic views. The new lines come with innovative spatialities linked to the identification of strategic areas for the creation of a widespread public space with a dual role: a place of community and urban sharing, and at the same time an interchange point for soft and sustainable mobility.
The new accessibility network thus redefined becomes the basis for the realization of punctual interventions of reconnection between levels and facilities that are very close between each other yet difficult to reach. This is in fact a very peculiar feature of the Sanità district which, if from the social point of view shows itself as very lively and compact, it suffers from significant social fractures and inequalities from an urban point of view.
The occasion for mending and opening urban strips abruptly interrupted in the past, therefore becomes now a feasible scenario through the insertion of mechanized elevators and ramps for overcoming quotas. For example, in the case of the Botanical Gardens and via Tenore, to the Moiariello climb from the area of the former student house Casa Miranda. Yet with a new enlarged accessibility to the Santa Maria della Vita complex at the future exit of the Materdei station. Further elements of oblique mechanized reconnection can be imagined for entering the Astronomical Observatory and the Park of Capodimonte directly from the Cristallini area, as well as for the reuse and reopening of the area of the former Conocchia complex.

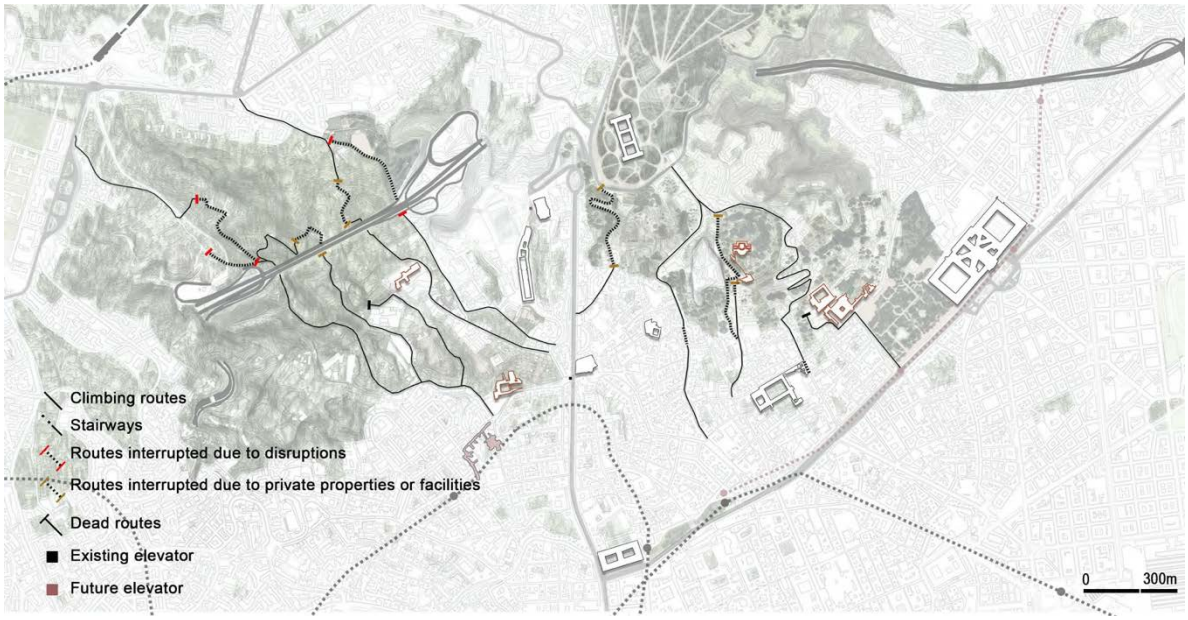

Fig. 2: Mapping of the current accessibility to and within the Sanità district in Naples (drawing by P. Miano, A. Bernieri, 2021)

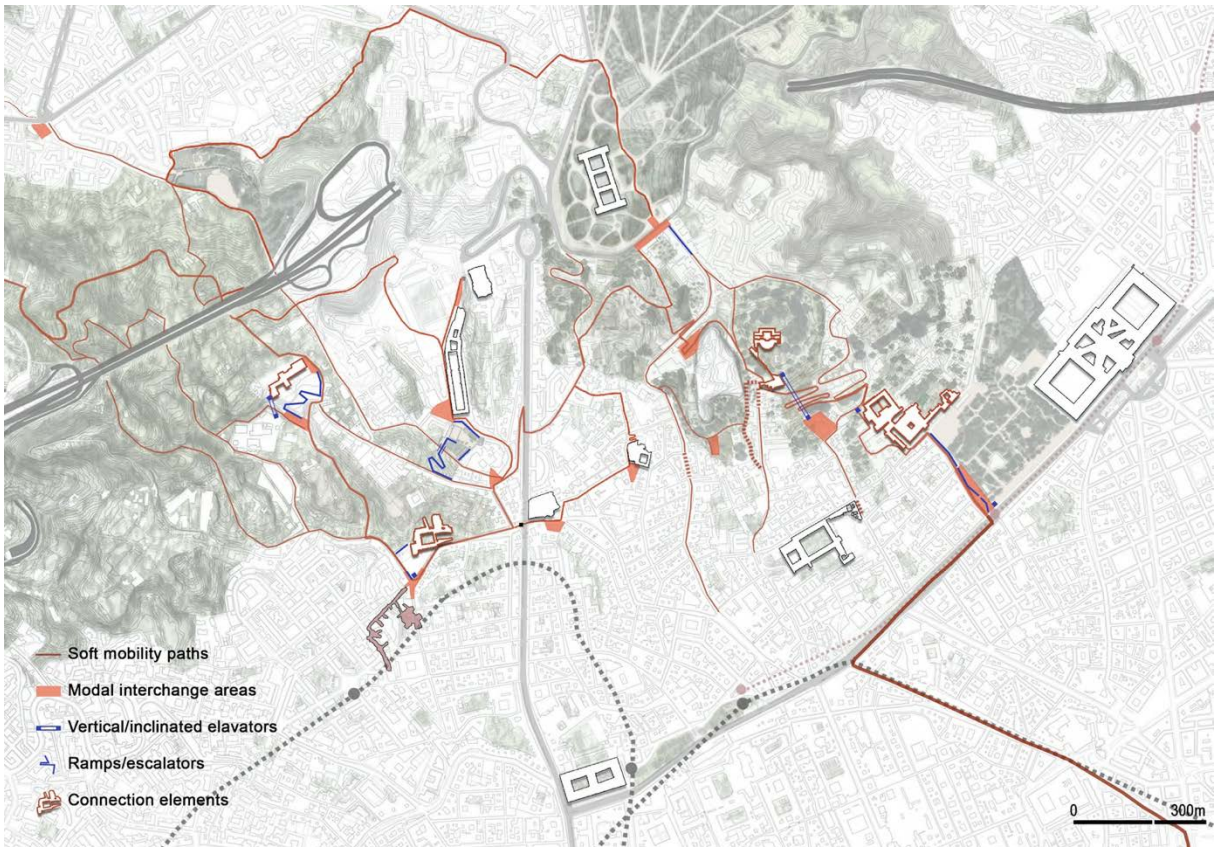

Fig. 3: Mapping of urban micromobility interventions (drawing by P. Miano, A. Bernieri, 2021)



Fig. 4: The reconfiguration of the western edge of the Botanical Gardens along via Tenore (drawing by P. Miano, A. Bernieri, 2021)

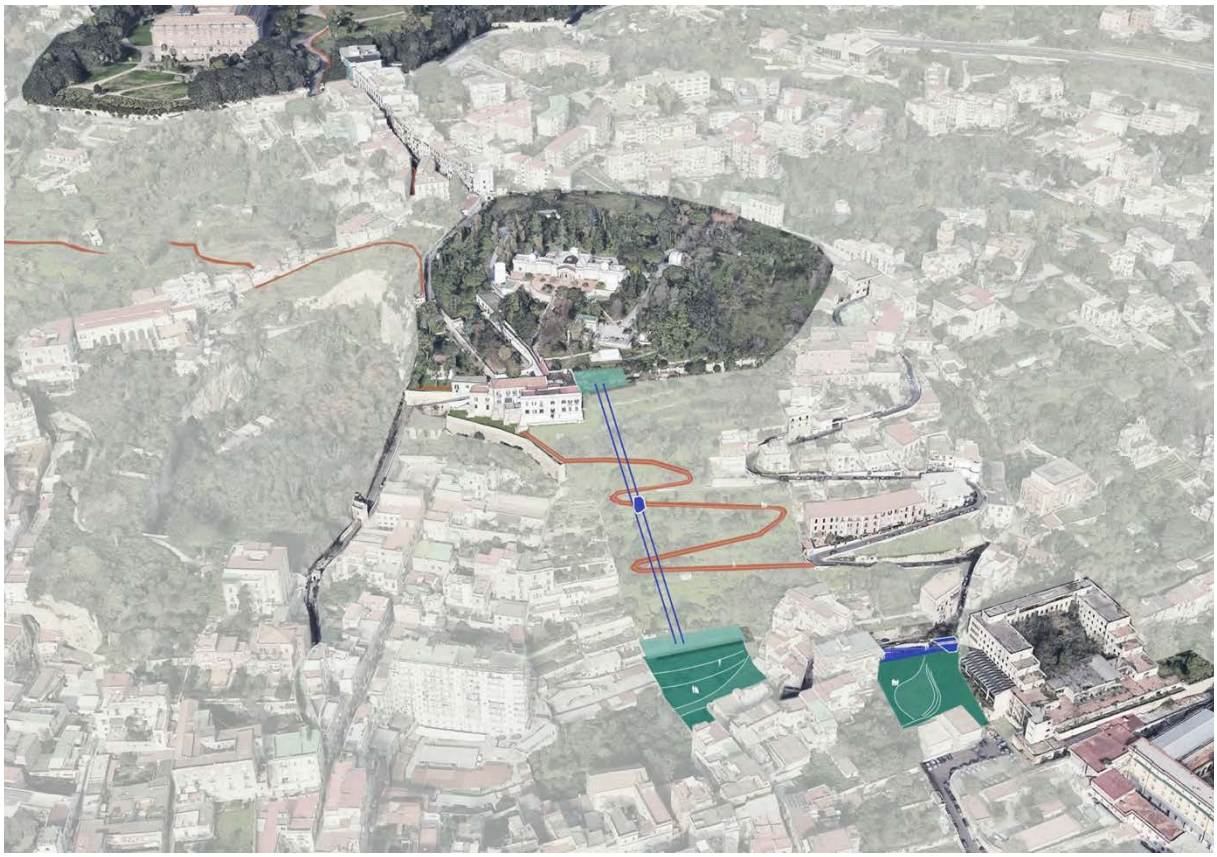

Fig. 5: The new accessibility from the Sanità District to the Astronomical Observatory and the Park of Capodimonte (drawing by P. Miano, A. Bernieri, 2021)

3. Emerging architectures: care networks and facilities

Rethinking emerging architectures, those which identify and structure the urban form of the city, according to an emergency perspective, in the sense of openness to the city in particular critical situations from a social and health point of view, engages a very intriguing dialectic. On this basis it is possible to propose a project for the health of the city. From this point of view, in fact, the design of a widespread care network, organized and imagined for redistributed levels of prevention and assistance, also affects urban buildings and spaces. They are no longer identifiable solely by their function yet by the contribution they are able to give in terms of prevention to the health of citizens. Nevertheless, holding roles and specificities necessary for the functioning of the actions and uses of the contemporary city such as working, studying, moving, etcetera.

It is clear that in this case the first level of methodological and design investigation explores the hospital buildings, which have often been object of research from an architectural and compositional point of view. From the Sanatorium of Paimio by Alvar Aalto as an example of a hospital surrounded by nature [8], to the unrealized project by Le Corbusier for the new hospital in Venice as a branch in the city [9], more recently projects have been carried out, somehow proposing a mixture of the previous experimental attitudes. These are, for example, the care and reception pavilions of Maggie's Centres, intermediary buildings, extensions of consolidated hospital complexes [10], which have been entrusted with the role of rediscovering that connection, now mainly lost, between disease and city, between man and care.

Starting from these experiments, in which the system of care and health opens up to the city, an approach in which hospitals are supported by a more widespread health care system acquires strong inspiration. From a practical point of view, the identification of the potential elements of a process of progressive “demedicalization” of the contemporary city, and a complete reconsideration of the levels of care, requires the construction of a map of new public spaces and buildings, places for the well-being of citizens, with specific architectural and social characteristics. It is a project built by leaps of scale, to be composed using heterogeneous urban materials, to be structured on nodes of extremely variable content and dimensions, to be centered on urban landscapes interested in dynamics of change. In this context, the identification of points and elements from which to build virtuous, even complex processes, in which architecture can be correctly reinterpreted from a perspective of care, becomes of fundamental importance. The triggering elements can be constituted by urban frameworks made up of new components, but also by pre-existing configurations, completely rethought. They can

be exceptionally concentrated in one point, but more plausibly they are diffused in areas that become real nodes [11].
It is a work of identifying complex spaces in which to intervene through mechanisms of progressive elimination of the logic of fragmentation between inside and outside. In these places, the fundamental theme becomes the improvement of living conditions and health in a structural and not superficial way. The aim is to constitute reference points for the design of the city as a cure. In this strategy, hospitals are inevitably involved, just as parks, stations, schools, sports facilities, in order to create places for mobility, physical activity, training, culture, hospitalization. Places characterized by a functional complication which share the objective of retracing a city of care.
In historical cities in general, and in particular in the case-study of the Curacittà project within PRIN research, the Sanità district in Naples, designing becomes a significant investigation tool in terms of reorganization of uses and grafting of new processes of urban care. The Sanità area, at the foot of the hills of Colli Aminei and Capodimonte, is also linked to this by an interesting concentration of structures, old and new, for the health of citizens. In fact, to Cotugno and Monaldi, Cardarelli and Pascale Hospitals, which are the structures currently in activity in the Hospital Area together with the Second Polyclinic of Federico II University, correspond, in the most “internal” part of the Sanità district, monumental and religious complexes whose history is partly linked also to healthcare. These are the San Gennaro dei Poveri, converted into a health facility as early as the mid-1400s; Santa Maria della Vita, within which there currently is a health department headed by the ASL of the city of Naples [12]; the former complex of Conocchia, which used to be in the past an emergency health facility, now in a state of neglect.
The approach proposed in the nodal areas of study is to transform historic buildings from functional thresholds (even largely abandoned) to hinges of an hilly city of health. In this sense, the Complex of San Gennaro, in particular, represents a very important opportunity for the redevelopment of the entire area at the foot of the Basilica dell’Incoronata Madre del Buonconsiglio in Capodimonte. It demonstrates how the previously illustrated network of paths and public spaces widens even more to comprehend different landscapes and urban structures. It therefore defines itself as a large continuous and open public space, which can be inhabited and crossed throughout its expansion or limited to a part of it. A large public space to be built gradually, using different scales of intervention, from the most minute and punctual ones, necessary to resolve intersections and discontinuities, to its entirety, by involving unfinished yet unsolved areas of the existing city.
San Gennaro dei Poveri, Santa Maria della Vita, the Conocchia, thus mark, even symbolically, a new way of understanding the care and health of citizens. Restored, recovered, reused places in a logic of multifunctionality, breaking the fences of the old, closed hospitals structures and presenting themselves as widespread spaces of an idea of care in which health, sport and culture can coexist with new architectural devices for disease prevention.
Ultimately, the experiment conducted in the Sanità area contains interesting and significant indications in relation to the topic of urban micromobility and emergencies, which cities all over the world have been facing at this time.

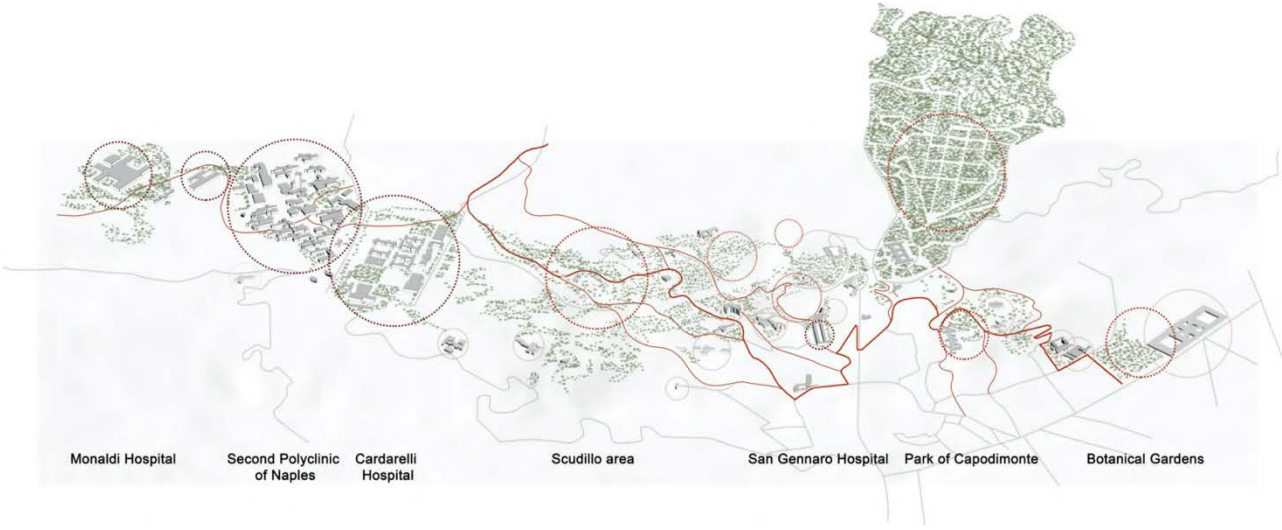

Fig. 6: Interaction among different levels of care, from the Hospital Area to the Botanical Gardens (drawing by P. Miano, A. Bernieri, M. Verrillo, 2020)

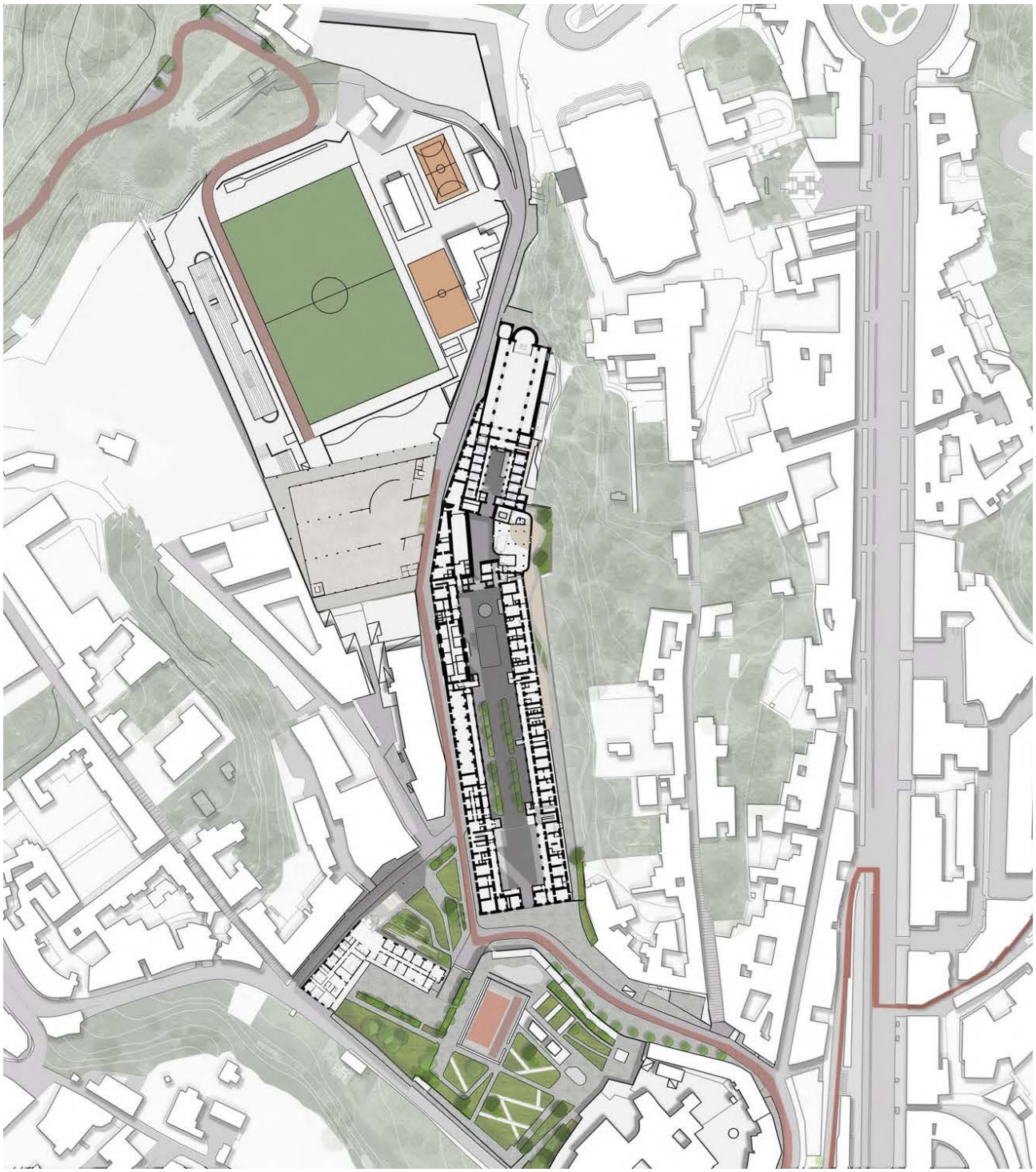

Fig. 7: The Complex of San Gennaro dei Poveri between opportunities and new triggers of urban care (drawing by F. Cordella, 2020)



Fig. 8: Historical heritage and contemporary intervention between health and design in San Gennaro dei Poveri (drawing by F. Cordella, 2020)

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Digital for sustainable use of cultural heritage: the Baptistery of Nocera Superiore

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Abstract
The recent medical emergency linked to the spread of COVID-19 has caused many people to rethink their habits, even the most common and everyday ones. Significant changes have undoubtedly affected the use of the historical and cultural heritage, especially artistic and architectural assets. The impossibility of moving around and visiting museums and monuments in situ has in fact led to the introduction of alternative forms of enjoyment of this legacy, which are in any case able to meet cultural needs that, like physical ones, contribute to human well-being. In this perspective, digital technology is a valuable tool for the dissemination of heritage: if, in general, drawing is an evocation of the physical reality represented, the virtuality inherent in the infographic space allows a more shared appropriation of the contexts "visited" remotely, of which it is also possible to provide integrated information not immediately perceivable. Starting from this premise, the contribution intends to focus on a little-known but very interesting architectural episode: the Paleochristian Baptistery of Nocera Superiore, in the province of Salerno. The space of this monument is thus revealed through digital representation in a virtual tour that accompanies visitors in the discovery of its morphological, geometrical, artistic, and architectural aspects, thus making it possible to offer the community an example of Campania's heritage to be enhanced.

Keywords: Digital Representation; Cultural Heritage; Enhancement of Architecture; Virtual Use

1. Introduction
The pandemic resulting from the spread of the COVID-19 virus, which has been affecting the entire planet for a year now, has forced radical changes in both the practical aspect of our lives and the social and cultural ones. While the first has involved a significant revision of daily habits, mainly of a logistical and organizational nature, with serious practical consequences, the effects of the restrictions in the socio-cultural field, although less tangible, have had even stronger and more extensive repercussions.
The deprivation of a dimension linked to socialization and the sharing of spaces and cultural experiences has in fact amplified the sense of isolation imposed by the lock-down, causing for all generations, without distinction, a loss of those cognitive inputs that influence the psycho-physical state and that have been recognised, in a recent study by the World Health Organization [1], as a driving factor of the well-being of everyone.
With reference to the aspects linked to the cultural sphere, significant changes have certainly affected the enjoyment of the historical cultural heritage – first and foremost the artistic and architectural one. The impossibility of moving around and visiting museums and monuments in situ has in fact led to the proposal of alternative ways of accessing this heritage. In this logic, digital technology is a valuable tool for the dissemination of heritage: if, in general, drawing is an evocation of the physical reality represented, the virtuality inherent in the infographic space allows a more shared appropriation of the contexts "visited" remotely, which can also provide integrated information not immediately perceivable.
Starting from this premise, the contribution focuses on a little-known but very interesting architectural episode: the Paleochristian Baptistery of Nocera Superiore, in the province of Salerno. Using forms of representation – especially digital ones – the space of this monument is thus revealed in a "virtual"

itinerary that accompanies visitors in the discovery of its morphological, geometrical, artistic, and architectural aspects, thus making it possible to return to the community an example of Campania's heritage to be enhanced.

2. The Paleochristian Baptistery of Nocera Superiore

In the city of Nocera Superiore, in the province of Salerno, rises the Paleochristian Baptistery of Santa Maria Maggiore, also known as the "Rotonda". It is one of the oldest Christian buildings from the Byzantine era in Campania, remained substantially unchanged despite the passage of time, but unfortunately little known.

Erected in the Middle Ages in the eastern area of what was then *Nuceria Alfaterna* (an important centre in Campania in the Oscan, Etruscan, Samnite, and then Roman periods), the Baptistery appears to be a mausoleum of "classical and pure architecture in its circular plan and its round of coupled columns", as Amedeo Maiuri described [2, p. 138]. Possibly erected on the remains of a thermal structure from the Pompeian period, the sacred building was probably an annex to a cathedral that was later destroyed. What is striking about it is the elegance of its interior space, which recalls the organization of the mausoleum of Saint Constance in Rome, and at the same time some early Christian architecture found in the East and Africa that can be traced back to the *baptisterium* typology. This term originally referred to the *frigidarium* pool in Roman baths. With the rise of Christianity, it was instead used to indicate the space in which the faithful received the sacrament of baptism: this was done by immersion in a basin that was usually placed in the centre of a specific room of the church or in a place independent of it. Over time, the baptistery became a real sacred building, usually with a central plan – often octagonal – and covered with a dome.

Built in the second half of the VI century, after the reconquest of most of the southern Italy by the Eastern Roman Empire, the Baptistery of Nocera Superiore is therefore an important architectural testimony to the Byzantine era. Externally, the building – which has changed its configuration over time – is a massive structure with a circular cylindrical body, accessed through a vestibule bordered by arches and closed by a pitched roof, which gives the upper part of its front a gable-like profile. The body is surmounted by a second cylinder, on a vertical axis with the first, and completed by a conical-pitched roof.

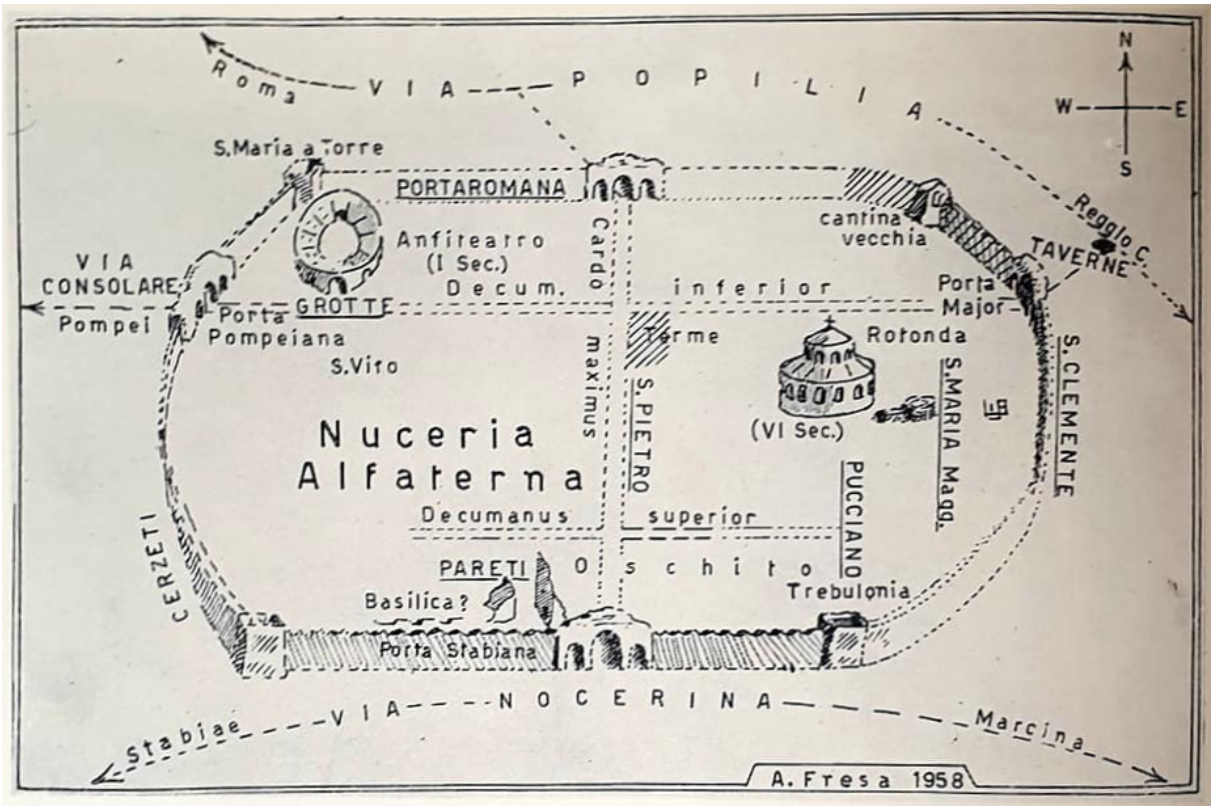

Fig. 1: Hypotheses for the reconstruction of *Nuceria Alfaterna* [3] and its Roman and Medieval architectural features.



Fig. 2: Nocera Superiore. External view of the Paleochristian Baptistery.

From the outside, there is nothing to suggest the rich geometric configuration of the interior space, built according to the logic of the original Byzantine models. The layout is in fact organized according to a central circular plan designed around the baptismal font, which is surrounded by a walkway that runs all around it, delimited by 15 pairs of elegant twin marble columns. This characteristic links the Baptistery of Nocera Superiore, not only to the model of Saint Constance in Rome, but also to North African examples found in Libya, Algeria and Tunisia and dating back to the V and VI centuries. The strong centrality of the plan is interrupted by the presence of an apse housing the altar, slightly misaligned (by about 12°) from the axis of the entrance to the "Rotonda".
In fact, various hypotheses have been made regarding the presence and particular orientation of the apse. Most probably, it is subsequent to the original structure: born specifically as a baptistery, the building did not in fact need an altar, which became indispensable when it was transformed into a real church. Some scholars believe that the apse was designed so that the altar would face perfectly east, in keeping with the construction tradition of Christian places of worship. Others believe that the apse was created in a pre-existing space that had been recovered and used for this purpose (the east-west alignment of this space was due to the layout of the ancient *Nuceria*). The presence of XIV- and XV-century frescoes in small chapels adjacent to the original entrance, under which older paintings were discovered, would have prevented a reorganization of the space, aimed at recomposing the rigorous symmetry inherent in the type of baptistery with a central plan, thus restoring the building to its current appearance. The conformation, despite the asymmetry of the structure, does not alter the unity and sumptuousness of the interior space, which is marked by bare polychrome columns arranged in two concentric rings, and is completely open to view. The columns – the outermost ones of *cipollino* marble, the others of grey granite, travertine, and oriental alabaster – were probably recovered from various Roman buildings that had fallen into disuse at the time of construction. This is testified to by the dimensions of their shafts, which show slight variations in diameters and heights: these differences are compensated for using Ionic bases and Corinthian capitals which give uniformity to the height of the impost of the arches above.

3. Geometry and architectural structure

With reference to geometry, the profile of the arches corresponds to a humped curve, generated by the intersection of the straight circular cylinder with a vertical axis, which envelops the ring of columns, and the cylinders, still straight circular but with a horizontal axis, which are arranged radially with respect to the centre of the baptistery plan, defining the intrados of the arches. In stylistic terms, the alternation of stone ashlars and brick ashlars placed side by side and left exposed, re-proposes forms and construction techniques of clear Byzantine taste. The double-curved roofing systems rest on the latter. In particular, the walkway between the perimeter wall structure and the outermost of the two rings of columns – corresponding in plan to a circular crown – is covered by an e buttressed annular barrel vault with a semi-circular orientation (whose diameter is equal to the span of the walkway) interrupted only at the apse. Although simpler in form and decoration, it is reminiscent of the similar space in the mausoleum of Saint Constance in Rome. The second ring of columns, the innermost one, supports a double-curved dome with a polycentric profile, both on the intrados and the extrados, but with variable thickness in the key and at the impost.

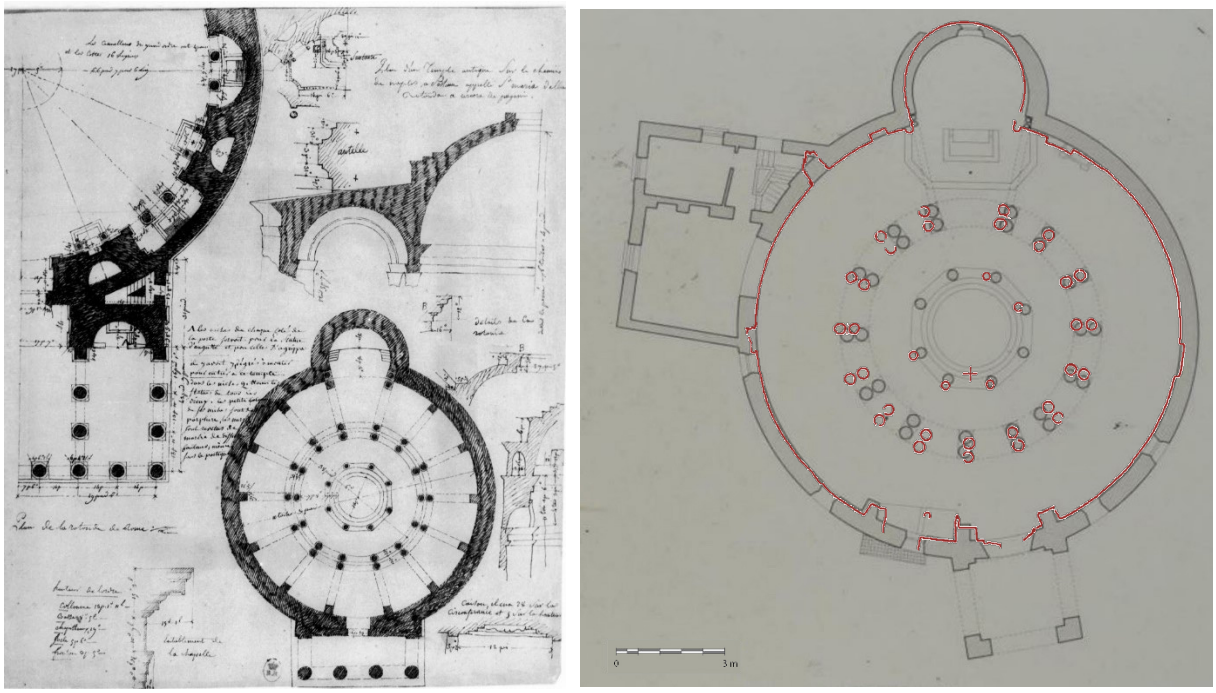

Fig. 3: Left: plan of the Baptistery of Nocera Superiore compared with the Pantheon in Rome, in a drawing by Jean-Jacques Lequeu (1757-1826) (image source: https://gallica.bnf.fr/ark:/12148/btv1b7703256k/f1.item).
Right: plan of the Baptistery and, in red, profile of the elements in horizontal section obtained from the point cloud obtained by photogrammetric survey.



Fig. 4: Left: the circular walkway, bordered by 15 pairs of twin columns, which develops around the baptistery basin.
Right: a detail of the arches and the annular barrel-vaulted roof of the ambulatory; in the background, the polycentric dome enclosing the central space of the sacred building.



Fig. 5: The baptismal font, circular on the inside and octagonal on the outside, is the true centrepiece of the Baptistery.

The dome, which stands directly on the arches without any connecting tambour, as is the case in Rome, is shielded from the outside by a conical roof that hides its geometry. About the double profile of the structure, raised on both the extrados and the intrados, the most accredited hypothesis is that it is a reconstruction of the original hemispherical dome, which partially collapsed following some natural disaster – probably an eruption of Vesuvius. The need to rebuild the dome, ensuring better static behaviour thanks to a slimmer profile, would have led to the current configuration. There is also a connecting element between the arches and the dome proper – for some, a sort of "inclined tambour" – which seems to be part of the original spherical dome, reused as a support for the new structure. At this stage, the conical sloping roof was also added to protect the space below from downpours: the opening of windows along the surface of the dome, whose curvature was followed, caused water to fall into the Baptistery.
The dome, whose intrados surface is left in face brickwork – as is that of the annular vault of the ambulatory – covers the real fulcrum of the structure: a baptismal font which, with its 7-metre diameter, is in Italy second in size only to that of Saint John Lateran in Rome. The large basin used for the immersion of catechumens is circular inside, while outside it has an octagonal base with rounded corners. The latter shape, in keeping with the tradition of the classical baptismal font, recalls the strong meaning of the number eight, a symbol of cosmic balance and resurrection. Indeed, the Neo-Platonists and Neo-Pythagoreans already imagined the origin of the world as represented by a circle generated by two squares rotated at 45° to each other. The resulting figure is in fact an octagon, one of the main esoteric symbols of Christian art and tradition: as mentioned, it embodies the concept of spiritual regeneration as an intermediary between the square (symbol of the earth) and the circle (symbol of heaven). The octagon therefore has an extraordinary evocative component, representing the intermediate world between the earthly and the otherworldly. According to Christian tradition, on the eighth day the new man was created, invested with grace, and the resurrection of Christ took place. Therefore, in Nocera as in many other baptisteries, the baptismal font – which symbolizes regeneration and rebirth, and evokes the eternal life that the neophyte immersed in it finally conquers – takes on an octagonal shape.
The actual basin, entirely covered in white marble, is 1.30 m lower than the floor of the building, and is bordered by a railing about 70 cm high, on which the remains of eight columns are set, probably originally used to support the structure of a *ciborium* covering the font or, according to Stettler, relocated here after restoration [4].



Fig. 6: The intrados surface of the dome, detected by photogrammetric survey and digitally modelled (graphic elaboration by Pietro Giaquinto).

In terms of decoration, despite its extreme simplicity, the Baptistery of Nocera Superiore shows forms and models typical of classical Christian iconography: the cross stands out among them, symbolically connected to the meaning of death and resurrection inherent in baptism. This decorative motif returns in fact in the marble panels that cover the perimeter structure of the baptismal font, in the form of Greek crosses with arms that end in arches. And, even more clearly, on the intrados of the dome of the building: here, the alternation of different materials – stone and brick again – draws a large cross over the baptismal font.
The frescoes in the baptistery, which date back to a period after its foundation, also propose a symbolic iconography linked to the architectural type. They include the Virgin Mary on the throne holding the baby Jesus in her arms, with Saint John the Evangelist beside her; the baptism of Jesus; scenes of the Resurrection, with Jesus dressed in red rising from the Sepulchre while an angel announces the joyful event; and the figure of Christ blessing the faithful.

4. A digital approach to the use of the monument

The use of Information and Communication Technologies in the field of cultural heritage is now considered a consolidated practice [5]. Many researches and experiments have been carried out in recent years concerning the creation of knowledge paths of artistic, archaeological, and architectural heritage, which have exploited new technological approaches based on three-dimensional digital reconstructions, virtual and augmented reality [6]. The result is an articulated and varied framework of experiences that, on the one hand, highlights the value of such artefacts in their ability to generate meaningful interpretative readings, similar to those produced by direct access to the assets [7]; on the other hand, through the use of interactivity, as well as movement in virtual space, they allow to "suggest ideas of thematically related events, evidence of social autonomy, notions of territorial possession and shelter, and focus points of artefactual possession" [8, p. 336]. The visitor, in other words, becomes part of a set of relationships that break down the limits of pure virtual representation, leading to the acquisition of the cultural meaning of the site or object explored. The use of interactive technologies has also changed the way in which we communicate with users. In fact, it has made it possible to move from a so-called passive model – i.e. that of the traditional visit – in which the movement of the visitor in the physical space and the perception of the characteristics of the cultural heritage represent the first and fundamental vector of knowledge, to an active one based on the use of digital tools (not necessarily at a distance), VR/AR or even gamification, thanks to which the user is involved in a dynamic and attractive way towards the object of knowledge [9]. The seduction of cultural heritage places and objects together with the new visit integration tools based on virtual and interactive reality have partly mitigated the economic impact of new technology applications, making the structuring of additional digital-based routes somehow feasible in many cases.

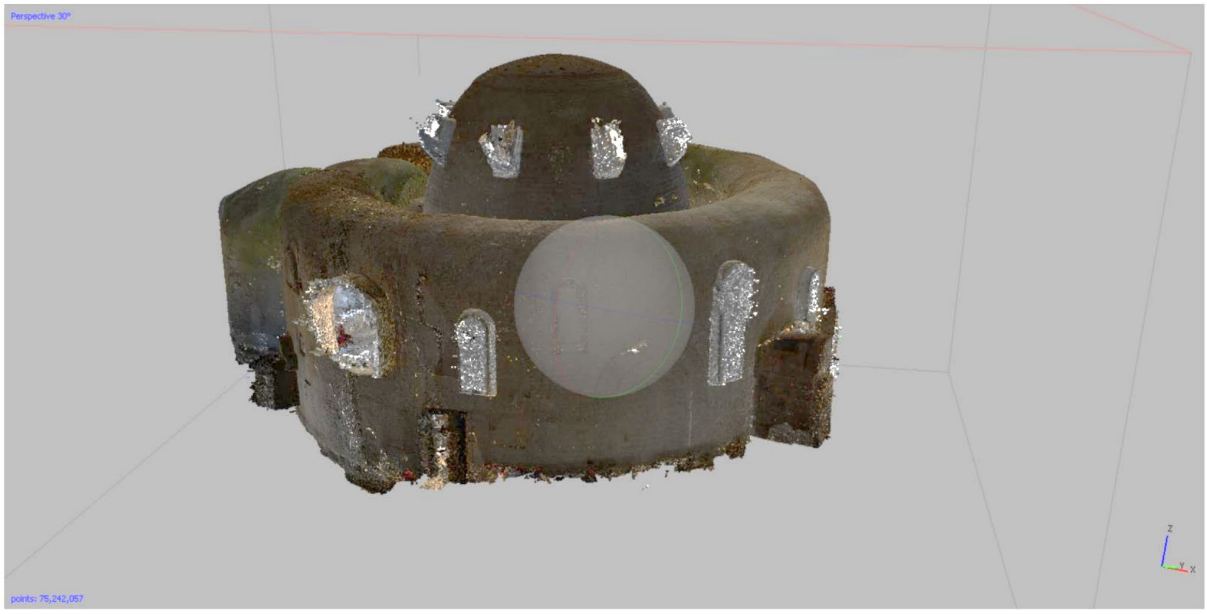

Fig. 7: An image of the point cloud of the Baptistery (graphic elaboration by Pietro Giaquinto).

At a time when the impact of the Covid-19 pandemic has limited the possibility of promoting and attracting tourist flows towards the knowledge of diffuse cultural heritage, the present research, based on existing experience, has set itself the target of constructing an approach to the digital diffusion of cultural heritage along two lines: one geometric-semantic, the other parametric-informative. Focusing on a specific case such as the Baptistery of Nocera Superiore, a three-dimensional digital model of the object was defined, to be employed both as an asset for the remote tourist use of the architectural heritage, according to established practices, and as a basic resource on which to implement information layouts for advanced knowledge of the heritage, also intended for specialized users (scholars, researchers, technical professionals).
It is well known that the creation of a three-dimensional model represents the basis to produce analyses of an architectural object at various levels: historical, structural, formal, dimensional, etc. The limitations to the construction of models of architecture generally lie in the costs of surveying and restitution operations. In order to overcome these difficulties and to define the basic three-dimensional resource, a point cloud was processed using photogrammetric imaging techniques [10] and then transformed into a 3D model. The photographic images used for the construction of the model then allowed a realistic view of the represented architecture, capable of highlighting aspects relating to the textures of the surfaces, the decorative devices and all the perceptible visual qualities.
The modelling became ready for the realization of subsequent steps. The first is the canonical creation of a virtual tour, with web-based applications, thanks to which the visitor can explore the work by moving freely within it. The information drawn from this first level of digitization is essentially related to illustrating the real entity with the holistic form of the architecture under study, to which some semantic information can be added. The second, which represents the essential purpose of this research, is to associate the digital model with a series of informative layouts that allow for the management of greater detail of the object and its sub-elements. To this end, a set of categories has been identified, such as, for example, the typology, geometry, materials and construction techniques, historical and temporal evolution of the building organism, and decorative devices. However, this set should not be understood as closed and defined, but can be expanded by introducing further categories and subcategories. Each of these levels is designed to retrieve a set of information that can be considered interoperable and interrelated. The user can therefore query the individual levels to deduce typological comparisons with other similar buildings, both nationally and internationally, obtain information on the geometry of the surfaces that characterize the rooms, learn about the materials and construction techniques of each part of the structural organism, explore the timeline of its formal evolution through a virtual tour of precise historical periods or, again, learn about the history and characteristics of the decorative apparatuses present (vestments, pictorial iconography, etc.). The aim is to make the three-dimensional model not only a virtual representation of the construction [11], but a resource composed of parts that can be considered as advanced objects with intelligent parameters capable of rigorously describing qualitative and quantitative data of the architectural work, while offering information on relationships [12]. Furthermore, we believe that such a system can be susceptible to continuous updates of the information archives without compromising the overall analysis of the object and the relationships between the parts.



Fig. 8: Longitudinal cut-section (A-A') of the photogrammetric point cloud.

The idea is to define a product that is not immutable in time but that is extensible, reusable, and sharable. It is also possible to offer the resource and its information structure for the elaboration of virtual exhibition routes.

5. Conclusions

The health emergency linked to the COVID-19 pandemic and the severe restrictions on the mobility of tourist flows to safeguard the well-being of populations, have constituted, as observed, a drastic blow to all museum institutions and cultural heritage sites. This has greatly increased the need to amplify or activate channels for digital dissemination of heritage, improving or significantly accelerating the development of sustainable tools for digital enjoyment. Based on the most recent development of the cultural industry in IT, this contribution aimed at presenting a study on the enhancement of the Baptistery of Nocera Superiore, an architectural heritage of cultural relevance, in a region of southern Italy. A proposal for a protocol for the digital fruition of the monument based on the most recent research in the field of 3D visualization and knowledge computerization was fielded.
A three-dimensional photogrammetric modelling of the architecture was then carried out, defining an approach to the digital dissemination of the asset by integrating a geometric-semantic criterion with a parametric-informative one. In fact, these methods appear to be the most suitable to allow knowledge paths capable of reconciling attractiveness with the rigour and scientific accuracy of the information. The presence of a system of information layouts that can be increased and modified without altering the overall analysis of the object also represents a fundamental opportunity in terms of possible differentiation in the use of the digital resource, making it possible to create different visit routes and digital exhibitions that can be used remotely.

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ID135_Healthcare architecture and sustainable reuse. The case study of the ancient hospital Saint- Vincent-de-Paul in Paris.

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Abstract
In recent years interest in the notion of adaptive reuse had grown internationally with a multitude of projects applied to abandoned historic buildings. In this context, historic former hospitals have seen a resurgence of interest with a number of successful transformations of this heritage into new programs. These experiences have shown also that adaptive reuse can play a key role in achieving sustainable development, producing sociocultural and environmental benefits. On this basis, this paper aims to investigate urban, morpho-typological characteristics and technological requirements that predispose an ancient hospital site for a sustainable reuse process, by presenting the case study of Saint-Vincent-de-Paul eco-neighborhood in Paris. An ancient hospital complex, characterized by an important and diversified architectural heritage asset, with buildings from the 17th to the 20th century, the former site is going under a redevelopment phase to transform it into a state-of-the-art sustainable neighbourhood. This paper explores how to find a balance between new uses, environmental ambitions and the character of the original building fabric. A further focus on the Adolphe Pinard maternity ward provides a deeper reading on the strengths and weaknesses of hospital architecture in sustainable reuse processes.

Keywords: healthcare architecture; eco-neighborhood; adaptive reuse; sustainability; typology.

1. Sustainable Reuse of historical hospital complex
Over the last century, deindustrialisation has emptied buildings and districts, leaving in the urban fabric a heritage of *terrains vagues* to be revitalised. The first attempts of adaptive reuse applied to industrial buildings have shown the opportunity of architectural heritage recovery [1]. Nowadays, these experiences seem also to be set up as experimental laboratories to define strategies capable of keeping together the reconversion of historic and existing buildings, ensuring compliance with its specific spatial and technological determinants, and the new ecological and social sustainability values.
On this basis, the present paper focuses on historic hospitals that have seen a resurgence of interest [2], notably since the 2000s. When they were built, these former hospitals often stood at the cutting edge of design and morphological function, and were subsequently transformed over time, henceforth (in many instances) becoming obsolete [3], and thus raising the question of how best to reintegrate them into urban life, without distorting or destroying their original spirit and atmosphere [4].
In Europe especially, cities are beginning to recognise this heritage as a lever for improving sustainable development and for making cities more liveable [5]. Indeed, there has been a growing body of qualitative and empirical studies supporting the potential and value of historic and existing building stock in creating sustainable cities [6]. In Germany, Spain, Italy and France [7] , best practices attempt at reusing hospitals have often involved their sustainable transformation into hotels, residences, mixed-use programs, or even cultural centers. Thus, the adaptive reuse of this heritage can contribute to sustainable development producing not only cultural benefits, but also social, economic and environmental advantages [8,9].
From the environmental point of view, reusing the existing stock reduces the consumption of new materials and all the environmental impacts and associated emissions [6]. Furthermore, demolition

waste is also reduced, and adaptive reuse allows extending the life cycle of the buildings, according to the circular economy principles that aim to prolong the lifetime of resources as long as possible [8].
The conversion of these places to new uses is also consistent with a sustainable approach because "new functions may encourage new public and private investments, promoting the development of related activities and the provision of support services in the area in which the reuse project is carried out" [8]. Moreover, adaptive reuse makes it possible to rethink connections between open spaces and buildings, starting up new relationships between the different parts of a city "by breaking down perimeters of separation and open up new connections" [7]. Other less tangible benefits such as place identity, intrinsic values, visual landmarks and social cohesion are also important to be included in these regeneration projects [6].
Notwithstanding this, some arguments against adaptive reuse of heritage exist. A number of publications on this topic suggests that ancient buildings' reuse operations can be controversial and challenging [9, 10]. For example, in many cases "demolition and new build is seen as a more straightforward option for development than reusing" [6] the existing and historic assets. Indeed, it is often tricky to reconvert this heritage [2], because of the specificity of the layouts of these sites, the plurality of healthcare buildings forms and, their technical and constructional typologies, which have a significant impact on the field of possibilities for a reconversion project [4]. Another important issue is related to the compatibility between intrinsic values and new use values [8]: it is not always easy to find a balance between the sustainability ambitions and the character of the original building fabric [11]. Finally, "another emerging argument against reuse is that a new building would be more energy efficient than an existing building" [6]. In this regard, retrofit interventions should be conducted to limit energy consumption, but making sure to preserve, at the same time, the cultural, historical and aesthetic values of these ancient buildings [12]. This explains the difficulty of retrofitting historic buildings [13], because of architectural constraints that often require the preservation of the integrity of the buildings [14].
On this basis, this paper aims to investigate the urban, morpho-typological and distributional principles as well as technological requirements that predispose a hospital complex or building, or part of it, for a functional and sustainable reuse process. These questions are reviewed by presenting and discussing a specific case study: the Saint-Vincent-de-Paul eco-neighborhood project in Paris. An ancient hospital complex, characterized by an important and diversified architectural heritage asset, with buildings from the 17th to the 20th century, the former site is going under a redevelopment phase to transform it into a state-of-the-art sustainable neighbourhood [Fig.1].



Fig. 1: The Saint-Vincent-the-Paul urban context. Source: P&MA 2020a

2. Healthcare architecture over the time.

time, places for healthcare in Europe have been subject to three main vectors: the social institutions in charge of disease treatments, the spread of diseases, and the scientific and technological progress in medicine [15]. Before the XII century hospitals were literally the place where food and shelter were offered, in that sense there were no specific institutions in charge. Instead, it was a common concern, and adapted rooms or small buildings were dedicated to hosting strangers in need for a place to stay during their journeys. Since the XII century and for a long time, religious institutions have taken on the role of hospitality lead, to which medical care has been added. Mainly because of Christian morality, dedicated pavillons buildings were built in monasteries with the aim of treating infectious disease among

the poor. Over time, material and spiritual help gradually separated from assistance for illness. Indeed, the function of health care prevailed around the XVIII century, and the private sector started to develop new centers who moved from Church properties to new buildings specifically built by Philanthropists.
At the end of the XVIII century, a shift in who was responsible for healthcare took place from Philanthropists to public trust, under the direction of medical scientists who studied aspects such as hygiene, patient care, and environmental conditions in hospitals. In fact, new hospital centers start to develop, and the typology of pavillon was chosen because of its hygienic characteristics – namely that it allowed a good amount of natural light and cross ventilation [16].
The continuous improvement of medical science and its applied technology gave more and more importance and value to healing practices, and the right to public health was recognised. Thus, from the end of the XIX century onwards, there was an important revolution in healthcare mostly related to "the discovery of the transmission of germs that revolutionized the design of hospital projects" [16]. In fact, detailed hygiene and sanitary knowledge had an important role in the spatialization process of hospitals. Healthcare buildings started to be designed in multiple pavilions. Maternity and surgical operations wards were the first to be developed. The reduction in the number of patients per surface area, the separation between wards and spacing as an element of hygiene protection led the hospital centres to be built in city blocks size composed of several pavilions and some gardens areas [15].
In the 20st century, healthcare developed rapidly, transforming hospitals into "temples of healing and technology". Technological development went hand in hand with the extension of type in care and patients, and increased numbers of patients were accompanied by scientific and pharmacological advances [17].
Moreover, mechanical technology in circulation of flow and air let the hospitals be built in a vertical type. The skyscraper was introduced as a building type in urban areas. The great advantages of development and urban densification brought about by early skyscrapers in the USA were also applied to hospitals. The vertical model has been successful thanks to the introduction of mechanical ventilation and lifts, and first vertical hospitals developed general districts for health in Europe too [18, 19].
At the end of the 20st century, studies on patient care demonstrate how a diversified environment helps the healing process. The vertical type, in that sense very poor, is gradually substituted by a new hospital architecture in which nature and public space are integrated. Nowadays, it is more common to find some mixed typological and spatial organization [20].
Often, hospitals "have an exceptional significance on account of the notable infrastructures, which distinguish them from other types of buildings in disuse" [3]. The overview showed that hospital buildings cover a multitude of different typologies, each of which carries a potential or limits for reconversion. Healthcare evolution highlights a few key points from an adaptive reuse architectural perspective.
First, from an urban point of view, it is useful to remember that between the XII and XVIII centuries hospitals were hosted in religious complexes. Usually located near the city centers and comprising of a set of buildings and extensive courtyards, hospitals formed a stratified urban district, underlining the urban value in adaptive reuse for dismissed historical hospitals [15]. Second, from an architectural point of view, the pavilion type has the greatest potential for reuse. Born out of the first hygienic concerns related to the spatial characteristics of reduced sleeve width, the dense rhythm of windows and the importance of circulation that make it adaptable. On the contrary, the vertical hospital type of the 20st century is the one that is least likely to be adaptively reused for functions other than hospitals. Moreover, it also least allows for the transformation of the plot into a new urban fabric integrated into the existing city [4]. Third, from a spatial organization point of view, hospital architecture has specific characteristics in terms of form, function and distribution. If, on the one hand, the building must guarantee a large degree of accessibility from the outside, on the other hand, it must be able to guarantee absolute privacy and a zone of isolation that enables treatment of patients. Therefore, the architecture of hospitals has to be an infrastructure [7] that links different degrees of accessibility, and connects different sectors to each other. Horizontal and vertical circulation in hospitals is a very significant component related to the total surface area, a peculiarity absent in other building types.
A reading of the case study of the Saint-Vincent-de-Paul complex makes it possible to explore the potential for adaptive reuse and environmental sustainability of hospital architecture. In particular, the historical stratification of the hospital complex allows to retrace the spatial evolution and compare different periods, types and materials.

3. The Saint-Vincent-de-Paul Hospital: an historical overview

The Saint-Vincent-de Paul-Hospital is located in a centuries-old site within the 14th arrondissement, in the city center of Paris. The surrounding area consists of a remarkable environment, with gardens, historical building site and artistic center.
The hospital complex has undergone major transformations over time. As below exposed, the site gradually densified collecting 300 years of architectural legacy [21]. The heritage presents a juxtaposition and stratification of building languages, materials and construction techniques.

Initially was a former novitiate, then converted to a maternity and children's hospital until 2012. Specifically, we propose a reading of the densification process in three major stages the from (i) *Hospice des enfants assistés* (1650-1795), to a (ii) *Hôpital public* (1795-1930), and finally a (iii) *Hôpital Circulé* (1930-2010) [Fig. 2].

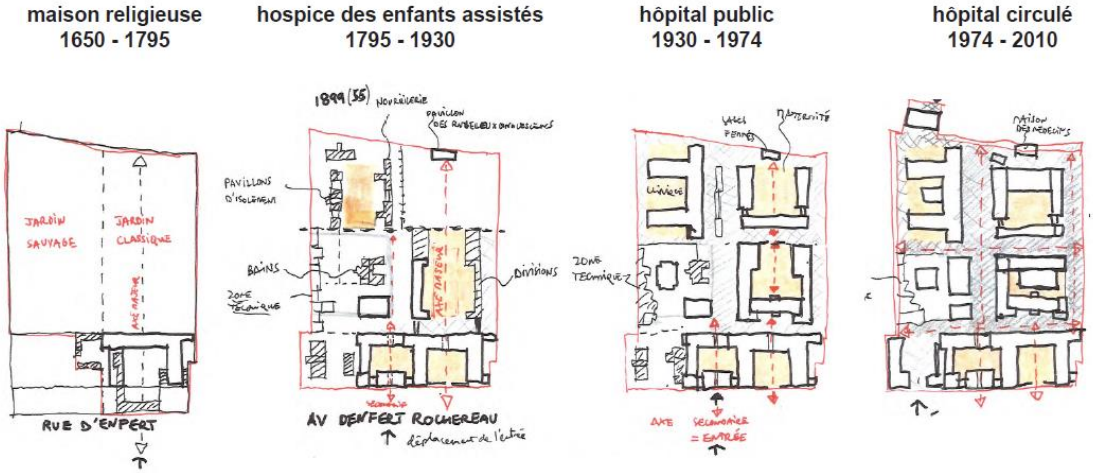

Fig. 2: The Saint-Vincent-the-Paul major stages. Source: ANYOJI BELTRANDO. *Lecture du site et orientations*.

i. Until the XVI century the site was a rural area, historically owned by the church. During the 1650, the site was organized by a first monumental building, the Noviciat de l'Oratoire, and the rest of the area was converted into a garden. The Oratoire, so labelled the building, defined the main footpaths of the site and the access over rue d'Enfer. A two-floor pavilion type, with a u-shaped system that delineates with its wings a large courtyard. The main wing is filtered by a gallery, and at the ground floor two churches are located. Over the centuries, the building has been extensively modified and functionally adapted.

ii. Between the 1795 and 1930 a gradual densification process took place. Two main buildings (Petit and Robin), and other minors (Lingerie, Maison Medicis and Jalaguier) were built along the main site axis. Here a secondary wing of the Oratory was built according to hygienic rules so the thickness of the sleeve was only 7.50 meters and had two floors. Later on, the Petit building (1836) was built behind the Oratoire, and connected to it by a covered passage. It is composed of two four floors L-shaped buildings for a children's home. Because of the heavy works he has changed in its internal organisations, as well as in its elevations. To overcome a service issue a laundry has been built to the ouest of Petit buildings. The Lingerie (1860) built in the neoclassical style and widely open to the outside by arcades, the building has modest dimensions. The laundry consists of four wings arranged around a central square courtyard with a covered washing area.

In continuity with the Oratoire, the Robin building (1881) with its style related to the academic and formal architecture constituted the large new entrance to the hospice. On the street, the building has a monumental entrance, echoing the façade of the chapel and forming the main façade of the hospital site. Robin is a stratified building in itself because of the three stone and brick buildings arranged around a central courtyard. Initially consisting of a pavilion forming a U with the oratory as a whole, it is constituted as a second closed block on a courtyard whose pavilions measure 11 metres in width on the open floor.

The Maison Medicis (1884) is the last example on the site of pavillonnaire architecture on the site. Designed under the hygienic architectural principles of preventing the spread of disease by isolating contagious people, it was located at the extreme north of the site. The building is an example of French rationalism, and in its architectural register and the use of red brick and metal elements on the façade it echoes the codes of the batiments mitoyens.

The Jalaguier (1895) is designed to accommodate the orthopedic surgery service. A small building is constructed along the access axis to the lot. In continuity with the Oratoire and Robin, the building is a pavilion consisting of a two-storey volume and a second orthogonal to the first of a single level, modest in size as well as in the finish and the register of the facade.

iii. The densification process (1930-1974, 1974-2010) filled the last part of the green area. Here, the last two large buildings Pinard and Lelong were built. Firstly, Maternity Adolphe Pinard (1934) has been built as a ward in the midst of the hygienist movement. A u-shaped building consisting of a main building with two parallel wings around a courtyard. The facades are made of apparent brick, with a fine texture, and distinguished by numerous tall windows. Served by monumental staircases, the wings have an 4 m height but a reduced depth of 8.5 metres. The presence of vast English courtyards makes the basement floors habitable. Associated with the Pinard building site, The Chaufferie (1934) is a

rectangular technical building. Despite its minor function, the aesthetics is in full modern language, it has the same materials and architectural registers as the maternity ward.
Lelong Clinic (1957), an architecture with a modernist aesthetic has been added to the nord west of the lot. A U-shaped building, in 13.5 m thickness a central corridor connects to the rooms. The presence of vast English courtyards makes the basement floors connected to the central courtyard accessible.
These are the last examples on the site of French architecture from the early XX century. Then, a radical change in the architectural registers followed, such as language and materials. By the 1970s the needs of the hospital imposed a further extension that took place by new aggregations to existing buildings. This comprised several minor buildings with concrete structure and curtain wall facades with aluminium windows. Among others the Nouveau Petit (1970), a six floors functionalist building that fits between the wings of Building Petit and demolishes part of one and almost the entirety of the second.
The Extension Pinard (1974) is composed of a new body of concrete frame building placed between the two minor wings of the maternity and two levels of parking in the basement of the courtyard.
The Clinique Michele Rapine (1983) it is an L-plan building, it completes with its concrete elevations the façade on rue Denfert-Rochereau. Francois Lepage (1965) is located in rue de Boissonnade, it is a six floor laboratoire that constitutes the northern facade of the lot. Colombani (1983) is a rectangular building in concrete, brick and stone. Its specific aesthetics is defined by the tours at each corner of the building.
With this last phase, the whole lot became car use in its urban plots, and the public green areas were limited into the buildings' courtyards.
The densification stages show the historical stratification's specificities at the urban and at the architectural scale. The result is a lot where the heritage is a fabric axes and composition where a variety of buildings, which differ from each other in terms of shape, size and materials and construction techniques, are located and juxtaposed.

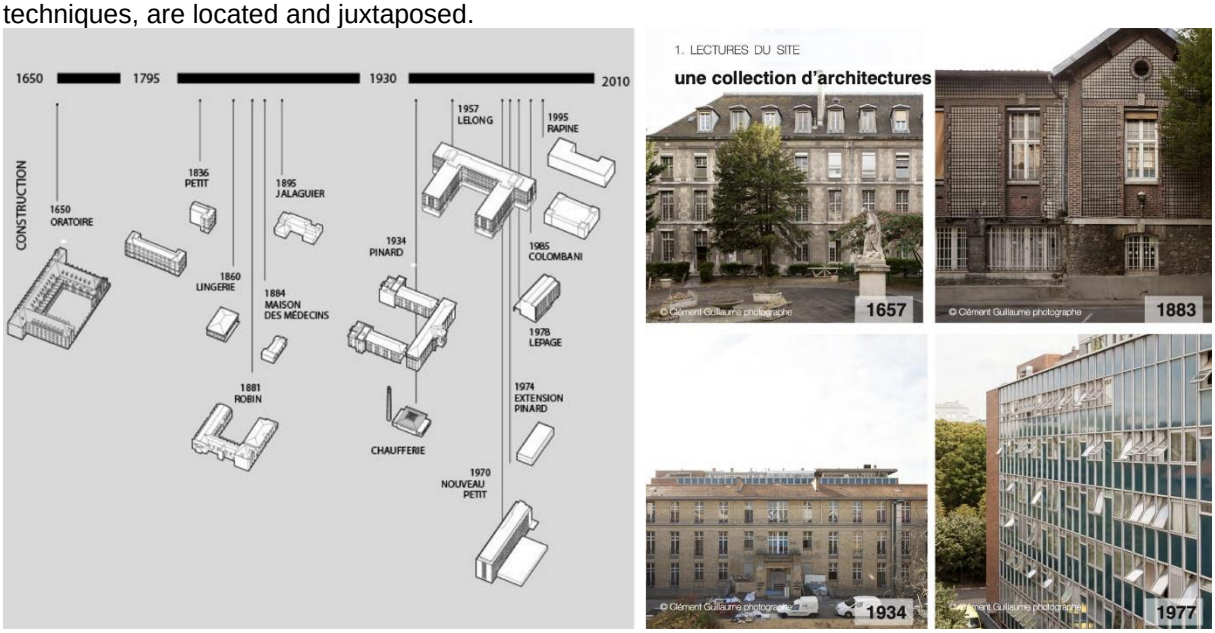

Fig. 3: The architectural stratification timeline. Source: P&MA 2020a

The first two phases show a densification process ruled by macro plots and macro buildings. Indeed, recurring building types can be found in U-shaped buildings and peculiar architectural elements in English courts and green courtyards.
Thereafter, it followed another form of stratification within the lot and the buildings due to the XXI century programmatic-functional needs. The construction of smaller buildings has been set to solve such needs. Connections or new volumes of the existing buildings, in strong architectural contrast with the original ones were added.
The final result is a very eclectic urban fabric where a variety of buildings, in typology, dimensions and architectural language can be found [Fig. 3].

4. Towards an eclectic eco-neighbourhood

In the late 1990s, a reorganisation and restructuration of the Paris hospitals was carried out and Saint-Vincent-de-Paul gradually merged with other healthcare facilities to optimise the costs of bringing the buildings up to new standards. All the hospital activities ended in February 2012, thus raising the question about the evolution of the site.
Since the hospital activities were relocated and the site has stood empty, Saint-Vincent-de-Paul immediately accommodated some temporary residents. Indeed, different associations and cooperatives

moved in upon decommissioning, running numerous initiatives and making the site a living place founded on the values of hospitality, creativity, and environmental responsibility.
The city of Paris has supported the development of these initiatives and designated the ancient hospital as a testing ground to experiment with innovative solutions for environmental, social, and economic sustainable urban transition [22]. Therefore, in 2015 the municipality acquired the property of the former hospital with the aim of transforming it into an eco-neighbourhood. The main objective for this major urban transformation project is to create a predominantly residential neighbourhood, open to the city and favouring a social mix, providing an ambitious and exemplary environmental approach, and and at the same time respecting and enhancing respecting and enhancing its heritage, landscape and history [Fig. 4]. Thus, the Saint-Vincent-de-Paul eco-neighbourhood will combine housing, public and private amenities, shops and businesses, spaces for cultural and creative activities and 4,000 m2 of green spaces. Of the 60,000 m2 of building floor area, about 43,000 m2 will be dedicated to housing-social (50%), mid-range (20%) and unrestricted (30%). A shared flexible-use facility of 5,400 m² will host a nursery, a school and a gymnasium, and 7,500 sqm will be dedicated to shops, businesses, and an arts and creative activities centrev [23].
The project designed by the Anyoji Beltrando agency and the developer Paris & Métropole Aménagement is intended to ensure a harmonious balance between the hospital's historic buildings and the new buildings required, focusing on transformation rather than demolition. Almost two thirds of the architectural heritage will be retained: the Oratoire, Robin, Pinard, the Maison des Médecins and the Lingerie will be renovated and conserved, including the characteristic basement courtyards, whereas Lelong will be raised in height. Moreover, the hospital's two historic orthogonal footpaths will be transformed into a green public space reserved for soft mobility. This approach provides a remarkable ratio of planted public spaces, most of which are existing planting, and will also limit the amount of levelling and groundworks required, support biodiversity and increase the rainwater permeability of the soil. A vast range of pooled services will be open to the neighbourhood, such as an auditorium, accessible terraces, and shared gardens [24].

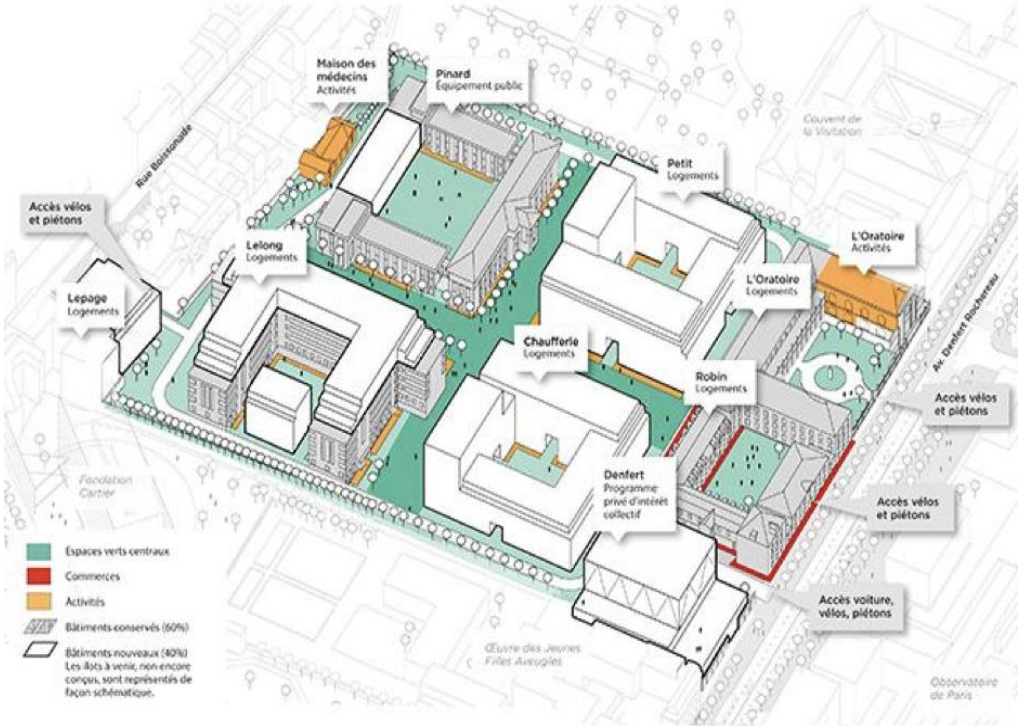

Fig. 4: The Saint-Vincent-the-Paul project. Source: P&MA 2020a

Concerning the contemporary blocks, the Lepage, Petit, Chaufferie and Rapine buildings, whose historical interest was low, will be demolished or deconstructed to make way for new blocks. "The aim is to encourage contemporary architecture that respects the existing heritage and prioritises high-quality, bio-sourced materials, such are bricks, which are already widely used in the architecture of the old hospital" [24].
As mentioned, the project is very ambitious, notably from an environmental perspective. The future eco-neighborhood will be "the first urban project that sets out to be carbon-neutral and resilient" (Ville de Paris 2020), thereby becoming symbol of what the city of Paris aims to do in the future in terms of urban sustainability. To this end, the Saint-Vincent-de-Paul eco-neighbourhood project is based on a "triple zero" ambition: aiming for zero-carbon, zero-waste and zero-discharge [23]. Thus, the project primarily

focuses on reusing materials, managing resources, local production of renewable energy, alternative transport, biodiversity protection, water management, and the circular economy.
In particular, the eco-neighbourhood aims to achieve a high standard of energy efficiency at all stages of a building's life and precise energy requirements have been included in the project. The proposed strategy is based on heat recovery from the non-potable water network of Paris aiming for 100% renewable energy by 2050 [24]. To pursue the objective of reducing the carbon footprint as much as possible, retrofit actions will be provided for existing buildings and a specific tool is envisaged, the EnerPHit label for retrofit, allowing the passive house goal to be adapted to the characteristics of the existing buildings. For the new blocks, energy efficiency and renewable energy production standards are set by the Passivhaus method. Accordingly, all the new buildings are constructed primarily using bio-sourced materials and the structures are designed to be flexible and adaptable.
Concerning the zero-waste objective, the main actions focus on promoting building and material recycling and reuse, through a circular economy approach. More specifically, the ambition is to reuse all architectural elements and materials from the demolition process, both on-and off-site.
Finally, the zero-discharge objective is meant in terms of sustainable water management and biodiversity protection. Attention is paid to the autonomous management of rainwater collection, stored in green roofs, and the reintroduction of plant and invertebrate species to improve biodiversity and to contribute to regenerating the soil and increasing its capacity to absorb water [23].
In general, it is possible to observe how the requalification of the lot is inscribed in the continuity with the densification process. Probably for the first time, the urban project has a unitary and comprehensive design approach on the site. The balance between existing and new buildings is achieved by prioritising the conservation of certain building blocks, alongside the construction of new buildings on central blocks. The preserved buildings correspond to u-shaped types, more intact and coherent in terms of function and space. The demolished central blocks, on the other hand, were either still of low density, as with the case of the Chaufferie building, which contained technical buildings, or alternatively, as with the case of the Petit building, of such stratification as to preclude the restoration of both functional and energetic coherence. However, this variety and historical stratification allows observations on the potential for adaptive reuse at the urban and at the architectural scale. The Pinard lot is chosen as a case of further exploration because of its Hygienist design and as representative of the healthcare u-shaped pavilion type.

5. Maternity Pinard’s hygienist architecture, an architectural focus

Adolphe Pinard is a stratified historical building built in 1930-34 as a Maternity ward. The first site operation took place in 1934. The original building system was considered innovative, since it was the earliest example of hygienist architecture applied to a maternity ward. Based on geometrical symmetry basis and a U-shaped system, Pinard is originally composed of three wings built on a central courtyard. English courtyards are a particularly distinctive architectural element. They provide light and air access to the basement, rendering it usable along the entire length of the building [Fig. 5].
The geometry is organized by wings 8x57 meters thick and almost 4 meters high. The shape of the building, together with the interdependence between rooms, required an articulated system of vertical and horizontal connections. A central corridor runs in continuity along the entire length of the building, connecting three staircases and lifts located in the centre of the main wing, and at the north ends of the secondary ones. Later, two more lifts were added at the two ends of the central wing, with annexed external safety stairs. In addition, the English courtyards offer further opportunities for accessibility to the building from the urban plot, making the basement an additional level of permeability between the hospital complex, the inner court, and the internal connection system.
Together with the almost 40% of perimetrical walls dedicated to high windows, the building offered a very hygienic space for hospital functions. It provided a large amount of natural light and good ventilation. Moreover, the English courtyards are very peculiar architectural elements, bringing light and air into even the basement. With a fair-faced but load-bearing brick facade, independent interior walls and reinforced concrete floors construction solutions, it has a modern aesthetic.

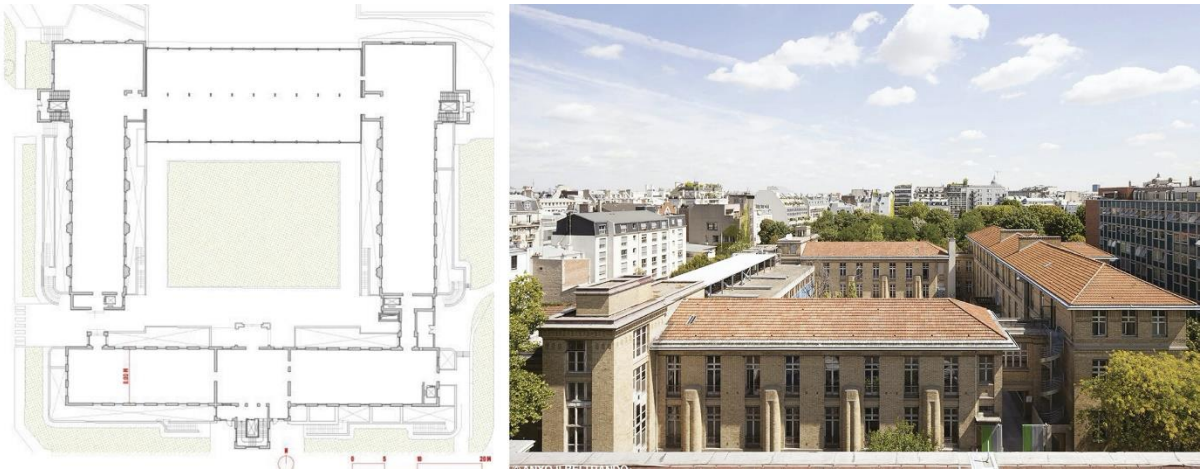

Fig. 4: Maternity Pinard's Plan and façade. Source: P&MA 2020a

Pinard has been modified twice during the 20th century: in 1942, when the two side wings were fitted with a two-sided painted roof in place of the original terraces; in 1969-72, when a car park was built under the central courtyard, and a new building was constructed above the building and between the two wings. This new building has a concrete structural frame, and an envelope of prefab PVC panels. With this extension, a fourth wing was created and the lot was closed surrounding all the courtyard.
From an architectural point of view, the reuse program proposed the demolition of the 1970s intervention. Moreover, the reuse program required the replacement of the underground car park with a gymnasium, the reuse of the original building to accommodate schools of a different order, a ground floor for alternative commerce, and a "third space".
Pinard is an interesting case for understanding the value and potential for adaptive reuse of architectural heritage. In particular for the intention to intensify and alternate an already mixed functional program, opposed to the other maintained buildings where a more classical program is inserted (residential and commercial).
In order to underline how the functional and sustainable reuse goals might be achieved in a u-shaped type healthcare building, Pinard case study shows typology strength in adaptive reuse process, and significant limits related to energy efficiency in retrofitting hygienist architectural heritage.
Pinard Maternity's U-shaped type is easy to adapt. The characteristics of the u-shaped type, together with the specificities of hospital architecture, make Pinard an easy to adapt building.
Starting with the morphology, the three wings allow for an articulated subdivision of the surface. In fact, it is possible to isolate several programmatic entities within the same building and within the same wing. In addition, the shape of the building facilitates the completion of the u by a fourth wing. This action has interesting implications on the possibilities of spatial layout and intensification of uses.
The inner geometry, in spite of its narrow width, the four-meter inter-floor height would allow for mezzanine portions. The general configuration also makes the basement accessible and livable.
The porosity to the lot is remarkable thanks to the diversification of points of access along the internal perimeter around the courtyard, as well as along the external perimeter. Access to the English courts has to be considered as well. The number of access points greatly increases the building's potential for reuse.
The extensive connections, typical of hospital architecture, are a further element of interest for reuse. The presence of a staircase for each wing, set at each extremity, guarantees an independent connection to the floors and rooms, an independent access from the outside to the various spaces.
Furthermore, the architectural principles of hygienic architecture make energy retrofit more difficult. In terms of consumption, energy efficiency can be easily achieved by installing new high-performance fixtures and a layer of internal thermal insulation. However, even the most ordinary solutions can be in tension with the specific nature of the building. In Pinard for example, the replacement of all fixtures and doors with new triple-glazed windows is very expensive. Moreover, the 4-meter-high floor results in highly voluminous internal spaces, thus impacting on energy consumption.
The brick stratigraphy of the opaque walls would require bio-sourced insulating panels 25 cm thick. If applied to a width of 8 m building, it would reduce by 0.5 m an already limited thickness, leading to a loss of about 29 m2 of floor space per wing. The total loss of surface area not only affects the building's chances of adapting to the new use, but could also lead to a considerable economic loss to its market value.

6. Conclusions

Both scientific literature and practice alike suggest that the adaptive reuse of ancient hospitals is a great opportunity to improve sustainable urban development, even if it is not always easy to find a balance

between new uses, environmental ambitions and the character of the original building fabric. In this context, the Saint-Vincent-de-Paul project is an interesting example of inner-city regeneration, showing the huge potential of historic hospitals complex for sustainable and adaptive reuse, albeit with accompanying challenges and risks.

In particular, this analysis has shown how the historical layout of the hospital site, with its system of historic orthogonal footpaths, circulation routes and courts, is particularly suitable for transformation into a new mixed-use neighbourhood. Furthermore, the ratio of solids to voids, as well as the density and volumetry of the site, allow for the creation of a new human-scale urban environment. The green and open spaces, maintained and enhanced, offer new quality public spaces accessible to all. Despite this, there is the impression the new neighborhood is still enclaved, as a legacy of the site's hospital and religious past.

Moreover, the case study clearly shows that historic hospital buildings are well suited for new uses, while more recent buildings are difficult to convert. In the case of Saint-Vincent-de-Paul, the new functions and design solutions have been carefully tailored to the characteristics of the stratified heritage. To achieve this, it is essential to adopt an integrated strategy that combines the preservation of the historical heritage and memory of the place with appropriate new uses.

All these elements, characteristic of an eco-neighbourhood, show that the former hospital also offers great potential in terms of sustainability. In this regard, the Saint-Vincent-de-Paul project could be a forerunner of a new concept of eco-neighborhoods, in which sustainable development objectives are integrated with hospital architectural legacy. This is decidedly innovative, because very often ecological districts do not make use of historical heritage buildings, but above all new buildings, and the resulting aesthetics and the atmosphere sometimes appear to be at odds with the existing city. In this case, in contrast, the integration with the ancient hospital site, landscape, urban fabric and architecture has been carefully taken into account in the eco-neighborhood project.

Also, the dialogue between the existing hospital heritage and the new architecture appears to be in continuity with the historical evolution of the lot in terms of eclecticism and stratification. While on the urban scale the design process enhances the construction and environmental characteristics of the site, on the architectural scale there are conflicting elements.

As highlighted by the focus on Pinard, the legacy of hospital architecture until the 19th century is well suited for reuse on a functional and spatial level. The same is not true for the following architecture, both for the low architectural quality and for the excessive superfetation, therefore expensive or difficult to reconvert. In fact, it must be said that the infrastructure of pavilion hospital buildings, the oversized presence of horizontal and vertical circulation, as well as the high porosity enables multiple potential for reuse.

However, the architectural principles of hygienic architecture are far from the principles of energy efficiency. The importance of light and ventilation gives rise to architecture with excessive glass surfaces and a high ceiling. These elements require expensive retrofit work to reduce energy consumption – all the more so because of the dispersed volume.

Despite these threats, the Saint-Vincent-de-Paul case study shows the opportunity of ancient hospitals adaptive reuse, not only in terms of ecology, but also socio-cultural aspects. Indeed, health care assistance buildings are often a familiar landmark and part of the cultural identity of the civil society. As shown in this case study, adaptive reuse can lead the way toward preserving architectural heritage, allowing its legacy to live on through a different purpose. To conclude, it is important to note that the Saint-Vincent-de-Paul project is currently underway. For this reason, our analysis is limited to the design phase. Further steps in this research would be interesting in the next phases to verify urban and architectural achievements.

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Design for health in the landscapes of Southern Italy: the "Widespread Park of Knowledge and Wellbeing"

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Abstract
The paper illustrates the 'Widespread Park of Knowledge and Wellbeing' project, a system of initiatives and places scattered throughout the territory of Reggio Calabria, in a typical Mediterranean landscape, all linked to the concept of care applied to people and landscape [1].
The Widespread Park proposes a model to contrast the pathologies of the new poverty, typical of the contemporary city, based on the sharing of knowledge and the cooperative management of health as a common good and finds application in the care of the environment and of the landscape as well as man.
The project experiments with the community activities of social agriculture, forms of circular economy and energy production from renewable sources, hosts opportunities for knowledge of cultural heritage and artistic performance, according to an unprecedented systemic offer for the territory.
The Widespread Park offers a landscape that holds together sustainable cultural, social and economic processes, responsible behaviour and ethical and aesthetic regeneration.
The project can be replicated in other Mediterranean territories because the formula of the Widespread Park as a permeable system can be implemented and transferred to other marginal contexts in transition towards more decisive roles for the rebalancing of cities.

Keywords: Landscape Care, Human Care, Widespread Park, Health, Wellbeing

1. Design for health

The correlation between the daily care of people and the daily care of the environment and the landscape is a principle widely shared in contemporary culture, expressed, among others, by Pope Francis in the 2015 Encyclical "Laudato si'"; in the UN resolution "Transforming our world: the 2030 Agenda for Sustainable Development" (09/2015); in the Horizon 2020 axis "Health, Demographic Change and Wellbeing work program"; in the Italian pavilion at the 2016 Venice Architecture Biennale entitled "Taking Care"; in the WHO European Healthy Cities Network project; in the call "Europe in a changing world - inclusive, innovative and reflective Societies - Prize for Social Innovation in Europe".
It is now well established that health and well-being are closely integrated with lifestyles and the quality of the environment and landscape and the improvement of health and the prevention of diseases, especially chronic-degenerative diseases, cannot be separated from the improvement of quality of places of daily life and the provision of services, social and collective goods [2].
Proof of this is the Pandemic that, starting from the first days of 2020, afflicts nations and communities of the planet, determined, according to an interpretation widely shared for several years, by the "species leap" carried out by a virus that has moved from being hosted in the animal world into being guests of humankind. An anomalous behaviour, probably determined by the profound impairment of the planet's environmental qualities and the reduction of biodiversity following a development process that has profoundly altered its ecological balances [3].
This is a condition that requires a radical "paradigm shift", from an anthropocentric logic, centred on the intensive and predatory exploitation of the planet's resources, to a renewed relationship and balance

that mankind must be able to establish with the plant and animal world, with nature in all its forms and manifestations [4].
The principle of care, therefore, is particularly effective in translating this renewed relationship of man with his habitat into new attitudes and behaviour.
It goes beyond that of maintenance; if maintenance is a technical practice, the gesture of care involves the feelings of empathy, care, delicacy, respect and kindness. At the base of the treatment there is an assumption of responsibility towards a person as well as a place.
In this vision, taking care of the person coincides with taking care of the landscape in which we live permanently or which we cross temporarily, with constant and shared action. The quality of life coincides with the quality of everyday landscapes; respect for people coincides with respect for landscapes and above all for those most compromised and neglected.

2. A place of experimentation for a dynamic community

Pellaro, a town/district/suburb south of Reggio Calabria, is an appendage of land projected towards the sea, with the last foothills of Aspromonte behind it, facing the Strait, and within it fragments of bergamot groves (cultivations of precious citrus that grows only in this extreme southern land). Often beaten by lashing sirocco winds and icy mistral winds, it is a site where Greeks and Romans settled, and it could not be otherwise for the beauty of its sea and its light. Pellaro is also a typical example - of Southern Italy and contemporaneity - of a rural village hit by the rapid process of urbanization that has determined an uneven and incoherent urban structure, characterised by tall residential buildings built next to elegant rural houses and by a multitude of places without particularly apparent qualities: a disorderly urban context, with a poor supply of services and productive activities and pressing problems of a social, environmental or cultural nature.
Not only for these characteristics is the Pellaro district a privileged field of research and applied experimentation of regenerative processes, but also thanks to the presence of a community of volunteers who have decided to stubbornly defend their environmental, landscape, identity and heritage and to fight battles, sometimes almost impossible. Not only fighting urban poverty, the abandonment of cultural heritage and the illegal practices of environmental disfigurement, but also against the processes of homologation and trivialisation of contemporaneity.
In 2010 this active community of volunteers founded ACE, an association promoted by doctors which is focused on the value of solidarity medicine and concrete help towards the weakest social groups who, especially in Southern Italy, often have no way of accessing basic health care.
In a short time, the activities and initiatives of the association have expanded, involving other social and professional categories that adhere to the project; in particular, multidisciplinary research, both of a theoretical nature and of applied experimentation, are initiated from the union between doctors and architects. In addition to the issues of the health of the weakest and most exposed to diseases, the objectives of the association also include issues of the quality of the environment and the living spaces of the entire Pellaro community.
Over the years, ACE's commitment has translated into the concrete action of starting regeneration projects for abandoned buildings and spaces. These are "urban and rural waste" of a recent past which, with limited resources and self-construction practices, have been transformed into extraordinary spaces for shared, supportive and convivial life.

3. The Widespread Park of Knowledge and Wellbeing

By skilfully interpreting the vocations and potential of each individual place subject to intervention, the ACE volunteers have launched into a new cycle of life of abandoned landscapes and identifying places. A public building never used and degraded surrounded by a precious citrus grove next to a concrete stream, is today a solidarity medicine clinic frequented daily by dozens of people. A wonderful five-hectare terracing, no longer cultivated, today is a neo-rural Park where the traditional cultivation of vines, almond and olive trees have been restored and works of environmental art and thematic educational paths have been added. A small, partially completed and uninhabited building overlooking the Strait of Messina, after the restoration work of the internal and external spaces, houses the headquarters of the ACE Foundation with a study and research centre and a library, open to all, which houses valuable thematic collections of books, objects donated by private individuals, ranging from medical disciplines to Calabrian history and literature.
The whole of these places constitutes the Widespread Park of Knowledge and Wellness (Fig. 1); an open system of relationships, of meaning and significance between places, even heterogeneous from each other, scattered throughout the territory of Reggio Calabria, connected by a circular, pedestrian and cycling path of 12 km.

The Widespread Park is not a bureaucratic tool that identifies a portion of perimeter territory to be subjected to a protectionist regime as opposed to a degraded environment to be considered without interest, but rather a landscape in the making, flexible, porous, susceptible to variations and additions, extendable and modifiable over time.
The Widespread Park above all carries out actions to raise awareness of environmental issues and the quality of life, with an intense program of recreational and cultural activities ranging from the organisation of seminars and conferences on the issues of public health and urban regeneration to convivial with the consumption of Km0 products, from the constant cultivation of vegetable gardens and vineyards to the recovery of small rural artefacts or the installation of environmental artworks.
The aim is to trigger a virtuous process to involve an ever-increasing number of inhabitants of Pellaro, belonging to all social categories, in the care practices of their places of daily life, according to the model of the ACE volunteers who care, with the same dedication and passion for both people and their landscape.
The more general ambition of the project is that the process can progressively extend to other *abused* places in the Metropolitan City of Reggio Calabria. With this in mind, a new project promoted by the ACE community, in fact, started in September 2020 in the popular neighbourhood of Arghillà, a northern suburb of Reggio compared to the city centre, exactly at the geographical antipodes of Pellaro.
The Arghillà district, built in the 1980s to provide the city of Reggio with public housing, soon became a ghetto, a no-man's land, of abandonment, of widespread illegality which manifests itself also and above all in the illegal occupation of spaces and accommodation. A condition of increasing degradation, despite the extraordinary geographical location of the district which rises on a plateau overlooking the Strait of Messina, surrounded by a fertile plain with a strong agricultural vocation, especially wine.
Approximately one thousand social housing units house, according to only presumed estimates, about five thousand inhabitants of destitute and multi-ethnic families; over 50% of the houses are, in fact, illegally occupied by numerous and unstable families, therefore difficult to censor. The hygienic, health and social conditions are disastrous: piles of waste everywhere, running water only periodically, absence of public services and facilities, absence of economic and productive activities, reports of violence against minors and women, widespread illegality with illegal employment, housing also often expanded, modified or vandalised.
For years, numerous voluntary associations have been active in Arghillà carrying out exemplary work of help and assistance to people in economic and / or health difficulties. In 2009 the Coordinamento di quartiere was established in the parish, made up of associations and citizens who live both in other areas of Reggio Calabria and in the same neighbourhood, with the aim of stimulating all the inhabitants to start a virtuous path of dialogue, socialisation and legalisation, care of common goods, defence and recognition of their essential rights.
Over the years, various projects have taken place, which have started up and are in progress; among these, is also the proposal of the ACE community to create a health centre of proximity, which is always inspired by the principles of solidarity medicine, to support not only health problems, but also, and above all social problems, aimed at all the inhabitants of Arghillà.
The intervention consists of starting a new life cycle for part of a public building on the ground floor that has been abandoned and vandalised for years, assigned by the Municipal Administration of Reggio Calabria to the ACE Association. The project involves the recovery of the internal spaces, where to create ambulatory and waiting rooms, and their connection with the external spaces, where to create gardens of medicinal plants, collective gardens and spaces for convivial activities to consume the cultivated products and play areas for children with furnishings in recycled materials. The first step taken by ACE was to establish a continuous dialogue with public bodies, with the Coordinamento di quartiere and with those who, even in a personal capacity, intend to provide a concrete contribution for the start and implementation of the project, in a spirit of collaboration and sharing.
The concept of the project is that of a welcoming, listening space, open to the surrounding buildings; a space for meeting and socialising for all the varied components of the community of inhabitants; a common home that can also and above all represent a point of reference and coordination for all the associations and volunteers active for years in Arghillà. Also in this case, as in the previous ones, ACE volunteers receive funding and economic aid from foundations and private citizens who only partially cover the costs of carrying out the interventions. Much of what is planned and implemented is instead due to the commitment and concrete and free work of the many volunteers who actively participate in the initiatives.
The nearby health centre of Arghillà, inaugurated in February 2021, constitutes a further piece that is added to the previous ones in the masterplan of the Widespread Park, significantly increasing the range of actions of the project in the territory of the Metropolitan City of Reggio Calabria.

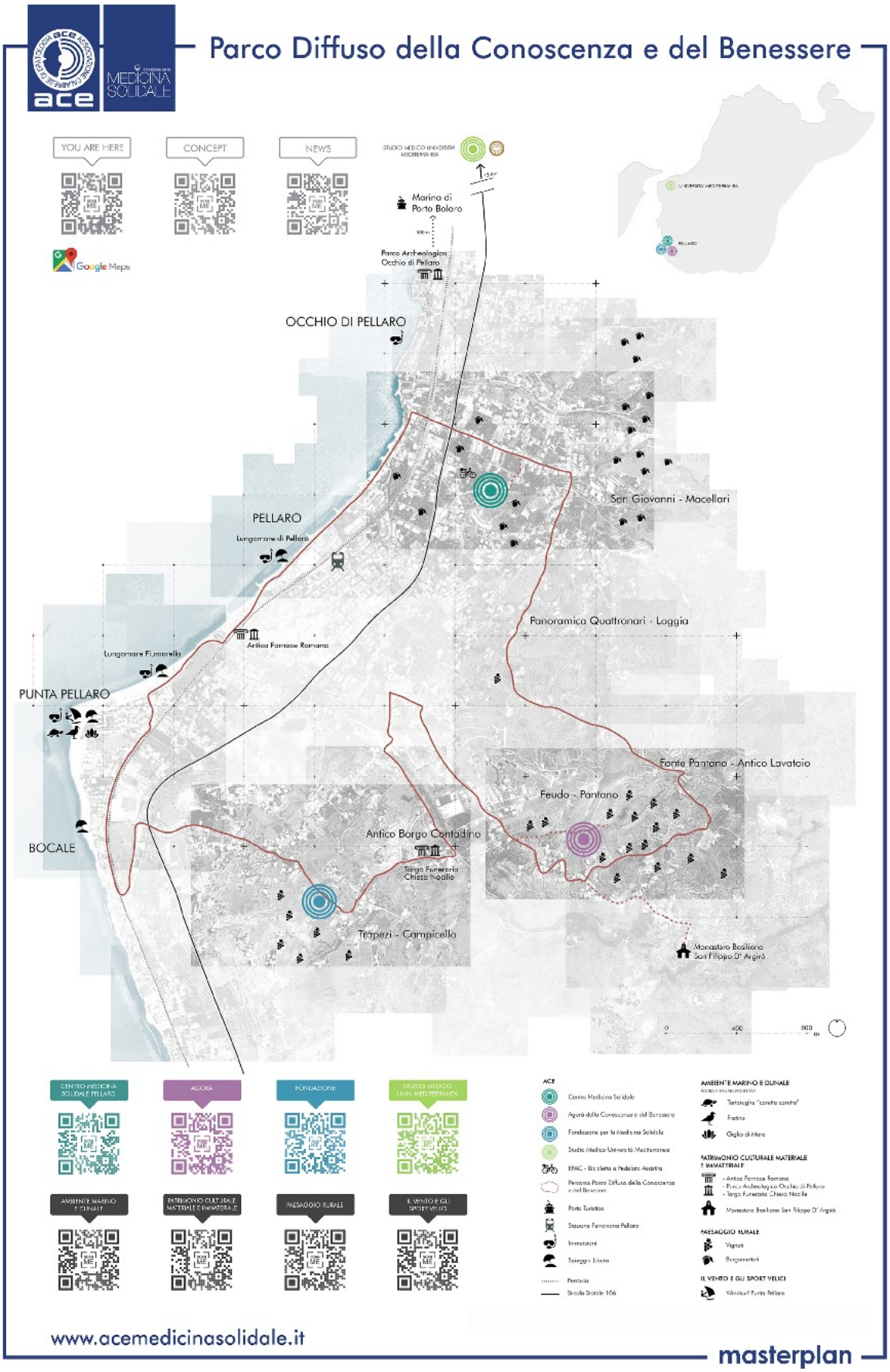

Fig. 1: Widespread Park of Knowledge and Wellbeing masterplan.

4. Main objectives of the Project and results obtained

With the Widespread Park of Knowledge and Well-being, we want to propose a model of 'treatment' of the pathologies of the new poverty, especially typical of the marginal areas of the contemporary city, based on the sharing of knowledge, on the cooperative management of health as a common good, a culture of solidarity, which finds its application in the 'care', as well as man, of the environment, the landscape and the cultural and identity heritage.

The main purpose of the Park, therefore, is to offer the community of inhabitants a set of places (medical clinic, research centre and library, social gardens and cultural spaces) for activities (presentation of books, artistic performances, multidisciplinary seminars), services (medical, social, solidarity), products (popular and scientific publications) in which to seek physical and mental well-being and, at the same time, an opportunity to assume responsibility towards one's own living space through the gesture of the cure.

The treatment model proposed by the diffuse Park has launched a participatory process close to the real conditions of fragility, not only linked to health, but also social and cultural, of the marginal fringes of the city and has promoted a network that involves individual citizens, families, associations and institutions.

In addition to providing about 1200 monthly specialist services (dedicated to chronic-degenerative diseases, psychological distress of children and adolescents, eating disorders, diseases more present in degraded environments) in the Solidarity Medicine Centre and in the university clinic. The Park offers study and co-working spaces and a library with over 2000 volumes and a section dedicated to Calabrian culture within the Observatory which hosts constant moments of multidisciplinary discussion, with free access. In both cases, it was decided to recycle existing buildings which was followed, over time, by the spontaneous regeneration of the surroundings.

A 5-hectare terracing has been recovered which houses traditional crops, convivial spaces, social farming activities, temporary and permanent artistic performances, screenings, educational paths, all for free use and participation by the community.

The Park has promoted various editorial initiatives and stimulated scientific and popular publications on the theme of the relationship between health, well-being and landscape quality (Fig. 2, 3).

5. Exemplarity and sustainable territorial development

The inspiring principles of the Widespread Park are consistent with the sustainability objectives proposed by the guidelines of the Strategic Plan of the Metropolitan City of Reggio Calabria (which signed the Bologna Charter in 2017) especially that of social inclusion in terms of reducing the marginality of suburbs and recognition of the natural, historical and landscape components as characterising values of the metropolitan identity.

The project, which is constantly evolving, makes it possible to transfer and consolidate the value of caring for the environment, landscape, cultural heritage and identity in the community as a collective action towards a common good, on a par with the right to health. It also experiments with the community activities of social agriculture oriented towards healthier lifestyles and correct eating habits, circular economy forms and energy production from renewable sources in respect of exogenous resources, stimulating innovative actions to promote the landscape, hosting scholars, artists and their works. It is a shared project generated by a participatory path which is always open to contributions that will come from associations, public bodies, scholars, researchers, citizens and visitors.

By initiating new life cycles of artefacts and abandoned spaces, the project inspires reactive processes in the community previously addicted to decay. The Widespread Park, therefore, encourages responsible attitudes and promotes sustainable cultural, social and economic processes, as well as ethical and aesthetic regeneration.

Specifically, the Widespread Park formula (intended as a permeable, evolving, flexible system that welcomes implementations and in-depth studies) also substantiates its replicability; it is a transferable model - with the necessary additions and/or corrections - in other territorial contexts, not only in the Metropolitan City of Reggio Calabria itself but in general, in the marginal areas in transition towards more decisive roles for the rebalancing of urban agglomerations.

Finally, the project encourages the sharing of knowledge for the development of a collective critical capacity especially towards the responsible consumption of common goods, the redetermination of community relations in the name of reciprocity and solidarity, the promotion of a renewed sensitivity towards relationships between quality of life, health, and landscape quality. It promotes an unprecedented model of social commitment that counters urban and environmental degradation by proposing a systemic logic that goes in the direction of the principles of 'care for the common home' and 'integral ecology' enunciated by Pope Bergoglio.



Fig. 2: Photographic atlas of the Widespread Park.

6. Public awareness and participation

The project has made use, in all its phases, of the constant comparison with the associations operating in the area. They are indispensable to mirror the real picture of the needs of the community, with the public bodies that have supported the bureaucratic and administrative processes necessary for its implementation, becoming part of it. active with technical support, from the Mediterranean University which, through the commitment of some professors and researchers of the Architecture, Landscape and Cultural Heritage area, has provided constant scientific support and with the Academy of Fine Arts for the realisation of environmental artworks.

Transparency in the public transfer of results and initiatives and the invitation to participate is also ensured by the constant updating of the site, by the interactive map of the Widespread Park present in different parts of the city, by the multidisciplinary scientific and educational production.

The constant dialogue with the municipal and metropolitan administrations as well as with the Mediterranean University also ensures that the founding principles of the project are always consistent with local governance policies and with the National Sustainable Development Strategy and the objectives pursued adhering to the national and international scientific debate on the landscape project as a tool to combat social inequalities.

For this reason, the Park, in addition to proposing a health model conceived on prevention and healthy interaction with the living environment, hosts constant public activities such as the annual collective harvest of the autochthonous vineyard (once abandoned and recovered thanks to activities of social agriculture), the ecological days combined with the knowledge of the architectural and archaeological emergencies visible along the paths that unite some nodes of the Park. In addition the social inclusion paths directly connected to landscape care actions, the opportunities for cultural comparison (presentation of books, multidisciplinary seminars, screenings) which are otherwise difficult to access for peripheral communities. The Park, therefore, increases the critical capacity of the community in becoming aware of the frequent condition of degradation of the marginal areas, of the right to individual and collective well-being and of the opportunity to pursue it through a model of man/landscape rebalancing already experimented in other national and European contexts.

The community of the Park, and its supporters, is constantly expanding.

7. The community at the center

The experience of the Widespread Park of Knowledge and Wellbeing teaches us that the conditions exist today for an active involvement of the inhabitants in the processes of urban and landscape regeneration. In fact, we are witnessing the rapid spread, even in precarious and degraded contexts, of a growing sensitivity of the correlation between quality of life and personal well-being, with the quality of common goods and landscapes of everyday life. In the most critical conditions, even in areas where there is a frequent propensity for illegality and informal occupation or alteration of places, there are innovative and significant experiences in terms of new models of sociality and urbanity.

Paradoxically, where the most difficult and apparently hostile conditions exist, the experimentation of innovative models centred on the “care of the common home” [5] becomes even more effective and incisive than in more consolidated and ordinary contexts. The active involvement of communities is above all motivated by the observation that very often the inhabitants are bearers of new urban meanings and values and mirror a social dimension that perceives, before the institutions responsible for the governance of the territory, needs and problems and suggests with more rapidity, answers and solutions "[6].

It is therefore a question of channelling that enormous resource of energy and ideas of the populations of the South into virtuous, collective and shared care activities; those same resources which, if ignored, or worse opposed, too often end up finding an outlet in solitary works of destruction and abuse.

The formula of the Widespread Park therefore, wants to be above all the experimentation of an unprecedented model centred on a principle: urban and environmental degradation cannot be addressed in a point-like manner but rather with a network and system logic that takes into account the social context, cultural, environmental and economic and involves various actors, both public and private, with the widest possible involvement. In fact, in order to trigger a virtuous process of change from the current unfavourable condition of degradation of some territories in transition from the role of suburbs to that of a metropolitan area, a short circuit is necessary. It needs a creative step capable of generating a new model of urbanity and an approach that is also visionary and imaginative, which is realised starting from the specificities of the places and communities settled [7].

The strategy of the diffused Park is based on this principle: the community - plural, multicultural, multi-ethnic - is at the centre of the scene and is to be considered the true protagonist and advocate of its own well-being and future. The project Widespread Park of knowledge and wellbeing of Reggio Calabria, presented by the Calabrian Association of Hepatology Onlus, received a recommendation for the National Landscape Award 2021. The recognition was announced by the Minister of Culture on March 14, on the occasion of National Landscape Day.

As part of a common drafting of the paper, the abstract and chapter 7 were collectively conceived by the two authors, chapters 1,2,3 are to be attributed to Vincenzo Gioffrè, chapters 4, 5, 6 are to be attributed to Chiara Corazziere.

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Fig. 3: Widespread Park, environmental sculpture called 'Tribute to Don Quixote'.

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Health as an Institutional Commitment. The conversion of Nordkraft from a Power Station to a Cultural and Health Centre

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Abstract
More than half of the world's population currently lives in cities, and urban health problems have worsened. In cities, there are serious risk factors for health and the spread of diseases, such as COVID-19 whose major epicentres have been in urban settlements.
To guarantee public health, urban environments must be remodelled on the basis of new urban planning principles, in a holistic vision with integrated social and health-related aspects. Indeed, public health in urban habitats is not just about increasing life expectancy but also about improving the quality of life itself. Consequently, urban environments must offer not only health services but also social opportunities to individuals, namely the ability to build relationships, cultivate interests, develop culturally and lead a healthy lifestyle.
The World Health Organization promotes health in urban environments through the Healthy Settings approach and the establishment of a network of healthy cities, encouraging local authorities to experiment with initiatives for the construction of environments favourable to health. Among these is the former Nordkraft power plant in Aalborg (Denmark) which was converted into a centre for psycho-physical well-being for citizens in which spaces and equipment are offered for diverse hybrid and creative activities. This work examines this conversion as a case study of projects promoting community health and well-being in urban environments.

Keywords: Urban Health; OMS Healthy Cities Network; Healthy Setting; Aalborg; Nordkraft

1. Introduction
The phenomenon that has most profoundly characterized the beginning of the 21st century is urbanization. Currently, over 55% of the world's population lives in urban areas, and the trend is continuously increasing. Cities undoubtedly offer many opportunities but, at the same time, urban life is not free from risks and threats to resident's health. Among the main factors threatening health in the city are inadequate housing, inefficient public transport, poor hygiene, inadequate waste management, air, water and soil pollution, noise and light pollution, urban heat islands, lack of pedestrian spaces and spaces and equipment for leading an active life.
To these factors can be added phenomena related to ethnic and religious violence and intolerance; noncommunicable diseases, such as heart disease, stroke, asthma and other respiratory diseases, cancers, diabetes and depression; infectious diseases that find their ideal environments through which to spread and multiply in the gatherings and concentration of individuals in the cities. The pandemic produced by the spread of the COVID-19 virus has clearly demonstrated the latter factor; in fact, in the spread of the pandemic, cities were the major epicentres of the contagion [1–3].
The sanitation problems of contemporary cities have changed in recent time as community needs have evolved and the relationships between urban planning and health have become increasingly evident. Urban and regional planning is a fundamental tool for the protection of individual and collective health. Urban regeneration, social innovation, an efficient public transport system and alternative mobility are tools that make it possible to improve citizen' state of well-being as well as their quality of life, life-style options and living conditions [4].
Starting from these considerations, the Urban Health approach [5] was developed which is a new approach to the city focused on the relationship between urban planning and health and aimed at

promoting urban planning principles and practices for a healthy city. The Urban Health approach seeks to define actions that can have positive impacts on human health and quality of life, thus underlining the strong interdependence among physical, mental and social well-being and the environments in which people live [6–8].
The World Health Organization (WHO) is one of the main players that, on a global level, defines strategies for improving health; among these are indications for the creation of living environments that favour well-being and promote health in its broadest definition [9]. To this end, in 1986 the WHO promoted the international Healthy Cities Network with the aim of putting the issue of health on the agenda of the city governments [10].
In more than thirty years of experimentation, the WHO Healthy Cities Network has tackled the problem of health in urban setting from different points of view, finding original and innovative solutions. Among these is the conversion of the former Nordkraft power plant in Aalborg, Denmark, which this article analyses as a case study. The city, part of the Healthy Cities Network, has adopted a Healthy Settings approach to create a new services centre focused on citizens' well-being and which offers spaces and equipment for pursuing diverse hybrid and creative activities.

2. WHO Activities for the Promotion of Public Health in Cities

The WHO was established as a specialized agency of the United Nations to help improve nutrition, hygiene, housing, urban liveability and working conditions around the world. Its Constitution, drawn up in 1946 and in effects since 1948, defined for the first time the concept of health as «a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity» [11] (p. 1). The Constitution also stresses that the environment is extremely important for achieving a state of health: the individual or group must be able to change the environment or adapt to it to fulfil their aspirations and meet their needs [12].

Denouncing the enormous disparity between the quality of the environment and the health status of populations in developed and developing countries, the WHO has intensified its campaign to defend the right to health. In 1978 the organization, together with UNICEF (United Nations Children's Fund), promoted the signing of the *Alma Ata Declaration* which emphasizes the importance of primary health care – which addresses the major health problems of the community and provides the necessary promotion, prevention, treatment and rehabilitation services – as a strategy for achieving a better level of health for the world's population.

The motto of the declaration was "health for all by 2000". The goal was to ensure an acceptable level of health for all people in the world by 2000 through a better and more complete use of the world's resources, a considerable part of which was then – in the context of the Cold War – devoted to armaments and military conflicts. A true policy of independence, peace, detente and disarmament could have freed up additional resources for peaceful purposes, including primary health care.

The statement also highlighted that achieving a better level of collective health, a result to be achieved around the world, required an interdisciplinary approach and the contribution of the economic, social, construction, urban and health sectors.

Based on these considerations, in 1986 the WHO promoted the drafting of the *Ottawa Charter for Health Promotion*. This document is based on a socio-ecological approach to health and underlines the inextricable link between humanity and the subsystems that make up the ecosystem in which people live, from the family to the community, from the physical to the socio-cultural environment [13].

The *Ottawa Charter* introduced the concept of "health promotion", which is the process of allowing people to exercise greater control over their health and its improvement. One of the key factors in this process is taking care of each other and the environment we live in by creating so-called "supportive environments". The concept of supportive environments implies the evaluation of the effects of the physical environment on individual and collective health, to be evaluated both in private and public space, directly involving the architectural and urban planning disciplines. To this end, the WHO has launched the Healthy Cities project on an experimental basis (see below) to sensitize local administrations to the need to include the issue of health in the city government's agenda.

The need to create supportive environments for health promotion was subsequently the subject of the WHO-sponsored Third International Conference on Health Promotion in 1992, held in Sundsvall (Sweden). The *Sundsvall Statement on Supportive Environments for Health* defined the concept of "supportive environments for health", later introduced in the WHO's *Health Promotion Glossary*, which

says: «supportive environments for health offer people protection from threats to health, and enable people to expand their capabilities and develop self-reliance in health. They encompass where people live, their local community, their home, where they work and play, including people's access to resources for health, and opportunities for empowerment» [9] (p. 20).
The Sundsvall Conference demonstrated that issues related to health, the environment and human development cannot be separated and that a supportive environment has many dimensions – physical, social, spiritual, economic and political – to be addressed broadly and holistically. People form an integral part of the earth's ecosystem; their health is fundamentally interlinked with the total environment [14].

This global dimension of the concept of health was the subject, in 1997, of the *Jakarta Declaration on Leading Health Promotion into the 21st Century*. The participation of everyone at the local level is essential to supporting global health promotion efforts. To be effective, actions must be centred on people and, in this context, living and working environments are places that offer concrete opportunities for meeting, socializing and sharing to build and implement global strategies for a better future.

The protection of health and the achievement of well-being are central themes of the 2030 Agenda for Sustainable Development defined in 2015 by the United Nations. The Urban Health approach is transversal to all 17 objectives, with particular reference to the strong link between Sustainable Development Goal (SDG) 3, "ensure healthy lives and promote well-being for all at all ages", and SDG 11, "make cities and human settlements inclusive, safe, resilient and sustainable" [15].

On the theme of implementing the SDGs for sustainable development, the 9th WHO World Conference was held in Shanghai (China) in 2016, celebrating the 30th anniversary of the WHO European Network of Healthy Cities. Over 100 mayors attended the International Forum to exchange ideas and experiences in creating healthy cities in the context of the SDGs. The *Shanghai Consensus on Healthy Cities* [16] highlighted the political responsibility of local administrators to support citizens in leading healthier, safer and more fulfilling lives by using urban planning to create healthy environments. Health is created in the environments of daily life, in the neighbourhoods and communities where people live, love, work, shop and play. Health is one of the most effective indicators of the successful sustainable development of any city and contributes to making cities inclusive, safe and resilient.

The experience of the meeting of mayors was repeated two years later, in 2018, in Copenhagen (Denmark). The WHO promoted the Consensus of Mayors of Copenhagen, *Healthier and Happier Cities for Everyone. A Transformative Approach for Safe, Inclusive, Sustainable and Resilient Cities* [17]. The theme of the Consensus of Mayors focused on the need to design urban places on a human scale, capable of improving health and well-being, giving priority to people and the planet.

The vision of the meeting, fully aligned with the United Nations 2030 Agenda, has given renewed impetus to the activity of the Healthy Cities Network [10]. The mission of the Network has been summarized in the so-called 6 Ps: "Healthy Cities foster health and well-being through governance, empowerment and **P**articipation, creating urban **P**laces for equity and community **P**rosperity, and investing in **P**eople for a **P**eaceful **P**lanet".

3. The Healthy Settings Approach

To "move into the future" towards a health and wellness perspective, the *Ottawa Charter* suggested paying particular attention to the ways in which health is «created and lived by people within the settings of their everyday life; where they learn, work, play and love» [13] (p. 4). This *Ottawa Charter* statement is at the heart of the Healthy Settings approach, which is a holistic approach that integrates health promotion and sustainable development and includes community participation, partnership, empowerment and equity.
The WHO adopted the Healthy Settings approach to launch the Healthy Cities programme in 1986 [18]. Since then, hundreds of healthy cities have spread rapidly across Europe – the European network of healthy cities has brought together about 100 flagship cities and around 30 networks covering approximately 1,400 municipalities – and in other parts of the world [19].
The term "health city" indicates a city aware of the importance of health as a collective good, which allows people to exercise greater control over their health and which implements clear policies to protect and improve it, counteracting inequalities [5]. According to the WHO's *Health Promotion Glossary*, «a healthy city is one that is continually creating and improving those physical and social environments and expanding those community resources which enable people to mutually support each other in performing all the functions of life and in developing to their maximum potential» [9] (p. 13). In other words, a healthy city aims to create a healthy environment to achieve a good quality of life. In addition

to providing basic sanitation and guaranteeing access to health care, a healthy city prepares environments conducive to the performance of all the functions necessary for life, with health meaning not only the absence of diseases but the positive psycho-physical well-being of people [20, 21].
The experience of healthy cities has changed the way cities understand and deal with health. As highlighted in 2018 by the Copenhagen Consensus of Mayors, healthy cities are the best way to achieve the SDGs of the 2030 Agenda. Indeed, most global health, social and environmental challenges require local action and strong leadership [10].
A new idea of the city is emerging from the Healthy Cities project based on a new planning model [22–24]. In urban areas, the health of the population is influenced by the characteristics and conditions of the city. In particular, in developed countries, the higher levels of urbanization, air and noise pollution, aging of the population, sedentary lifestyles and unhealthy diets, cause an increase in the incidence of non-communicable diseases and produce social and psychological inequalities as well as disparities in access to services. The new urban model can become one of the most suitable tools to respond to new critical issues. The links that exist between people and their environment represent the basis for a new socio-ecological approach to promoting health and quality of life, overcoming the disciplinary barriers between urban planning and medical disciplines, through the active involvement of local administrations and communities [5].
The current configuration of cities presents as many risks to public and individual health as there are opportunities. Cities, in fact, are the cause of the problem, but they can also become part of the solution [25]. Properly planned, well-organized and consciously administered cities can improve the living conditions and health of the population [5, 26].

4. The Danish Healthy Cities Network

Denmark is one of the European countries that are participating in the WHO Healthy Cities Network. The Danish Network was established in 1991, and more than half of Denmark's local governments are members (53 out of 98 municipalities). The Network contributes to the development of public health in Denmark through close cooperation with municipalities and regions. The Network is a laboratory that facilitates the collection and exchange of knowledge and experience on public health, develops co-creation models that rethink how municipalities can work for and with their citizens, and promotes alliances with research institutes to translate knowledge and scientific research into practice [27].
In Denmark, following the reform of municipal powers initiated in 2007, responsibility for health promotion and prevention has been transferred to municipalities. In line with the 1997 Jakarta WHO Declaration, the municipal level has been identified as the most appropriate for addressing and solving the health problems of a city community. This responsibility was subsequently reaffirmed by the Shanghai Consensus on Healthy Cities in 2016 and the Copenhagen Consensus of Mayors in 2018.
Local actions are part of a national public health programme, based on the connection between the risk factors present in the environment and the main diseases of the population. The programme – in accordance with the definition of "health" developed by the WHO – underlines that the objectives of prevention and health promotion are not only to increase life expectancy but also to improve the population's quality of life. The determining factors that ensure an individual's quality of life and health generally include educational opportunities, income level, housing conditions, working environment and quality of the health system. The guidelines for the promotion of public health [28] underline the importance of also evaluating the general social conditions, i.e., the opportunities that the individual has to build relationships, develop a social dimension, cultivate interests, participate in cultural events and, in particular, play sports.
In 2011 five Danish cities, Aalborg, Ikast-Brande, Gladsaxe, Slagelse and Odense, pioneered innovative ways to integrate health considerations and sustainable development into the way we plan, design, maintain, improve and manage our cities and neighborhoods. Each city has organized itself differently, achieving results in different contexts. In general, cross-sectoral teamwork has been the approach that all these cities have adopted for health promotion and prevention. Evidence clearly shows that implementing projects benefitting health requires good planning, cross-sector management skills and strong leadership [29].

5. The Nordkraft Case Study

5.1. The Ecological Transition of Aalborg

Aalborg has faced a very intense urban transformation process. Since the 1970s, the city has changed its image from an industrial centre to an innovative pole in the services sector for education, health, renewable energy and digital technologies. The change process was guided by and based on the principles of sustainability and respect for the carrying capacity of the environment: to minimize land consumption, many former industrial buildings were converted to accommodate new functions.
The recent re-functionalization of the Nordkraft power plant is an example of urban circular metabolism that has also activated a new social metabolism; this project addresses the issues of public health as

an institutional commitment and contributes to the reduction of climate impacts through the use of eco-sustainable energy sources.
The factory conversion project started from the national decarbonization energy plan. Nordkraft was a coal-fired power station built in 1947 to cover Aalborg's energy needs. In 1999, the plant was definitively decommissioned in favour of a production mix of energy sources that excluded the use of hydrocarbons. As evidenced by the results of the IEA (International Energy Agency), Denmark is the nation that is pursuing the goal of a carbon free future by 2050 with the utmost commitment.



Fig. 1: Nordkfraft, Aalborg. Prospectus of the multipurpose cultural center on Nyhavnsgade, 2020.

5.2. Nordkraft from the Power Plant to the Health Centre

Having abandoned coal as an energy source, the great power plant reached the end of its life cycle. The building was originally built on the edge of the city; overtaken by the expansion of the city, it is now in a central location. Its centrality and its size (about 30,250 square meters over thirteen levels) make it a building and urban heritage of great potential.
Therefore, the Municipality of Aalborg decided not to demolish the building and, in 2004, took the initiative to buy the entire complex. Through the involvement of numerous stakeholders – including associations, public and private bodies, citizens – the building has been re-purposed into a cultural centre capable of hosting multiple and diverse functions of economic and social utility. The new identity of Nordkraft, while preserving historical memory with the maintenance of the original appearance of an industrial building, becames that of a new urban place dedicated to health promotion, where hybrid expressive forms are mixed and synergies are generated from the encounter between culture and sport [30].
Following the principles expressed by the health law, the Municipality of Aalborg has seized the opportunity offered by the decommissioning of the plant to create in the city centre a place dedicated to health in its broadest sense, thus offering, in addition to spaces and equipment for disease prevention and the promotion of health and body care, opportunities to meet, exchange, socialize, enjoy cultural entertainment, training, eat healthily and pursue leisure activities.

5.3. Public-Private Participation in Management

The Municipality has launched numerous public consultations seeking collaborations with volunteers, private individuals, sports associations, bodies and institutions for the realization of the project and for the co-management of sports, social and cultural services. Currently, the main Nordkraft players who have voluntarily joined the project are: DGI (Danske Gymnastik- & Idrætsforeninger, the Danish association of sports clubs), which manages approximately 5,000 m^2 of the complex; the Municipality of

Aalborg, with approximately 6,500 m^2; Skråen (a musical association), with approximately 4,000 m^2. There is also the University of Aalborg and numerous smaller players, including private entities such as the owners of the 16 apartments created in the complex.
All the actors are organized in an association of owners (Nordkraft Drift) which manages the maintenance, common areas and activities open to the public. The common spaces, owned by the owner's association, can also be rented for events and are managed by DGI Huset.



Fig. 2: Nordkfraft, Aalborg. Entrance hall Kedelhallen, 2020.

5.4. Entertainment, Socialization and Catering Activities

Nordkraft is always full of activity (the centre is open daily from 06:00 to 23:00) and has become the most important and vital cultural centre in the city. The common areas, deliberately left in their raw aspect, are flexible and capable of hosting musical, theatrical and sporting events, cultural and artistic activities, professional and university training, entertainment for children and teenagers, restaurants and cafes, fairs, parties and markets.
The large Kedelhallen – the former 1,000 m^2 boiler room, today the entrance hall – has been adapted as a common space also used as the foyer of the Italian restaurant Azzurra, the Indian restaurant Mumbai, the Skråens café and the cultural café KUL. Visit Aalborg, the city's travel agency, has its information desk for local cultural events in the lobby. The monthly food market with local specialties takes place here, and the space is often used for artistic performances and by street performers.
The gastronomic offer of Nordkraft is enriched by the Den Grønne Café restaurant, located on the fourth level, specializing in the preparation of healthy food prepared with fresh local and organic seasonal ingredients, and by the Biffen Café, the theatre café.
Kunsthal NORD is the meeting place for contemporary art and cultural debate: exhibits of Danish and international visual arts, high-quality craftsmanship and design are held witch aim to show the diversity of contemporary art, with a special commitment to the regional art scene.

5.5. Professional and University Training Activities

Much of Nordkraft is devoted to training. There are cultural institutions and associations that offer different types of learning: the University of Aalborg is present with one of its university libraries, with courses on *Communication, Digital Media and Psychology*, and, thanks to a collaboration with the DGI, courses on *Training in Sport Technologies*. The Fokus Folkeoplysning companies offer professional,

sporting and cultural training courses; the Aalborg Kulturskole School of Culture offers dance, music, visual arts and theatre instruction; the Aalborg Ungdomsskole youth association runs KUL, a cultural café and venue for informal events and activities with theatrical rehearsal rooms and workshops for music, journalism, media, dance, theatre and art. The DreamHouse, located on the top floor, is an entrepreneurial incubator dedicated to new small businesses wishing to operate in the field of culture and creativity.

5.6. Culture and Entertainment

Large spaces are dedicated to entertainment and the performing arts: the Skråen musical association offers every year a rich calendar of music, shows and events every years with national and international artists; the Teater Nordkraft, which organizes up to four shows at the same time in four rooms, is divided into theatres for children, young people and adults and is continuously present in the life of the city as an important point of reference that creates and shapes its identity; the Biffen independent cinema presents film reviews and arthouse films.

5.7. Sports, Health and Assistance Activities

Sport occupies a prominent role in the Nordkraft cultural centre. The regional association DGI North Jutland manages most of the sports facilities in the building, with an extremely varied offer of sports for all ages. On public holidays, the association offers children the DGI Hallen (the large room where there is a 20 meters high indoor climbing wall, the highest in Denmark) for free play activities, transforming a weekly closing period into a time for multigenerational gatherings. The association also plays a supporting role for voluntary associations that focus on sport as a tool to protect health and strengthen a sense of community.

Nordkraft also manages SIFA (Samvirkende IdrætsForeninger Aalborg), an umbrella organization for sports associations which acts as a consultant for business organization, management, construction and development activities. As a representative of the Public Information Committee, SIFA also has an influence on the sports policy of the Municipality of Aalborg, which is responsible for awarding grants to sports associations. There are also numerous associations that have taken up residence there, including Sportskarate.dk, Aalborg Taekwondo Soo-Bak, and martial arts clubs.

There is also the I.H. (Idrætsforeningen for Handicappede) health and sports centre for the disabled which is part of the largest disabled sports association in the country. There is also an Aalborg Health Centre hub, providing free municipal support and guidance services to optimize lifestyles and habits and assisting those living with a chronic disease (diabetes, lung disease, cancer or cardiovascular disease).



Fig. 3: Nordkfraft, Aalborg. Hall of Skråen performance halls and Teater Nordkraft, 2020.

6. Conclusions

The predominantly urban dimension of the 21st century population is confronted with the numerous and differentiated aspects of life in the city that threaten health. Segregation, discrimination, crowding, social and economic disparities and unhealthy environments increasingly affect the lives of citizens.

The WHO's intense work promoting health as a right of the world's entire population has identified cities as part of the solution to the problems they cause. Therefore, the WHO has called for action at the local level to achieve a global impact, entrusting mayors with initiatives to promote health in the city through a multisectoral approach and with the active involvement of citizens. The network of healthy cities promoted by the WHO has shown that this approach achive appreciable results and has highlighted that urban planning is an indispensable tool for implementing effective prevention and health promotion policies.

A practical example of how to transform urban environments into healthy environments through the Healthy Settings approach is the regeneration of Nordkraft, the former Aalborg power plant. The city, which is part of the WHO network of healthy cities, has applied the principles of the Healthy Settings supported by the WHO to create a new urban space dedicated to health.

The case is also representative from the point of view of the urban circular metabolism. Aalborg has dealt with the crisis of the industrial sector, the main economic sector of the city, through the ecological transition, reconverting the sources of energy supply and recycling abandoned industrial buildings.

The process of reintroducing abandoned industrial buildings into new production cycles has made it possible to respond to the new needs of citizens. Nordkraft is a significant part of this regeneration process based on sustainability, both from an environmental and socio-cultural point of view, with a vision particularly focused on physical health and on the growth of the community life of the population. In the reconversion of Nordkraft, health is considered a right of all and an institutional commitment of the city government. Today, the power plant, transformed into an environment conducive to health, fully responds to the objective of favouring «a state of complete physical, social and mental well-being, and not merely the absence of disease or infirmity» [9] (p. 1).



Fig. 4: Nordkfraft, Aalborg. Prospectus of the multifunctional cultural center on Teglgårds Plads, 2020.

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WORLD HERITAGE and DESIGN for HEALTH
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Structural design criteria for safety by monitoring of the architectural heritage damage: new proposal

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Abstract
In nature, several types of events undermine structural safety, but precisely the intrinsic characteristics of the struck object play a crucial role in determining its resistance. A historic building has different possibilities of resisting an unexpected event than a more recently constructed building; each category of buildings behaves differently towards an unusual event, and no generalization or transversal homologation is possible. The methodologies to define the structural robustness of such building typologies or the ability to adapt to an unexpected turn of events should be evaluated following different paths. While for steel or reinforced concrete buildings, it is possible to proceed with the concepts of the classical elastic theory, for masonry buildings, such a theory is set aside, being fundamental, as a primary hypothesis, the non-deformability of the material and its non-tensile strength. Heyman's hypotheses can be assumed for this category of masonry constructions: no tensile strength, infinite compressive strength, and no sliding between blocks. Moreover, while the science has been expressed by far in a precise way on the seismic behaviour of steel or reinforced concrete buildings, for historic masonry buildings, it remains to be tested. For this reason, this paper concerns relating the typology of the building to the possible response to the occurrence of a particular type of event, interpolating these categories with that of the possible solutions of structural evaluation.

Keywords: masonry bell-tower; seismic vulnerability; architectural heritage; damages; rigid blocks.

1. Introduction
An inherent vulnerability characterizes historical buildings and monuments to seismic action since most of them are usually designed to withstand gravity loads only and, overtimes, have undergone several transformations with a consequent lack of quality of the masonry or ineffective connections among walls. This is especially true for traditional bell towers, which present a great seismic vulnerability because of their slenderness.
The present paper deals with the structural and seismic evaluation of the fourteenth-century bell tower of St. Chiara in Naples. The bell tower was built in the 14th century together with the adjacent monastic complex and the basilica by Roberto D'Angiò and Regina Sancha d'Aragona [1].
This research work starts from Heyman's study in 1992 [2] to address the issue of leaning towers analytically. According to Heyman on assuming masonry as a unilateral material with no tensile strength, the methodology here adopted proposes to describe the crack curve that delimits the failure mechanism for the bell tower of St. Chiara and evaluate the limit inclination angle associated with the collapse of the structure under gravity loads only. Once the limit inclination angle is identified, the collapse multiplier is derived to assess the vulnerability of the bell tower object of the study.
Future developments of this theme concern, on the one hand, the evaluation of the seismic vulnerability and risk of the bell towers of the historical centre of Naples at large scale, and on the other hand, the possibility of applying the dynamic analysis taking into account the rocking of rigid blocks [3].

2. The historical bell-tower of St. Chiara in Naples

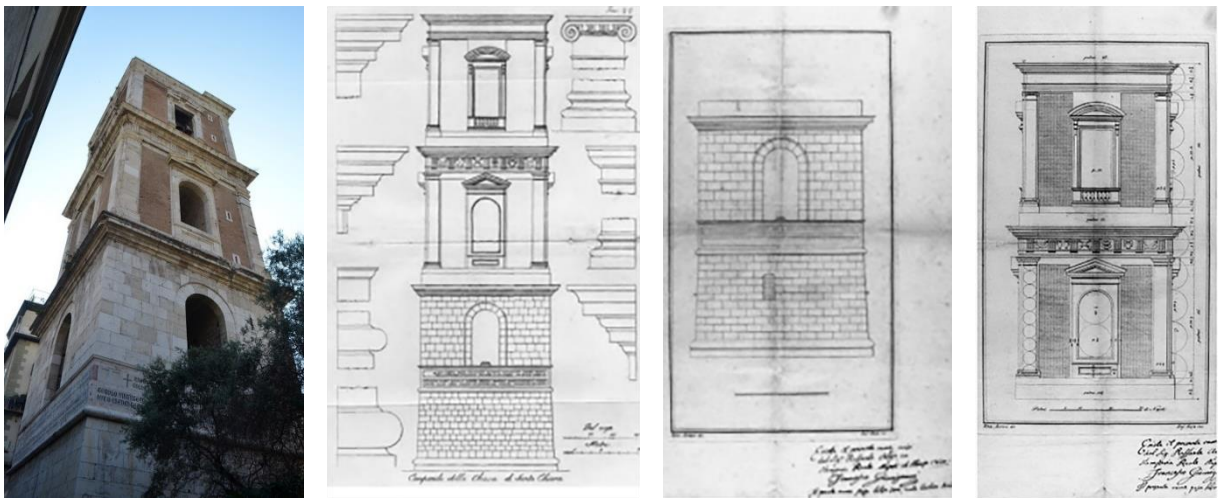
2.2 Graphic description

The construction of the bell tower, located to the left of the basilica of St. Chiara, dates back to 1338. Still, the works were immediately stopped in 1343, after the death of Roberto D'Angiò for lack of funding. At this date, the structure was to a third of its completion. The building work was resumed in the early 15th century, following the earthquake of 1456, when the bell tower almost completely collapsed, with only the marble basement leaving standing. It was later rebuilt in the Baroque style until it was completed around 1604.



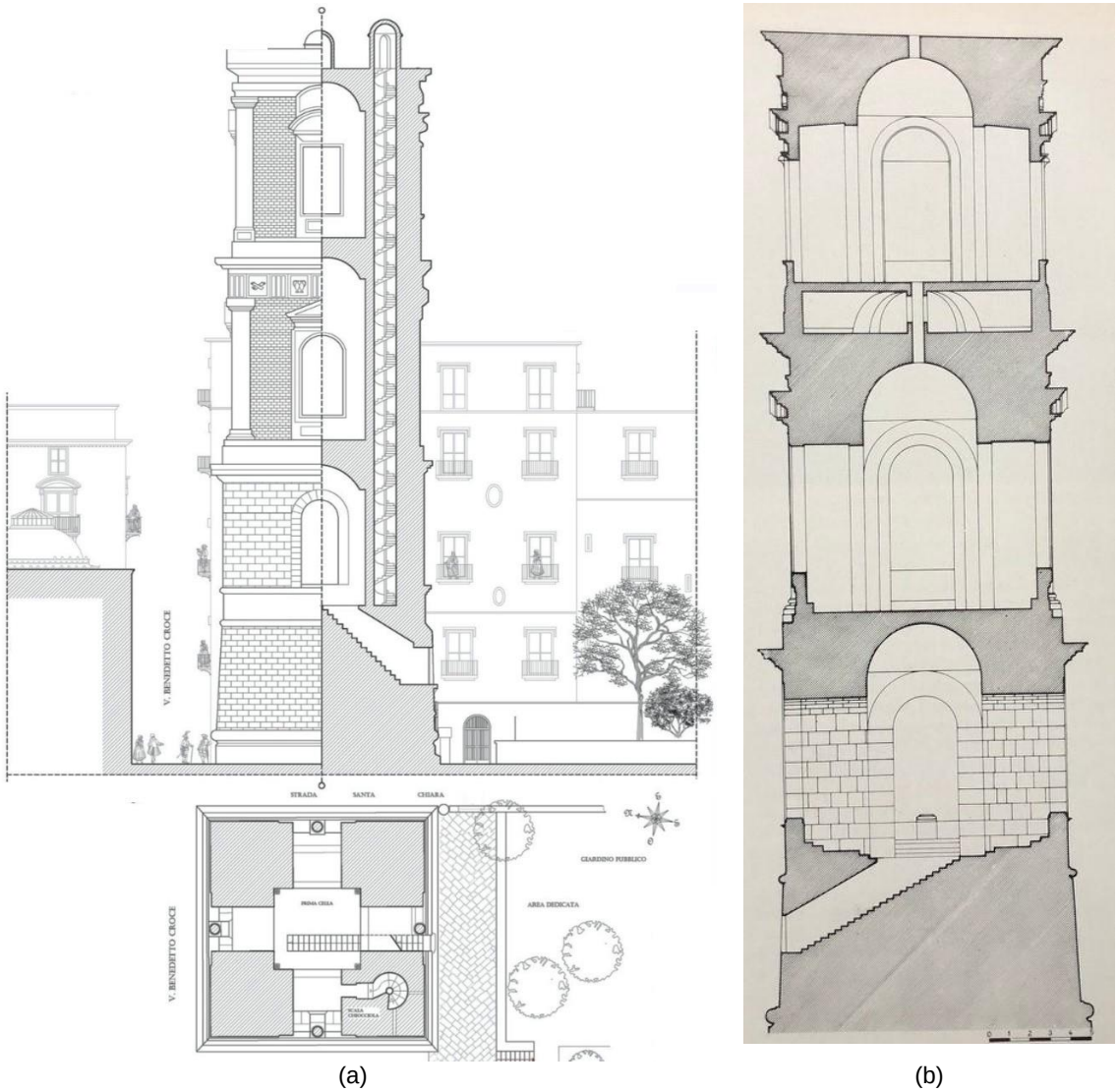
Fig. 1: C. Guerra, Study for the isolation of St. Chiara, June 1954.

Separated from the core of the Basilica and located on the left edge of the monastery walls, the monument looks like a defence tower. The square-plan bell tower has been constructed in three levels, although the original plan probably envisaged the construction of at least five floors [4]. All that remains of the original 14th-century bell tower is the basement made of large blocks of piperno, marble and Tifata travertine, four corner pillars inside the first cell from which the ribs of the lost cross vault started, and four bases, one for each window, which probably included the columns of the old double lancet windows [5].The basement cell underwent significant changes and interventions: a cloister vault over lunettes replaced the cross vault, and the double lancet windows became monofore surmounted by round arches instead of the original ogival arches. Two new cells were added to the first, both characterized by exposed brick walls, alternating with marble cornices and pilasters. The second level, in Doric order, dates back to the 16th century, while the third one, in the Ionic order, to the 17th century (Fig.2). The three levels are reached by a spiral staircase located in one of the corners of the bell tower; it leads up to the attic slab, where there is a small dome with a cylindrical base (Fig. 3). The tower is 50 m high.



(a) (b) (c) (d)

Fig. 2: Bell tower of St. Chiara: (a) picture by the authors; (b) elevation and details from [6]; (c) detail of the first order of the monument; (d) detail of the secondorder of the monument - printingproof for the work by E. Ascione, *De' Migliori monumenti di Napoli*, ASN, Ministero Presidenza del Consiglio.



(a) (b)

Fig. 3: Bell tower of St. Chiara: (a) Half section and half elevation with the plan of the first cell. (b) Survey and section taken from [7].

3. Structural studies

3.1 Empirical rules

The analysis of the equilibrium of masonry towers was approached relatively late. The first scientific report seems to be that of Fresnel (1831) and was followed by few contributions until Rankine (1858) rigorously formulated the theory of the stability of masonry towers and chimneys [8]. Until then, calculations had been based on empirical rules.

Concerning the dimensioning of a tower, once its slenderness has been established (the ratio between the height h and the base side d), the thickness of the wall is the most critical structural parameter to be determined. With reference to the case study, a slenderness $\lambda = 3.08$ and a wall thickness $m = 2.64\text{m}$ have been calculated. This latter value can be compared with empirical rules adopted in the past in the project of towers.

Among the best known empirical rules to determine this thickness are:

- The Gothic rule of the German treatises: $m/h = 1/20$
- The Alberti rule: $m/h = 1/15$
- Rodrigo Gil de Hontañón's rule: $m/h = 1/2$

Indeed, the value we obtained seems to be within the parameters of the Gothic rules.

3.2 Stability assessment of the bell-tower

Concerning the stability assessment of a tower, it is a statics problem of statics: at each horizontal section, the moment of stability of the part of the tower above this plane (for a specific geometrical coefficient of safety) must be equal to the moment of wind force W with respect to this plane. The wind force is normally calculated as the product of the dynamic wind pressure and the effective or apparent area (the cross-sectional area normal to the wind direction). Of course, this product may be qualified by a certain factor that considers the particularities of the tower (its round or square shape, the existence of buttresses, etc.) [8].

Considering that the most critical section is at the base, it must therefore be verified:

$$P_t d(q - q') = W h_w \tag{1}$$

where P_t is the total weight of the tower; d is the base diameter in the wind direction; $q = 1/2c$ defines the geometrical safety and q'represents the deviation of the centre of gravity of the tower with respect to the base (e.g. if the tower is leaning); W is the total wind force and h_w is the height at which the wind force acts. Usually, the value of q is taken so that no traction occurs, i.e. q defines the limit of the central core of inertia of the section for the direction considered.

For a tower of uniform cross-section and perfectly vertical ($q' = 0$), the above equation becomes,

$$P_t\,(qd) = W\,(h/2) \tag{2}$$

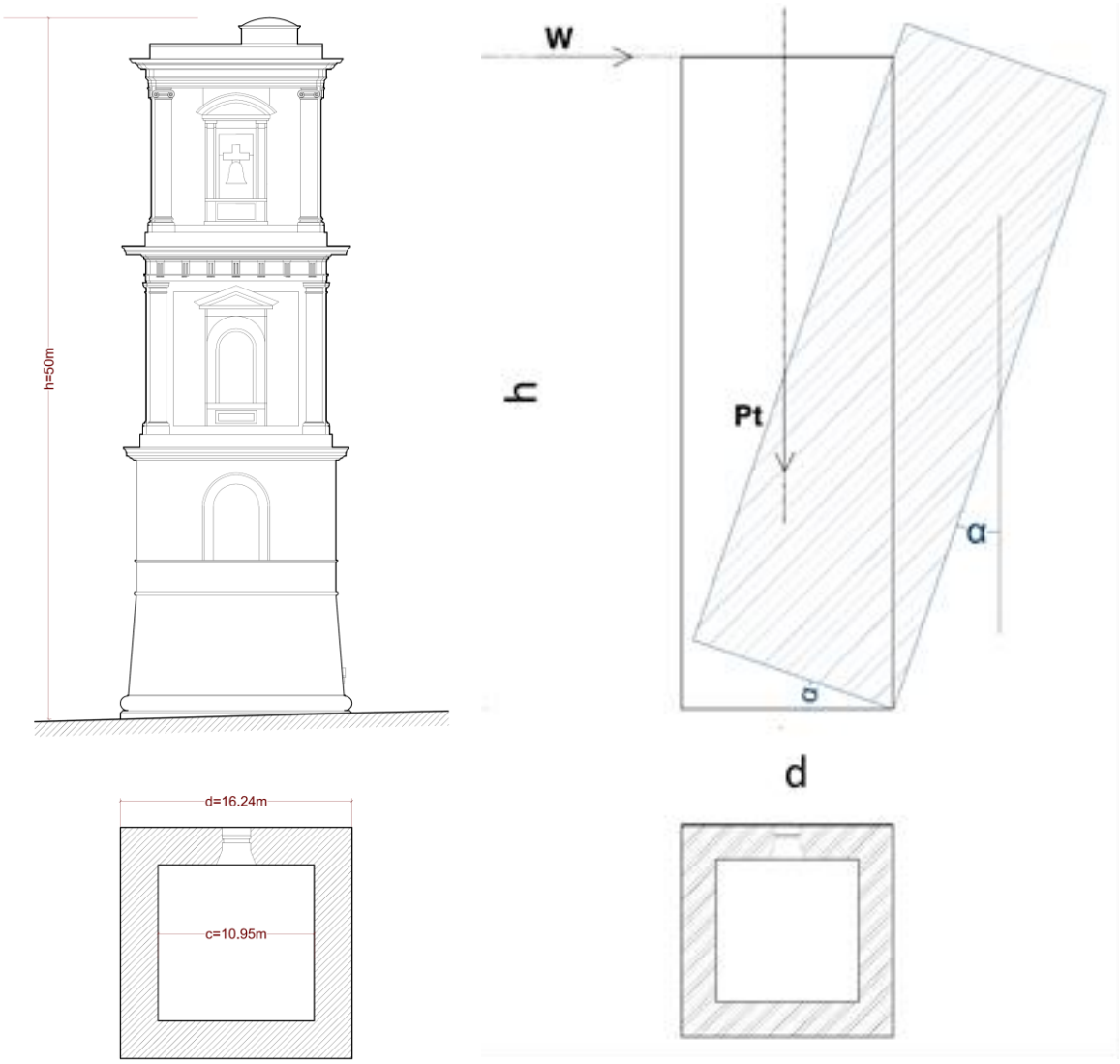
For a hollow square section, like in this case, we have:

$$P_t = \gamma h\,(d^2 - c^2) \tag{3}$$

$$q = (d^2 + c^2)/6d^2 \tag{4}$$

$$W = w\,(hd) \tag{5}$$

where γ is the specific weight of the masonry and w is the wind kinetic pressure.



(a) (b)

Fig. 4: Bell tower of St. Chiara: (a) cross-section of the hollow tower and elevation with main parameters; (b) approximate analysis of the tower, shown at its critical inclination with the identification of the wind force $\boldsymbol{W} = \boldsymbol{370kN}$ and the angle $\boldsymbol{\alpha} = \boldsymbol{19}°$ which defines the dangerous limit inclination.

Figure 4a shows the square cross-section of St. Chiara bell-tower with external dimension $d = 16.24m$ and internal dimension $c = 10.95\mathrm{m}$; the area is $(d^2 - c^2)$ and the corresponding section modulus is $(d^2 - c^2)/6d^2$. Thus, this means that cracking will start when the loading becomes eccentric to the centre-line by an amount $(d^2 + c^2)/6d^2$. In the following, equations (3), (4) and (5) have been applied to the case study.

To compute the total weight of the campanile, the specific weight of the masonry has been assumed to be $\gamma = 18\mathrm{kN/m^3}$ for the tuff, obtaining $P_t = 129.45\mathrm{kN}$ approximately equal to 13.20 tons.

The eccentric factor $q = 0.24$, has been obtained from calculations. This is a good value, considering that the geometrical safety value might be 0.29 or 0.30 for a tower of usual wall thickness [2].

To calculate the wind force W, the wind kinetic pressure has been introduced as $w = \frac{1}{2}\rho v_r^2$, where ρ is the air density and v_r is the default reference air speed depending on the site zone. Assuming $\rho = 1.25\mathrm{kg/m^3}$ and $v_r = 27\mathrm{m/s}$, the wind kinetic pressure obtained is $w = 0.456k\mathrm{N/m^3}$. Consequently, by substituting this value into equation (5), the wind force W applied on top of the bell tower has been achieved and its value is $W = 370\mathrm{kN}$.

3.3 A preliminary vulnerability study

The theoretical framework of the structural study proposed in this paper is the Limit Analysis developed by Heyman [9,10]. Following this approach, masonry is considered a unilateral material that can resist compressive stresses but has weak tensile strength. According to Heyman's, the unilateral

model assumes that compressive stresses are very low so that there is no danger of crushing of the material and that tensile stresses cannot be developed.
A masonry tower, subjected to uneven foundation settlements, will crack, and these cracks may lead to overall structural collapse. Often cracks are considered a dangerous sign. Conversely, cracks in masonry construction can be simply attributed to the unilateral behaviour of masonry, which exhibits cracks as soon as tensile stresses appear [11]. Thus, cracking is the way adopted by masonry buildings to stably accommodate small changes in the external environment through a rigid macroblocks partition as clearly described in [9,12;13].
In this section, following the approach introduced by Heyman in [2], a preliminary analysis is developed for the maximum inclination that may be regarded as safe for the masonry tower analysed. Figure 4b shows the exact solution at the point where the bell-tower of St. Chiara is just overturning at an angle α of $19°$; it sketches the results corresponding to Equation (6) that defines a hollow masonry tower for dangerous limiting inclination:

$$\tan\alpha = \frac{1}{3}\frac{d}{h} \tag{6}$$

$$\alpha = \tan^{-1}\frac{2}{3}d/h \tag{7}$$

Equation (7) computes the value of the angle at which the hollow tower first develops cracks. In the analysed case this angle is equal to $12.21°$: These findings can be compared to the Table I in Fig. 4 elaborated by Heyman in [2] which gives fast results on the value of inclination α of a masonry tower, once known the height to base ratio *h/d* (*H/b* in [2]).

TABLE I
Values of inclination of tower, α

	H/b						
	3	4	5	6	8	10	12
Overturn:							
Solid, Equation (19)	13.4	10.1	8.1	6.8	5.1	4.1	3.4
Hollow, Equation (22)	15.7	11.9	9.6	8.0	6.0	4.8	4.0
First crack:							
Solid	6.3	4.8	3.8	3.2	2.4	1.9	1.6
Hollow	12.5	9.5	7.6	6.3	4.8	3.8	3.2

Fig. 5: Value of inclination of tower, $\boldsymbol{\alpha}$. This Table provides α-values of for different $\boldsymbol{H/b}$ ratios, according to the solid and thin-walled towers, respectively; the second two lines give values of the angles at which the solid and hollow towers first develop fissures [2].

According to this rule, the Campanile of St. Chiara at Naples, which has a ratio h/d of about 3, should not cause concern. The inclination for overturning is about $15.7°$ from Table I; the angle at which the hollow tower first should exhibit some cracking is about $12.5°$.

4. Conclusions and future works

Damage, failure and collapse mechanisms for the towers, in general, are diverse and depend on slenderness and constructive features such as masonry quality.
Starting from the assumption that masonry structures are made of no tensile-resistant materials, and considering that their low tensile strength does not allow distribution of stresses on the whole structure, in case of seismic actions, local mechanisms of failure/collapse are presented. That is to say that, since a global behaviour does not characterize masonry, it may collapse for loss of stability of limited portions (macro-elements) in certain conditions. Based on the above, a kinematic approach [14] is proposed for evaluating the seismic vulnerability of the surveyed bell tower, as it is introduced and carried out by the research of A. Giuffré [15] and Doglioni [16] on the damage mechanisms studied following the recent earthquakes that occurred in Italy. We mean the kinematic representation model that describes the macro-element's discretization process and its displacements by damage mechanism. With reference to the 'Guidelines for the assessment and mitigation of seismic risk of the cultural heritage of 2011 [17], the future research aims to identify the primary damage mechanisms

through a 'check-list' of vulnerability identifiers. The bell tower can be divided into two distinct macro-elements consisting of the actual tower and the belfry. In this check-list, vulnerability indicators are classified according to two categories: indicators associated with the geometric configuration of the building and indicators associated with specific construction techniques.
There are several approaches to model the mechanical behaviour of masonry structures (Sarhosis et al. 2016). Housner [3] was the first to investigate the behaviour of rigid single degrees of freedom blocks subjected to horizontal excitations analytically. With formulations derived, it is possible to estimate the minimum horizontal acceleration at the base to cause the overturning of the rigid body.
This paper just represents the starting point of a broader ongoing research project on the vulnerability of masonry towers in Naples. Hence, at this early stage, the study proposed an approximate analysis based on some simplifications: the hypothesis of the square hollow section of uniform thickness and the absence of any irregularity along the height. The authors will further examine these aspects in the future in parallel with the deepening of constructive surveys and aware that, for practical cases, the wall thicknesses could diminish towards the top. Furthermore, the analysis carried out does not account for seismic actions. Anyway, this kind of research allows providing handy hints to insight into the limit inclination angle associated with the collapse of the structure for gravity loads only.

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MEDIEVAL BUILDINGS: FROM DEFENCE SYSTEMS TO SOCIAL AGGREGATION CENTRES.

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Abstract
In Roman times the "castellum" was a small fortification of minor importance. From the end of the ninth century, and throughout the eleventh century, large areas of western Europe were covered with a dense network of castles.
The first castles were very simple, generally consisting of a central tower, surrounded by walls, and had a military and defensive function, for this they were built on top of the hills for an easy and better sighting point.
These castles had no comfort and only the soldiers and the lord lived in the fortress.
The medieval castle was enriched over time by important elements for its double function, both defensive and residential, becoming the symbol of the power of a powerful lord: bright-colored banners waved from the towers, while the light of the sun shone forth from the armor of the sentries upon the wall.
From the tenth century, thick palisades and walls were built around the castles. The top of the wall was articulated in protruding structures, with battlements parapets and loopholes, from which the soldiers could hurl on the enemy spears, arrows and ammunition of various types.
In this paper we report three examples of castles in northwestern Campania..

Keywords: Medieval buildings, social aggregations centres

1. THE CASTLE: FROM A DEFENSIVE STRUCTURE TO THE CENTRE OF EVERYDAY LIFE

A fortification, consisting of a tower or a more complex element, such as the castle, can find its origins in the phenomenon of the population that, in the late ancient age, was limited to small rural centers, at the expense of other little villages which gradually disappeared definitively. The birth or the growth, even vertical, of urban agglomerations in the early Middle Ages, recorded a phenomenon much wider than the simple construction of castles, in a process divided into three distinct phases:

1) Legal creation and location of territories;
2) Fortification of the town;
3) Concentration of the settlement

Most of the castles in Campania developed with the fall of the Roman Empire, when the territory weakened by the fragmented power, was forced to face the incursions of other populations. In particular, the Longobards were the first to have a lasting dominion and to build defensive structures and houses.
In Campania because of the constant devastation of the armies, of diseases, of reorganizations of the cities, there was a retreat from the plain to the hills.
The Byzantines first, and then the Longobards destroyed the ancient cities and built new smaller and more defensible settlements.
Therefore, the Roman city was gradually abandoned in favor of a process of retreat to the hills where people built with fortifications and defensive towers.

Campania, although under Longobards and Byzantine control, was the object of more and more continuous Arab raids. For example, Capua, now Santa Maria Capua Vetere, seat of the homonymous Longobards county, was razed by the Saracens.
Thus, there was the migration to the newly founded city Sicopolis. What remained of the structures in the plains, was used by farmers and shepherds as a temporary shelter.
The castles in Campania, resisted numerous attacks and invasions, as a consequence of the domination of the Longobards, the Normans, the Byzantines and the Angevins.
In this way, broadly, new constructions were affected by the pre-existing architectures and new fortresses to protect the country were built.
Even abandoned ancient cities were used as quarries to recover building materials; thus, these devastated centers were further damaged.
However, even in conditions of stability, new territorial realities, new commercial and power poles have developed, contributing to the artistic and cultural development of the region.
The succession of dominations has hardly left unchanged local buildings: in fact, the families living in the castles, born as castrum, readapted them to transform them into sumptuous residences and defensive places against possible attacks.
This happened mainly for those castles placed in socially, politically and geographically strategic positions, despite the changed needs, both as a military garrison and as a place of power.
This happened especially in relation to those castles with a town of considerable size and extension for the time, with an urban and demographic growth, and a good economic and cultural development.
During the Middle Ages there were several and different dominations, consequently "the military garrisons" changed, depending on the areas to defend and the different political arrangements.
The province of Caserta, for example, is the part of the hinterland of Campania where fewer defensive structures were built to defend the territory.
Instead in the province of Salerno, characterized by a landing at sea, (both a resource but also an attraction for the invasions of other powerful countries, interested in controlling the Mediterranean trade), there is a considerable presence of garrisons..

2. THE CASTLE: FROM A DEFENSIVE STRUCTURE TO THE CENTRE OF EVERYDAY LIFE

All castles have some standard characteristics:
- Fortified residence, with the keep, was the real home of the feudal family and the court
- Defensive towers
- the Keep, which was the largest tower, residence of the feudal lords, the most important part of the structure and used as a last defense in case of attack.
- Chapel, large niche inside a church that usually opened from a side aisle and had its own altar dedicated to the worship of a particular saint, often used as a family burial ground.
- Minor defensive towers: the square tower was the first type to be built. It allowed lines of sight and the enemies could often dig the foundations to bring it down. Later the polygonal tower appeared, offering more than one firing line; both the polygonal tower and the square tower were replaced by the round tower so that enemy excavations in the foundations were impossible and offered unlimited fire lines.
- Side access
- Small towers of the Keep connected by spiral staircase to external defensive towers
- Overhanging sentry boxes, sentry rooms and watchtowers
- Battlement, an architectural feature of medieval models consisting of an alternation of full and empty sectors at the end of the masonry; it is characterized by two architectural styles: Ghibelline or imperial battlements, with a dovetail top; Guelph or papal battlements, with square bodies, characteristic of the feuds ruled by priests
- “Chemin de ronde”, which is a raised walkway hidden behind the battlements of a castle, which allowed soldiers to control the district from the top of the walls
- Ditch/ moat, which could be filled with water and prevent the enemy from attacking the towers from below trying to break them down, keeping it at such a distance to be hit with arrows. The moat was equipped with wooden drawbridges, which were raised in case of attack.
- Barbacane, an outer wall defensive structure with the function of support or protection.

Let’s now pass to the description of 3 existing castles in Campania that have the characteristics listed above.

3. CAPUA

The evolution of the territories in northern Campania, including the city of Capua, was marked by the commercial and military flows between central and southern Italy that were concentrated in this area. The strategic importance of the geographical position was determining for the economy of the places, but at the same time it imposed a defensive order on the territory.
Today's Capua has its origin from Casilinum, a Samnite village located in a bend of the river Volturno, which for centuries represented the port of Roman Capua (today Santa Maria Capua Vetere).
In Roman times Casilinum represented the military garrison that controlled the whole territory from the Tifatini mountains to the mouth of the Volturno river.
The first news about military fortifications in defense of the bridge of Casilinum date back to the Early Middle Ages. After the Saracen destruction of Roman Capua (841 AD) the village, which had the river as natural protection, was chosen for the reconstruction of the destroyed city.
It was Frederick II of Swabia who built, in 1234, the Castrum Turrium Capuae (or Gate of Rome), a bastion with two towers to protect the city to the north. It was both a customs post and a military garrison that represented to travellers, coming from the Papal State, the majesty of the Frederick Empire.



Fig. 1: Capua : the entrance to the castle

Later Don Pedro of Toledo, Spanish viceroy, in order to strengthen the military role of Capua, introduced in the city walls a system of bastions to defend the northern and southern fronts of the city.
From the Bourbon period the city of Capua lost its role of operational importance and was enriched with structures to support the troops.
During the Middle Ages, around the area of the original settlement of the city, a square-stone wall with towers was built.
With the spread of gunpowder, which increased the range, and the action of the bullets, it was necessary a remaking of the plans of fortification, with changes in new defensive fronts, fan shaped fronts to Naples through five spurs (originally three then brought to five by Philip II).
The castle was built on the left bank of the Volturno near the Roman bridge to keep under fire the two main entrances to the city, Porta Roma and Porta Napoli, at the ends of the Via Appia. It was designed around 1543 by the architect Gian Giacomo della Acaya, under the direction of the engineer Ambrogio Attendolo, with a plan on a square matrix with four pentagonal bastions at the vertices, with orillions, a new defense technique.
After several restorations, the city of Capua, in 1732, with the plan of Vienna, had further defensive reinforcements.



Fig. 2: Capua : the access bridge to the castle

In 1734, under the reign of Charles of Bourbon, who conquered the citadel with his troops, Capua had further military reinforcements also due to the proximity to the Royal Palace of Caserta where the Bourbons would have wanted to install the new capital of the Kingdom.
During the French decade, some religious orders were suppressed, and their ecclesiastical goods were confiscated by the king and were converted into military areas.
In the middle of the 19th century, while the textile industries flourished in Caserta and the territories of the lower Volturno were partially reclaimed, Capua continued to be a military center.

4. AVERSA

The Castle of Ruggiero II was built near the church of Santa Maria a Piazza, in the area of Patibulum, at the northern limit of the third circle of walls, square, with crenellated towers at the corners, is oriented, according to an ancient division, on the four corners of the world: the southern, the northern, the western, the eastern. It stood on four levels and a basement, the prisons and warehouses. The first floor ended with the terrace while the central area, the castle itself, included two other levels. The third in the east and west towers had stairs in the masonry: when one tower was taken, the other, being isolated, was still firm. The castle has eastern origins, and it is inspired to the fortresses of Antioch that our builders have certainly known. The crenellated towers concluded a sort of frame. The castle was elaborated with the form of the golden section, 'medium and extreme reason', which is repeated several times in the layout of the scheme, considered already in the ancient times as a "divine proportion". On the other hand, Frederick II created the internal porch, perhaps the reconstruction of the corner towers, the restoration of some castle wings and probably, also the arrangement of the new moat.

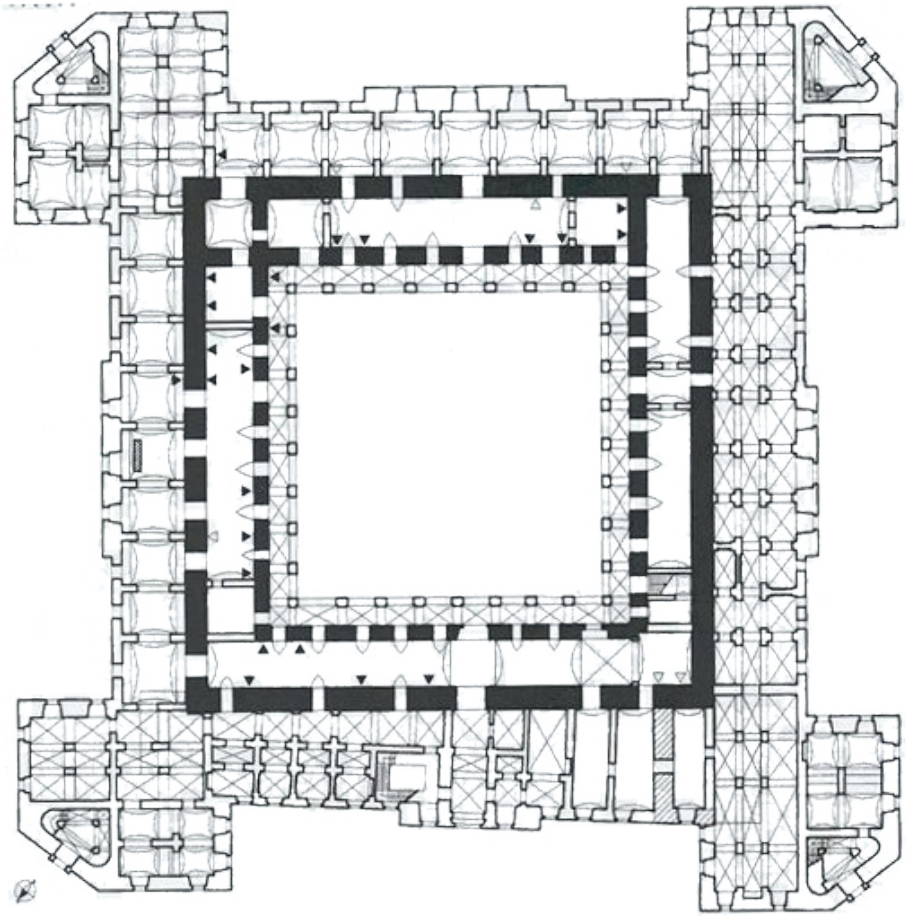

Fig. 3: Aversa: The Castle of Ruggiero

The castle of Ruggiero was residence and refuge of princes, famous queens, rulers and captains of fortune, including Joan of Anjou (Joan the mad), and Muzio Attendolo Sforza, father of the most famous Francis. After the damage suffered since 1382 and then in 1456 and 1457, in 1492 Alfonso of Aragon rearranged the castle as it appears in the view of the city of Aversa (XVI-XVII century) reported by Pacichelli where you can see the square with rows of stones and the terrace: It was then that it took the name of Aragonese Castle. The castle, surrounded by a high moat and equipped with bastions, developed around a square courtyard and a porch; on the ground floor there was a loggia with an equal number of arches per side and on the first-floor large rooms covered with barrel vaults overlooking the central courtyard. In 1700, due to the changing fortunes and human neglect, the castle was in ruins again, until in 1750 Charles III of Bourbon, (who also supported the construction of the Royal Palace of Caserta), gave the task of the restoration to his best architect, Luigi Vanvitelli, to make it a district of cavalry with changes both on the wings of the ancient body and on the second and third levels, while the fourth, with the towers, was built ex novo, altering the original structure with the perimeter curtains enclosed by a single architectural order, the Tuscanic, and the moat completely covered. In 1931, the well-known Avervian phrenologist Filippo Saporito (of which the asylum is named) had it restored, annexing it to its adjacent Nursing and Custody Home, thus becoming one of the most famous judicial prison in Italy. Today the castle, after the separation (only administrative) from the criminal asylum is the seat of the Court of “Napoli Nord”, while the asylum is back in the original buildings of the 1930s.



Fig. 4: Aversa: The Castle of Ruggiero, today the castle is the seat of the Court of “Napoli Nord”

5. PIETRAVAIRANO

The old town of Pietravairano is 42 km far from Caserta, located on the eastern ridge of Mount Caievola. The strategic position of the ancient village is highlighted by the Angevin watchtower, XIV century, which integrates to the previous Norman-Swabian Tower (sec. XI). Populations dedicated to cattle breeding and agriculture lived there already in the time of the Samnites, and the Romans. From the V sec. d.c., during the invasions of the Longobards and Saracens, in the IX sec., the inhabitants retreated on the mountains giving rise to a village on the slopes of Mount Caievola. The first settlement dates back to the end of the eleventh century. There is a reference of it in a Papal Edict of 1004, which defined the boundaries of the Diocese of Teano. In the text it is mentioned a Castrum quod nominatur Petrae, denomination derived from Terrae della Pietra proper Vairanum.



Fig. 5: Pietravairano: the “Torre Mastia”

In the sec. XIX there was the expansion of the urban center towards the plain below, with the construction of farmhouses (“masserie”) belonging to the noble families who gave work to the peasants, giving life to the new Borgo where now the majority of the population and the main administrative, social and economic activities were concentrated. It is thought, given the urban structure, that there was an access to the village through the Porta Vigna, although some local scholars assume an even older access, the Porta delle Grotte (the Door of the Caves). It is believed that in the twelfth century a first ring of walls was built, and also the Church of St. Martin, later Church of Sant'Eraclio, located within the village, dates back to this period, exactly to 1129. Starting from the thirteenth century, also for a strong demographic increase, there was the construction of a real ring of walls, with towers, and a gate called Cauto (Guardian), which led into the current Via Trivio in the center of the country. The last three doors, namely Porta S. Andrea, S. Sebastiano and Portanova, were built in the sixteenth century, through which you could access the extra moenia districts.



Fig. 6: Pietravairano

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The relation between Life Cycle Assessment and the historic buildings energy retrofit projects

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Abstract
The built environment is one of the main sectors that contribute to environmental pollution and resource consumption.
The European Commission emphasizes that the reuse of existing buildings plays an important role in maximizing the 2050 decarbonization and resource conservation target.
Furthermore, the "New European Bauhaus" states that the renovation of the built heritage should be carried out using the latest technologies being adopted in the sustainable construction sector, never neglecting the beauty dimension of architectural design. The reuse of historic buildings, if understood according to these perspectives, is capable of reducing environmental impacts on the one hand and reconnecting people with their living environment on the other [1].
The aim of this paper is to explore how energy retrofit projects of the historic buildings can contribute to the reduction of carbon emissions.
In fact, in this paper several project alternatives for the energy retrofit of Villa Vannucchi, a historical building located in San Giorgio a Cremano (Naples), have been proposed and evaluated.
Through the Life Cycle Assessment method, a comparative analysis of different project scenarios has been carried out, with the aim of selecting the most sustainable one, i.e. the one able to reduce CO2 emissions both in the design and in the use phase of the building itself.

Keywords: Cultural heritage, Adaptive reuse, Life Cycle Assessment, Bio-materials, Energy retrofit

1. Introduction
Nowadays, World Organizations launched many initiatives to reduce the negative impacts of climate change, able to operationalize the 17 Sustainable Development Goals, promoted in the "Paris Climate Change Conference".
The "European Green Deal" represents for Europe the action plan able to promote the efficient use of resources, through a new model of a more circular economy, capable of restoring biodiversity and reducing pollution. In this document, it is shown that there is a strict relationship between climate change and all the activities taking place within the cities. Cities consume a large amount of resources with negative external effects in terms of pollutants and climate change.
Buildings are a major source of greenhouse gases (GHG) emissions and contributors to the climate crisis [2].
Buildings, as the major contributor to climate change, should become sustainable, and consequently their impacts should be reduced [3].
It is necessary to assess the overall sustainability of construction processes and take more effective choice for sustainable building management [4].
In this regard, Europe recommend to address the problem of building sustainability, improving their energy efficiency and environmental performance. A more sustainable built environment will be essential for Europe's transition towards climate-neutrality [5].
The existing building stock in Europe represents the 80-90% of all buildings that will exist in 2050 [4] while buildings are responsible for the 40% of energy consumed in Europe [5].
The "New European Bauhaus" mentions that the renovation of cultural heritage is able to contribute to the green transition (according to the New Green Deal), through the energy retrofitting of the historic

buildings. Moreover, the reuse of cultural heritage is able to generate greater social inclusion, through the valorization of crafts and creative industries [6].
The aim is to create a “new design movement”, that using the new technologies as a tool to enhance the city livability [7].
The Council of Europe’s Faro Framework Convention on the Value of Cultural Heritage for Society should be used to root the green transition in the European values of cultural diversity, human rights, and participatory democracy [8].
The aim of this paper is to explore how energy conversion projects of the historic buildings can contribute to the reduction of carbon emissions.
In fact, in this paper several project alternatives for the energy retrofit of Villa Vannucchi, a historical building located in San Giorgio a Cremano (Naples), have been proposed and evaluated.
The methodology starts with the elaboration of A BIM model of the villa to collect all building dimensional data and its structural characteristics.
Through the Life Cycle Assessment method, a comparative analysis of different project scenarios has been carried out, with the aim of selecting the most sustainable one, i.e. the one able to reduce CO2 emissions both in the design and in the use phase of the building itself.
This paper is a synthesis of research work carried out thanks to the project “PON research and innovation, dd n. 407 del 27/02/2018 – Miur Italy”.

2. The BIM model of Villa Vannucchi

Villa Vannucchi is an historic villa of 18th century, located in San Giorgio a Cremano (Naples). The surface area is 1200 square metres and it’s extends over three levels, plus an under-roof floor. Today the building is occupied by the Pegaso Telematic University. There are classrooms dedicated to students and other office space and meeting rooms.
As all the historic buildings, the livability of these spaces is compromise by problems related to space heating and cooling. This problem involves a large consumption of electricity.
After a lot of visits to the building revealed that the south-eastern wall is the most exposed to problems of humidity and infiltration.
These problems are caused by complete exposure of the façade to the weather. As there are no canopies that cover the windows, rainwater infiltrates directly into the wall surfaces. This causes mold and swelling on the inside of the façade. In addition, the existing wooden single-glazed windows do not provide adequate thermal insulation.
For this reason, a thermo-scanner survey was carried out to further investigate the remissiveness of materials. The following emissivity coefficients were used during the measurements carried out: wood only (0.85), window (1,00), wall (0.95). Measurements were taken at an average distance of 4.0 mdi 4,0 m. The model of the thermo-scanner is Optris PI 400 with a temperature ranges fluctuating from -20 ÷ 100 °C, 0 ÷ 250 °C, 120 ÷ 900 °C and the temperature resolution is about 0,08 K with 32°; 0,1 K with 13°.
So, we measured the temperature of the walls near the windows (wooden window) comparing it with the window temperature, where the humidity problem is more relevant. We obtained a thermogram that established the temperature/time of each room adjacent to the outside. The measurement was carried out during the winter period.
The results of the analysis/diagnosis are as follows:

1. first room: on the wall is about 19° C- 20°C, on the window about 18°C - 21°C
2. second room: on the wall is about 17° C- 18°C, on the window about 18°C - 25°C
3. third room: on the wall is about 18,5°, on the window about 13°C - 15°C
4. fourth room: on the wall is about 18° C - 19°C, on the window about 18°C - 23°C
4. five room: on the wall is about 18° C - 19°C, on the window about 18°C - 23°C
5. Six room: on the wall is about 21° C - 22°C, on the window about 18°C - 22°C
6. Seven room: on the wall is about 20° C - 21°C, on the window about 15°C - 19°C
7. Eight room: on the wall is about 20,3 °C, on the window about 16,2°C.

This data is influenced by the air conditioner present on the walls (Fig.1).

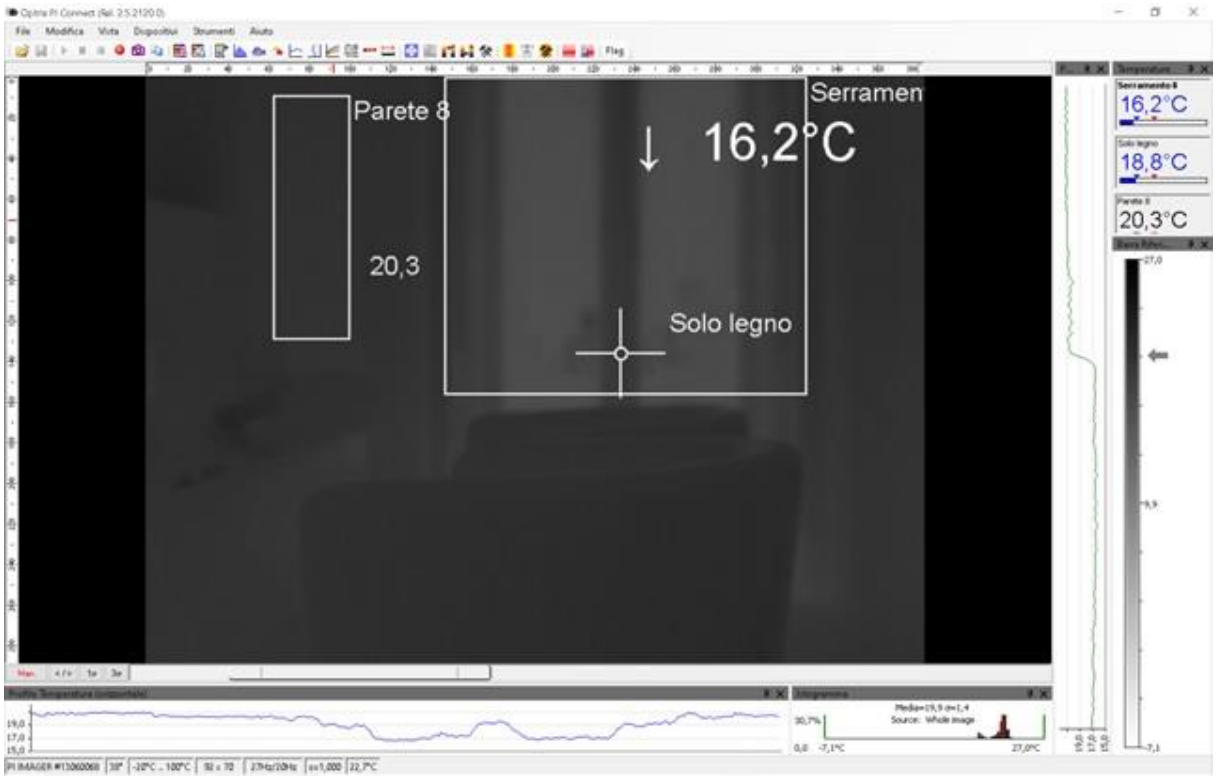

Fig. 1: Data elaboration of measurement with thermo-scanner on the internal walls of Villa Vannucchi.

Completed this energy diagnosis phase, we proposed three design projects for the refurbishment of the south east facades of the villa, always taking into consideration not to compromise or alter the historical and cultural values of the building with the new project. The first project scenario is to preserve the heritage building in its present state, by performing basic conservation interventions to avoid additional decay. The second scenario includes energy retrofit interventions in combination with the basic interventions envisaged in scenario A. While, the third scenario still concerns an energy retrofit of the building, but with the use of hemp materials.
Therefore, the environmental impacts of these three design scenarios, in terms of CO2 emissions, were assessed through the Life Cycle Assessment with the aim to select the most suitable for the villa energetic retrofit.

3. The relation between BIM model and LCA. The application to the case study

Analyzing the reference literature, there are various scientific studies that discuss about the technological innovation of BIM design integrated with the Life Cycle Assessment.
According to the BIM dictionary, BIM is a set of technologies, processes and policies enabling multiple stakeholders to collaboratively design, construct and operate a building or a facility in a virtual space [3].
Life Cycle Assessment is the most suitable evaluation tool capable to evaluate the environmental impacts of the design projects. By coupling LCAs with digital design tools, e.g., building information modeling (BIM), the identification of environmental hotspots and their mitigation is possible during the design process [3].
Therefore, in a study of Obrecht et al (2020) [3] were identified 60 relevant case studies where BIM and LCA are integrated. A total of 16 of the reviewed studies applied LCA during the early design stage. These studies used a manual or semiautomatic data exchange between the BIM models and LCA tools. In most cases, contemporary BIM-LCA workflows utilized conventional spreadsheets (e.g., Excel sheets in 16 cases) [3].
In a research of Verdaguer et al (2017) [9] it reads that Alvarez and Díaz [10] underline the importance of including LCA in BIM environment, especially in early stages of design. Soust-Verdaguer et al have underlined that the literature recognizes the advantages of BIM-LCA integration [9], [11], [12], [13], [14], [15].
Kreiner et al. [11], developed a methodology for building environmental assessment based on LCA, acknowledged the integration of LCA in BIM as a way of improving sustainability performance of buildings [16].
Therefore, understood the importance of integrating these instruments, a BIM model of the building was developed in order to draw up a suitable design for the renovation of the building, through interventions aimed at its energy efficiency. For our case study the BIM model was realized with Revit

software, capable to dialogue with One Click LCA software, that processing the Life Cycle Assessment. The BIM models allows to have under control all the dimensional data of the building and the data related to the materials used. Through BIM it is possible to calculate the quantities of materials needed to perform the LCA. The biggest revolution in the field of building LCA has been the introduction of automation: automation has allowed users to significantly reduce the time needed to calculate and LCA [4] Almost all the information needed for an LCA is already in the model. The Revit model includes information on materials used and quantities, it can be used to calculate a complete LCA. Figure 2 represents the 3D model of the Villa Vannucchi.

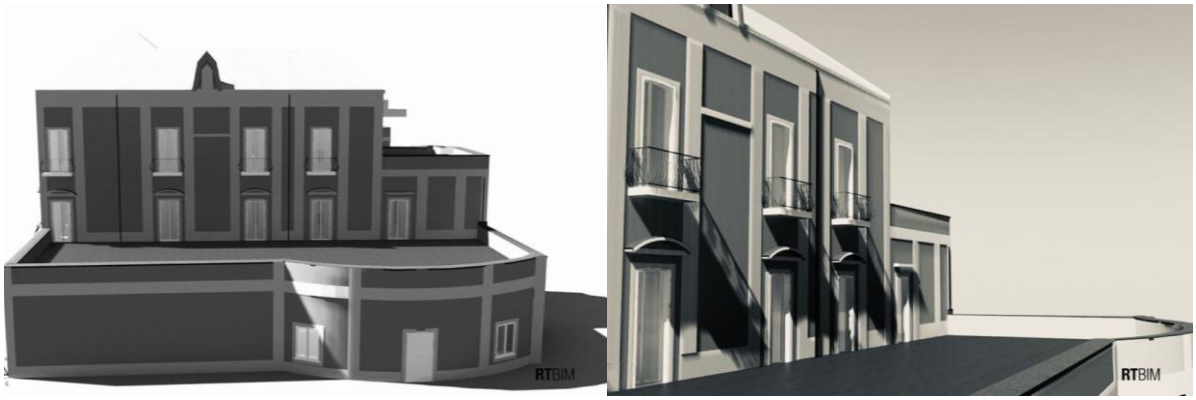

Fig. 2: Data elaboration of measurement with thermo-scanner on the internal walls of Villa Vannucchi

3.1 The Life Cycle Assessment

The database of dimensional and structural data of the building processed with Revit, was exported to the One Click LCA software, through a plug-in that allows dialogue between the two informatics systems.

LCA is recognized as an assessment tool capable to evaluate the environmental impacts. According to ISO 14040 [17] LCA method consists of four phases: goal and scope, life cycle inventory (LCI), life cycle impact assessment (LCIA) and interpretation. The ISO 14040 [17] standard also establishes that the LCA method represents the life cycle of a product as a system [16].

Therefore, for the energy re**novati**on of the historic buildings three design projects was proposed:

- the first scenario is to preserve the heritage building in its present state by performing basic conservation interventions to avoid additional decay (the rebuilt of roof membranes with FPO/PVC-P waterproofing reinforced with polyester, the introduction of a second window frame for all the windows inside the building and exterior facade plastering with a breathable product). The “operational energy”, requirement and calculated, for this scenario is 131372KWh/y;
- the second includes energy retrofit interventions (the insertion of photovoltaic panels on the roof and thermal coat on the facades with expanded polystyrene insulation panels) in combination with the basic interventions envisaged in scenario A;
- the third scenario still concerns an energy retrofit intervention of the building, but with the use of hemp materials to the polystyrene panels.

Therefore, table 1 and figure 3 show the results of LCA (Tab. 1) (Fig. 3).

	SCENARIO A	**SCENARIO B**	**SCENARIO C**
Category	**Global warming kg CO_2 - Life-cycle stages**	**Global warming kg CO_2 – Life-cycle stages**	**Global warming kg CO_2 - Life-cycle stages**
A1-A3 Materials	17415,19	65146,17	18843,74
A4 Transportation	55,51	125,65	142,33
B4-B5 Replacement	6138,38	19442,75	19442,75
B6 Energy	3968552,96	3243866,58	3072935,34
C1-C4 End of life	39,79	6643,15	634,53

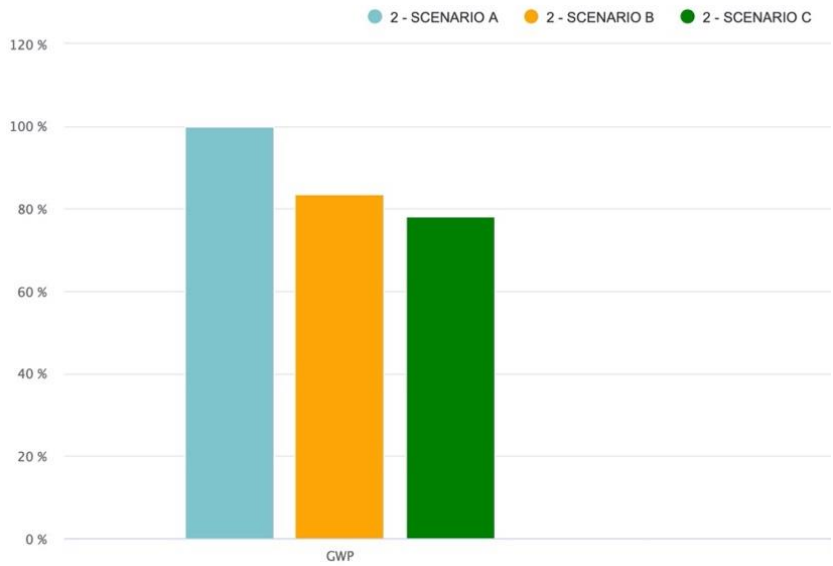

Fig. 3: Results of Life Cycle Assessment – data about the “Global warming” in kg CO2”

Analyzing these data, the scenario C is the most suitable for the energetic renovation of the south-east façade, because there is a significant C02 savings by using hemp materials. This bio-material have some properties able to reduce the amount of global warming, kg CO2. The plant already removes CO2 from the atmosphere when it is growing. Hemp captures four times the amount of carbon dioxide stored by the average tree during its growth phase.
It is considered a transpiring material, thus allowing the envelope to "breathe", ensuring a high degree of air healthiness.
In a research of Pittau et al (2018) [18], has already been discussed hemp materials generate positive long-term effects, because the carbon is stored in the anthroposphere before eventually being released as CO2 into the atmosphere after a relatively long timespan [18].

Conclusion

The National Resilience and Recovery Plans represent the interpretation that the various European countries have proposed in relation to the decision of the European Parliament to activate the European Green Deal - Next Generation EU27 (in May 2020), also in the context of the effects of COVID-19 [21].
In these plans the “built environment” is identify as a sector capable to contribute to the green transition, despite buildings are a major source of greenhouse gases (GHG) emissions and contributors to the climate crisis [19].
This new approach to sustainable design also applies to projects for the reuse of the existing built heritage.
The reuse of cultural heritage in a green perspective is able to contribute reducing energy consumption and CO2 emissions.
The historic buildings show high level of energy inefficiency contribute substantially to CO2 emissions. Even more, these buildings do not offer appropriate indoor environment quality (IEQ) nor the conditions necessary for heritage collections preservation [20].
Reuse projects today need to propose high-tech solutions to improve the energy efficiency of existing buildings. This can be achieved both through the use of materials capable of improving the thermal insulation performance of structures and through the use of renewable energy sources.
According to this perspective, in this paper show that the use of bio-materials for the retrofit of historic buildings is most convenient than the conventional materials.
Hemp materials contain a quantity of “biogenic carbon” typical of bio-based materials, capable to contribute to reduce the levels of carbon dioxide in the atmosphere and help mitigate the challenge of climate change [19].
Biogenic carbon within a building product can be considered as a “negative emission” [4]. This means that during the growth stage of bio-based materials carbon is stored into the material [21].
Moreover, in this paper it emerges that the use of the Life Cycle Assessment (LCA), should be supports the decision-makers in the choosing the most suitable design alternatives, capable of satisfying both the aesthetic quality of the projects and the reduction of the environmental impacts.

Nowadays, LCA is considered the assessment method capable to make operative the second macro-objective of Level(s), it is able to support a more holistic analysis of the performance of buildings based on whole life cycle thinking [19].
Level(s) is the latest evaluation tool, launched by European Commission to assess and report about the sustainability performance of buildings, throughout the full life cycle of buildings [22].

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Research, Mapping and Reduction of Infrasound Radiation in Conditions of Urban Territories on the Example of Samara Region of Russia

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Abstract

Negative impact of infrasound radiation in conditions of urban territories is constantly increasing. The sources of infrasound in urban territories are analyzed. The peculiarities of characteristic of sources are described.
Russian experience of estimation of infrasound in conditions of impact is considered. Infrasound levels measurements on the territory of the most large towns of Samara region (Samara, Togliatti, Syzran, Zhigulyovsk) were carried out. In total more than 400 points of measurements were investigated. Infrasound levels measurements were done both in day and night time in octave and 1/3 octave frequency bands. Examples of presentation of spectral characteristic of infrasound levels are shown. In total analysis of results of measurements is allowing to determine the most significant exceeding of normative values of sound pressure levels in infrasound range in octave and 1/3-octave spectra in a number of points of measurements on the urban territory of Samara region of Russia.
Russian approaches to infrasound and low frequency noise modeling of propagation and mapping are considered. infrasound maps of city districts of Samara region of Russia are developed.
Methods of protection from infrasound negative impact are discussed. In total, the most efficient infrasound reduction in urban territories may be achieved by provision of complex administrative-organizing, regime, technical, urban development, building-acoustic and the other measures.

Keywords: Infrasound, Impact, Mapping, Estimation, Reduction, Urban Territory

1. Introduction

Infrasonic waves are acoustic waves whose frequencies are below the audible frequency band, ranging from 20 Hz to 20 kHz. They are produced by a variety of natural and man-made sources such as sea waves wind turbulence, meteors, exploding volcanoes, earthquakes, nuclear and chemical explosions, land and air transport, rocket launches industrial plants etc.
Anthropogenic impact of infrasound waves to the people and to environment recently is rapidly increasing due to development of transport, industry etc., especially in conditions of urban territories [1-5, 11, 14, 15]. This is causing illnesses of population [2, 3, 10, 13].
Results of research of impact of infrasound to the human health are showing that negative impact if infrasound is complex. Therefore research and reduction of impact of infrasound to the population is important task.
Analysis of complaints of population of Samara region of Russia is also showing that the reason is a number of intensive sources of infrasound and of low frequency noise.
In a number of works it is shown that low frequency noise and infrasound are propagating on significant distances practically without decay [7, 9-12]. Therefore intensive impact of infrasound on the human health is possible on significant part of urban territories. Thus, infrasound pollution of

environment (natural, industrial, domestic) presently is serious problem.
This paper is devoted to the questions of research, mapping and reduction of infrasound radiation in conditions of urban territories on the example of the territory of Samara region of Russia..

2. Analysis of Main Infrasound Sources in Conditions of Urban Territories

Generally infrasound sources of urban territories may be subdivided into two main groups: natural and human. Natural group is including such sources like earthquakes, volcano eruption etc. Human sources may be subdivided as separate and complex. As separate sources single mounts of industrial enterprises (compressors, pumps etc.), single vehicles etc. may be considered. Complex sources are transport flows, industrial enterprises etc.
Analysis is showing that power plants of different kinds (automobile engines, compressors, pumps etc.) are significant sources of infrasound, which are radiating intensive infrasound waves.
One of the characteristics of the infrasound waves is that they can propagate in air for several kilometers, as shown in table 1, due to their low frequencies and related low air absorption [5, 9].

Table 1

Infrasound sources, their main frequency band and detection distances

Event type	Main Frequency band	Distance from source
Small nuclear explosions	0.01–0.4 Hz	250 km -5300 km
Volcano Etna	> 0.5 Hz	600Km
Rocket	0.1-10Hz	9 km
Sea wave/surf	1-9Hz	< 10 km
Earthquake	0.1 Hz	1800km
Bridge	6-8 Hz	8 km
Rock fall	7.5-20 Hz	< 1 km

Since the number of transport parks in cities is constantly increasing, it is necessary to consider transport (especially automobile transport) as an intensive source of infrasound generation, which is radiating from automobile internal combustion engine intake and exhaust systems.
Samara region is one of the main industrial regions of Russia. The biggest towns of Samara region are Samara (the capital of region), Togliatti (automobile capital of Russia) and Syzran. As typical industrial towns Samara, Togliatti and Syzran have as a number of large industrial enterprises as considerable automobile transport park, making significant acoustic impact to abutting dwelling territory. Samara also has railway transport, trams and metro; Syzran - railway transport. The problem of noise impact in these towns is intensified by the fact that some industrial enterprises and highways are closely adjoining to cities dwelling areas. As result significant part of cities population is affected by increased infrasound levels [2-4].
Let us point out the industry as one of the main infrasound source of town's discomfort. The main industrial infrasound sources are power plants of different kinds (compressors, pumps, ventilators, heat-exchanges, stationary engines etc.). Depending on the kind of power plants, conditions of operation power plants are having different infrasound characteristic [6, 9, 10, 14].

3. Peculiarities of Negative Impact of Infrasound to the Human Health

Results of research of negative impact of infrasound to the human health are showing that health damage is complex and leads to hearing loss, inhibition of vestibular and statokinetic functions, reduced performance, effects on the vestibular apparatus and cardiovascular system etc.
Due to continuous long-term impact infrasound may cause cumulative impact. Accumulating in the human body, infrasound impacts are depressing nervous system and in many cases are leading to the premature fatique, headache, irritability, impaired attention and memory, reduction of working capacity, dizziness etc.
Negative impact of infrasound to the human organism is increased with resonanse of infrasound oscillations with natural oscillations frequency of a particular human body. Human resonanse frequences are in range from 4 up to 15 Hz. The most dangerous is the range from 6 up to 9 Hz.
Infasound with frequency up to 10 Hz is causing resonant symptoms in large internal organs - stomach, liver, heart, lungs. Long impact of infrasound on the frequencies 4 ... 10 Hz may cause chronics gastritis or colitis, which is persists for along time ater finishing of impact.
Infrasound with frequencies about 12 Hz and with sound level 85–110 dB may cause bouts of movement and dizziness, and oscillations with frequences 6 Hz and from 15 up to 18 Hz may cause feeling of anxiety and of fear [2, 3].
Researches of biological impact of infrasound to the human organism are showing that for infrasound pressure levels from 110 up to 150 dB and more many negative effects in human body are occuring:

changes in the nervous system, damage of central, cardiovascular и respiratory as well as vestibular analyzer. Infasound impact may cause hearing losses at low and medium frequencies. Infasound impact with levels more than 150 dB may cause human death.
According to the some data infrasound may reduce labor productivity up to 75%. Significant psychotropic impacts of infrasound are thje most pronounced on the frequency 7 Hz, which is in consistent with the alpha rhytm of the brain's natural oscillations.
The degree of impact of different infrasound sources to inhabitants is depends on the number of factors: mutual dislocation of infrasound sources and living area, intensity and kind of moving transport flows etc. Generally, automobile transport is considered as the main noise source creating 60-80% of total acoustical pollution impacting to the town's population and giving up to 90% from all population complaints to negative noise influence.
The serious problems are also caused by low frequency noise impact. Analysis of inhabitant complaints confirms it [8]. There are also some peculiar characteristics of infrasound and of low frequency noise affection such as the resonance of humans body, the association with natural phenomena etc.

4. Russian Experience of Estimation of Infrasound in Conditions of Urban Territories

Infrasound, as a sound, propagates by mean of the air. The properties of sound propagation in the atmosphere are depending mainly by two atmospheric properties: temperature profile and dissipative processes. The vertical temperature profile of the atmosphere sets the variation of the sound velocity with height and the dissipative processes determines which acoustic frequencies can propagate. Another factor that influences propagation path is the wind field that changes the temperature profile [5]. In order to model the infrasonic wave attenuation along the ray path dissipative and adiabatic processes have been considered other than temperature, humidity and pressure.
Under the supervision of the author of this paper infrasound levels measurements on the territory of the most large towns of Samara region (Samara, Togliatti, Syzran, Zhigulyovsk) were carried out. In total more than 400 points of measurements were investigated. Infrasound levels measurements were done both in day and night time in octave and 1/3 octave frequency bands. Estimation of measurements results was done according to the valid normative documents.
According to Russian Sanitary Norms 2.2.4 / 2.1.8.583-96 maximally admitted level of infrasound in living areas is 90 dB Lin (general level of infrasound) for octave ranges: 2 Hz - 90 dB; 4 Hz - 85 dB, 8 Hz - 80 dB, 16 Hz - 75 dB. In case of time-varying and intermittent infrasound sound pressure level measured in scale Lin must not exceed 120 dB.
Measurements were done with using of modern measurement equipment: sound level meter – noise analyser "Octave – 101 AM", noise and vibration analyser "Asssistant". .
Examples of presentation of spectral characteristic of infrasound levels are shown in figures 1 and 2.

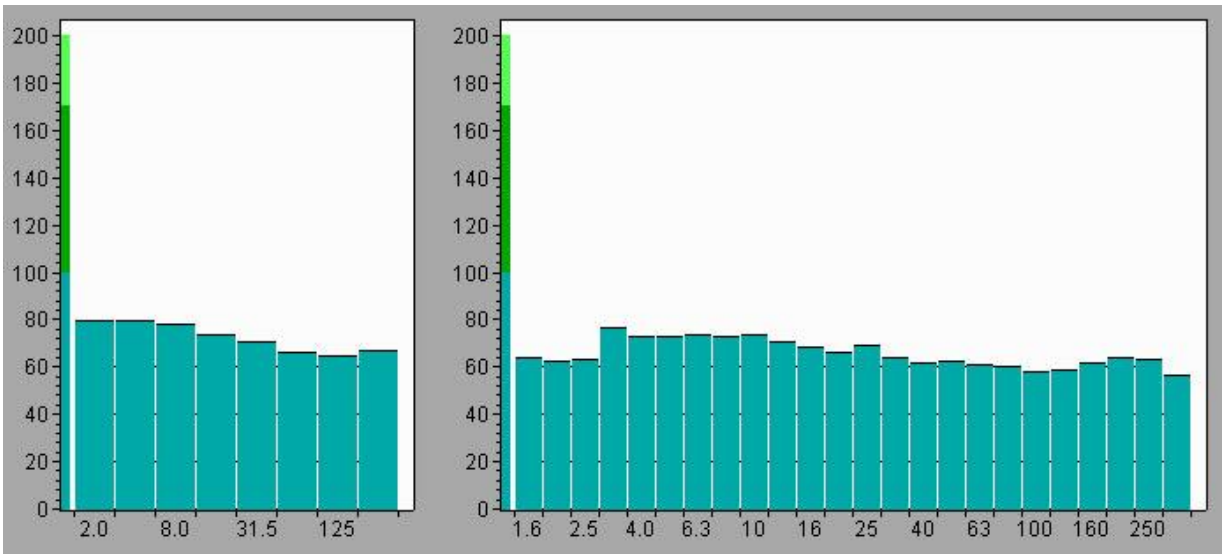

Fig. 1: Octave and 1/3- octave spectra of sound pressure levels in infrasound range on the point of measurements of Democraticheskaya Street, 4, Kirovsky district, Samara City
Description:
Vertical direction: sound pressure levels in infrasound range, dB
Horizontal direction: frequency, Hz

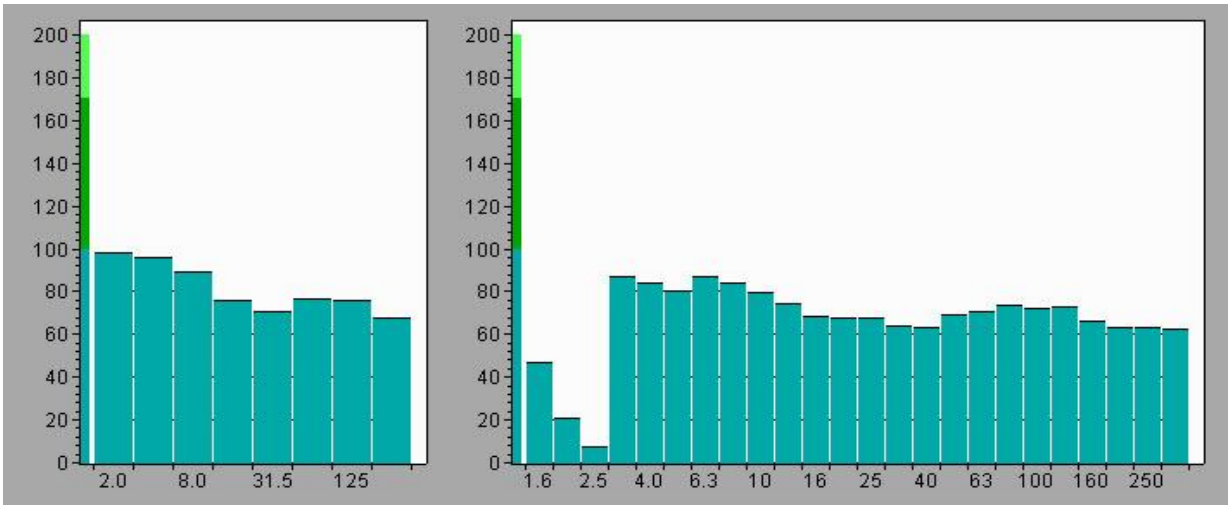

Fig. 2: Octave and 1/3- octave spectra of sound pressure levels in infrasound range on the point of measurements of Novo-Sadovaya Street, 33, Octyabrsky district, Samara City
Description:
Vertical direction: sound pressure levels in infrasound range, dB
Horizontal direction: frequency, Hz

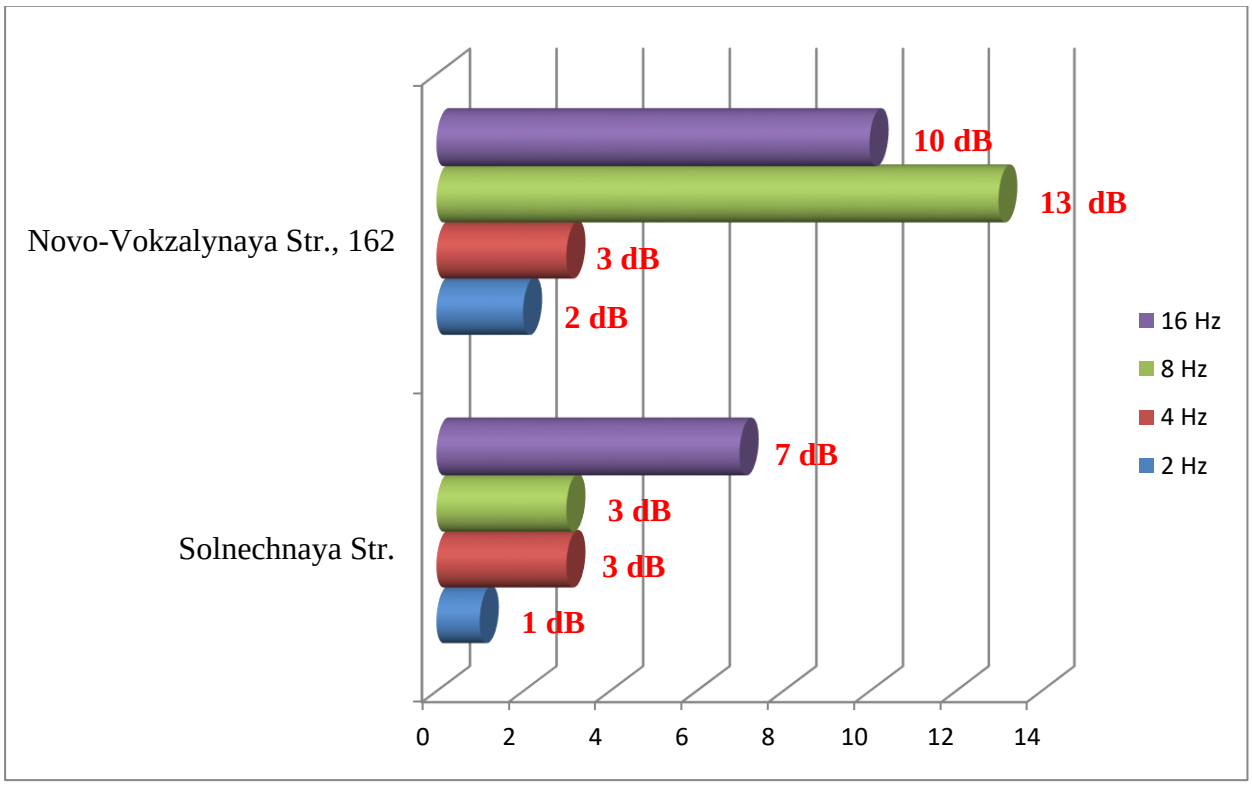

Fig. 3: Diagram of exceeding of normative values of infrasound in octave frequency ranges in Industrial district of Samara city

In total analysis of results of measurements is allowing to determine the most significant exceedances of normative values of sound pressure levels in infrasound range in octave and 1/3- octave spectra in a number of points of measurements on the urban territory of Samara region of Russia. For example, in Industrial district of Samara city exceedances of normative values of sound pressure levels in

infrasound range were determined in Solnechnaya street, house N8: on the frequency 2 Hz – 1 dB; on the frequency 4 Hz – 3 dB; on the frequency 8 Hz – 3 dB; on the frequency 16 Hz – 7 dB. In Novo-Vokzalynaya street, house N162: on the frequency 2 Hz – 2 dB; on the frequency 4 Hz – 3 dB; on the frequency 8 Hz – 13 dB; on the frequency 16 Hz – 10 dB. Diagram of exceeding of normative values of infrasound in octave frequency ranges in Industrial district of Samara city is shown in figure 3.
Thus, it is possible to speak about the existing of real problem of infrasound safety of urban territories provision.

4. Russian Approaches to Infrasound and Low Frequency Noise Modeling of Propagation and Mapping

There are the different methods of infrasound mapping. One of them the methods is using of topographic data, schemes etc. of living territory. Measured and calculated results in very of points of measurements are drawing to the map, infrasound dangerous zones are marked. There is possibility of infrasound situation forecasting in the living territories which are similar to the investigated territory. The scale of map may be completely different and depending on the required task: city map, districts maps, neighborhood units maps and even living houses maps. Rapid development of computing technique allows to automate the process of infrasound maps creation. Modern computers with high velocity proceeding huge volume of information as static, as graphical. As result, a lot of companies are suggesting different types of city noise and infrasound maps. For example, there are well known «LIMA» and «SoundPLAN» program provision.
The signing of the Comprehensive Nuclear-Test-Ban Treaty (CTBT) on 24 September 1996 and the establishment of the International Monitoring System (IMS) for Treaty verification has led to a rapid development in the use of infrasound monitoring technology for the detection of nuclear explosions. The IMS includes a 60-station infrasound monitoring network that is designed to reliably detect infrasonic signals from a 1-kiloton atmospheric nuclear explosion at two or more network stations. The stations in this network are located uniformly over the face of the globe. Each station consists of an array of high-sensitivity microbarometer sensors arranged in an optimal configuration for the detection of signals from atmospheric explosions. Fundamental design principles for IMS infrasonic array stations with an emphasis on the recent developments in array design, improvements in infrasound sensor technology, and advances in background noise reduction are described by Christie D.R. et al. [1].
For propagation estimation of environmental low frequency noise and infrasound it is necessary to model propagation in the open space. In fact it is a difficult task due to the numerous acoustical effects like diffraction, refraction, reflections, superposition etc. That is why it is necessary to select appropriate methodical approaches for environmental low frequency noise and infrasound modeling. For example, concerning transport low frequency noise and infrasound evaluation it is better to model not infrasound of separate cars, but transport flow infrasound. Formalization and modeling of transport flows are easily represented using the influence diagrams. Such diagrams are usually describing some formalized presentation of modeled categories (objects, processes, properties etc.) in a form of multitude of graphical symbols (assemblies, vertexes) and relations between it. In Russia the most popular types of influence diagrams are flow graphs, trees of events and functional nets [27, 28]. Flow graphs are including the variety of vertexes and a set of regulated and of unregulated couples, used for visual presentation of modeling process.
Recently semantic or functional nets are rapidly developing, which are present graphs, but with additional information in it assemblies and rib. The most popular functional nets PERT (program evaluation and research technique) and GERT (graphical evaluation and review technique). For mathematical description of street-road nets of city methods of graph theory have been taken. Carriers of information about city street-road net geometry may be automobile road schemes, road atlases, drawings etc. But for infrasound maps creation it is necessary to convert graphical information to analytical. The following work have been done by the authors:

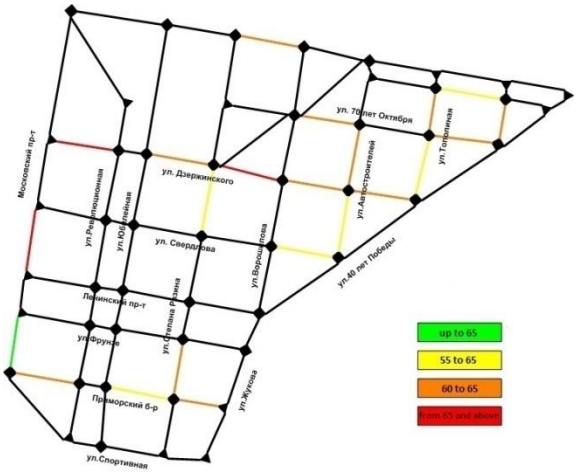

Fig. 4: Graphical presentation of transport of networks of Avtozavodsky district of Togliatti city

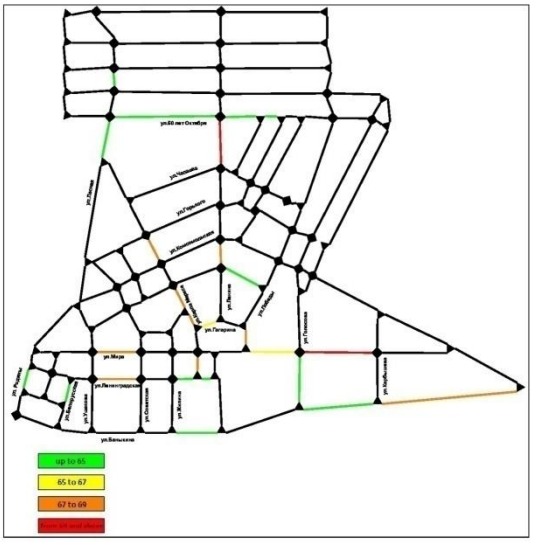

Fig. 5: - Graphical presentation of transport networks of Central district of Togliatti city

1. Mathematical apparatus of description have been analyzed and mathematical model of street-road transport nets have been worked out.

The influence diagram is a flow graph described by variables and constants corresponding to assembles-vertexes. To each variable is associated a set of meanings, its probability distribution density and a set of function that works on variables.

For indication of relations between variables corresponding symbol mass data are using. These mass data may be presented as: multitude of ribs, connecting assembles, vector of bows-predecessors and successors, vector of probability of transition between assembles i and j, vector of resource spends (e.g. time) during transition from assembly i to assembly j.

Geometry of two-side graph G is determined by incidence matrix (setting a numbers of vertexes) and corresponding coordinates matrix {y(i)}. To each rib {x(i1) , x(i2)} of graph G numerical characteristic are comparing, which are describing street-road net:

n - number of traffic paths;
α - road profile;
β - quality of road surface;
γ - directives about structure and dynamic of transport flow;
δ - meteorological conditions;
ε - surrounding landscape;
θ – other characteristic (lighting, presence of traffic distribution zones etc.).

Thus, graph is totality of vertexes and ribs. Information about graph structure is determined by matrix form.

2. By using of developed mathematical model street-road transport nets have been created. Transport nets are consisting of the roads with intensive load (marked in the program by black bold strip) and a net of local roads.

3. Algorithms of coding and of information restoring about street-road graph structure was created. Software have been developed to investigate infrasound situation in Togliatti city (Russia) streets and roads. Graf networks of the transport mains of Avtozavodsky and Central districts of Togliatti city are shown in figures 4 and 5.

By using of program provision «Physic-City-Test» infrasound maps of city districts of Samara region of Russia were developed. In figure 6 map of infrasound radiation for living territory of Avtozavodsky district of Togliatti city. Points with infrasound levels comply with regulatory requirements are marked in green, with infrasound levels exceeding hygiene standards are marked in red.

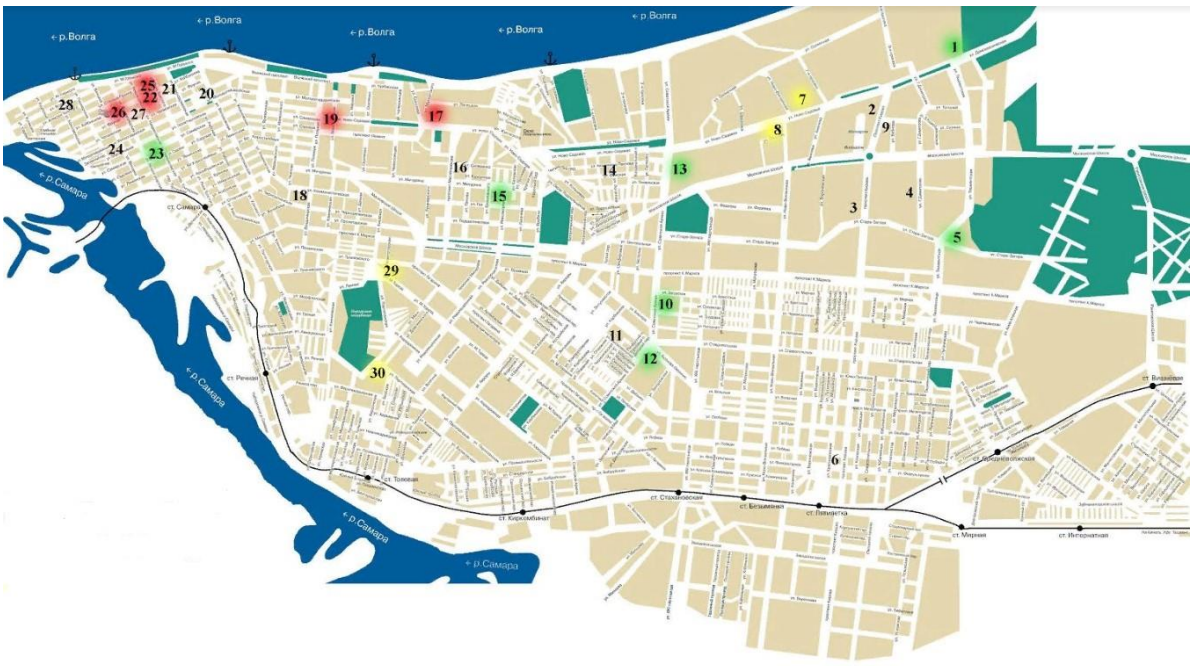

Fig. 6: Map of infrasound radiation for living territory of Avtozavodsky district of Togliatti city
Description:
- green color - sound pressure levels in infrasound octave ranges: up to 90 dB – on the frequency 2 Hz, up to 85 dB – on the frequency 4 Hz, up to 80 dB - on the frequency 8 Hz, up to 75 dB – on the frequency 16 Hz;
- yellow color - sound pressure levels in infrasound octave ranges: from 90 dB up to 95 dB – on the frequency 2 Hz; from 85 up to 90 dB – on the frequency 4 Hz; from 80 dB up to 85 dB – on the frequency 8 Hz, from 75 dB up to 80 dB – on the frequency 16 Hz;
- red color – sound pressure levels in infrasound octave ranges:: above 95 dB – on the frequency 2 Hz; above 90 dB – on the frequency 4 Hz; above 85 dB – on the frequency 8 Hz, above 80 dB – on the frequency 16 Hz.

5. Methods of Infrasound Reduction

In order to reduce efficiently infrasound impact in conditions of urban territories it is necessary to use complex measures [14].

Main methods of protection from infrasound negative impact may be subdivided as administrative-organizing measures; protection by time; regime measures; engineering-technical methods; monitoring of infrasound levels; urban development and building-acoustic methods etc.

Administrative-organizing measures of noise reduction: noise levels reduction due to decreasing of intensity and noise of transport flows; improvement of roads quality, using of road surface with lower noise; provision of rational velocity of movement; provision and even exclusion of automobile (especially lorry) transport traffic in central parts of town and in living area streets etc.

Protection by time is used in cases when there is no possibility to reduce the intensity of infrasound radiation up to admissible levels. In this situation it is necessary to restrict the time of stay of population and of personnel in the zone of intensive infrasound impact.

Regime measures are connected with restriction of entry of population in infrasound dangerous zones. Radiation zones are protected and warning signs are installed.

Engineering-technical methods are meaning the using of different technical solutions for reduction of infrasound radiation. Reduction of infrasound radiation in the source of its generation is the most efficient approach.

Urban development and building-acoustic methods of infrasound reduction are including rational acoustic planning of neighbourhood units, industrial enterprises and highways, definite functional zoning of the territory, removal of dwelling areas from intensive infrasound sources, using of compositional grouping of buildings etc.

In total, the most efficient infrasound reduction in urban territories may be achieved by provision of complex administrative-organizing, regime, technical, urban development, building-acoustic and the other measures.

6. Conclusions

Results of research of impact of infrasound to the human health are showing that negative impact if infrasound is complex. Therefore research and reduction of impact of infrasound to the population is

important task. Analysis of complaints of population of Samara region of Russia is also showing that the reason is a number of intensive sources of infrasound and of low frequency noise.
Analysis is showing that power plants of different kinds (automobile engines, compressors, pumps etc.) are significant sources of infrasound, which are radiating intensive infrasound waves.
Results of estimation of infrasound in conditions of urban territory of Samara region are showing that in some zones of measurements there are significant exceeding of normative values.
Different methodologies are used to show the result of the infrasound emission assessment such as noise mapping or influence diagrams, the latter especially adopted in Russia.
Those methods of infrasound modeling and mapping need to be improved following the growing demand of environment monitoring pollution, related to physical agents.
By using of program provision «Physic-City-Test» infrasound maps of city districts of Samara region of Russia were developed.
In total, the most efficient infrasound reduction in urban territories may be achieved by provision of complex administrative-organizing, regime, technical, urban development, building-acoustic and the other measures.

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Experimental Research and Modeling of Automobile Transport Noise (Russian Experience)

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Abstract

Automobile transport is the main source of acoustical pollution of industrial cities. Analysis of environmental noise sources of the main towns of Samara region of Russia (Samara, Togliatti, Syzran) is showing that there is a number of considerable automobile transport park, making significant acoustic impact to abutting dwelling territory.
Russian approaches to experimental research of automobile transport noise are considered. Some approaches to mathematical modeling of automobile transport noise are described. Automobile transport noise levels on the living territory of the Avtozavodsky, Central and Komsomolsky districts of Togliatti city was measured near to the city streets with intensive transport movement. In total over 500 points have been investigated. Results of measurements in many points are showing significant exceeding of permissible sanitary values.
Noise characteristic of different cars were also investigated. Results of measurements of sound pressure level for “Largus Cross” car in acceleration regime at the speed 50 km/h in the second gear at the distance 7,5 meters from a passing car are showing that maximal is sound pressure level at the frequency 125 Hz, which is corresponding to the main engine operation frequency.
Thus, in order to reduce efficiently automobile transport noise, it is necessary to attenuate both automobile transport flows noise and separate automobiles noise, especially in low frequency range.

Keywords: Noise, Automobile transport, Estimation, Modeling, Urban Territory

1. Introduction

Automobile transport is the main source of acoustical pollution of industrial cities [1, 2, 4-8].. Despite on all the measures to reduce it, automobile transport noise is rapidly increasing together with the cities growth. Since automobile transport park in cities is increased every month, the problem of transport noise reduction became one the most important. From all kinds of transport main input to noise generation in modern cities is provided by automobile transport (up to 90% from all population complaints). The most serious problems are caused by low frequency noise generated by automobile transport [1, 3, 4, 7].
Automobile transport noise modeling and estimation need completely different program products. For example, for mathematical description of street-road transport nets the methods of graphs theory may be used. Extremely difficult to create a good quality software for evaluation of transport noise propagation in cities living areas because sound propagation in living areas is sophisticated process, characterized by such phenomena as sound waves divergence, interference, diffraction, refraction, reflection, absorption etc.
Analysis of environmental noise sources of the main towns of Samara region of Russia (Samara, Togliatti, Syzran) is showing that there is a number of considerable automobile transport park, making significant acoustic impact to abutting dwelling territory. The problem is intensified by the fact that some highways are closely adjoining to city's dwelling area. As result significant part of city's population is affected by increased noise level [1, 5, 8, 9].

For example, automobile transport is the main external noise source affecting to Togliatti city dwelling area. Specific city peculiarity is large automobile transport park, the most part of which consist of cars. This cause intensive transport flows at city's streets, which are generating significant noise impact.
This paper is devoted to the questions of Russian experience of experimental research and modeling of automobile transport noise in conditions of urban territories.

2. Peculiarities of Measurement of Automobile Transport Noise in Russia

Russian State Standard R 52231-2004 “External noise of motor vehicles. Permissible levels and methods of measurement” determines methods of automobile external noise measurement. As external noise indicator when checking the technical condition of the car the level of the automobile exhaust system is used. Measuring microphone is installed above the platform surface at the height of the location of exhaust pipe of muffler, but not lower than 0,2 m. Microphone is displaced at the distance (0,5±0,05) m from exhaust pipe cross section. The main axis of the microphone should be parallel to the surface of the platform with the deviation of no more than ±15° and make up the angle 45°±15° with vertical plane passing through the axis of flow of exhaust gases coming out of the exhaust pipe of the muffler. For the automobile with vertical location of the exhaust pipe the microphone is installed at the height of the exhaust pipe cutoff at the distance (0,5±0,05) m in direction of the nearest side of the automobile. Microphone axis is directed vertically, the membrane is oriented upwards.
The test cycle of the engine during testing is the following. During engine operation in regime of idle speed with minimal frequency of rotation pressing the fuel supply control pedal and set the increased speed frequency of rotation with deviation no more than ±100 rpm. After engine operation during 5-7 seconds with increased frequency of rotation the force form the pedal is removed before setting the minimum speed. This test cycle is repeated with interval 8-10 seconds at least three times. Maximal value of noise level is measured in every test cycle. Measured values of noise level are rounded to the nearest whole number and are considered to be reliable during the difference in readings no more than 2 dBA. If the difference in readings is more, the measurements are repeated. Result of measurements is maximal reading of sound level meter, fixed during performing test cycles, which is comparing with admissible noise level. Measurements are considered to be valid if background noise is no less than 10 dBA lower than the level of measured noise.
Noise of automobile internal combustion engines is measured according to the Russian State Standard R 53838-2010 “Automobile engines. Noise exposure limits and measurement techniques”. This standard is determining the following noise characteristic of automobile engines: sound pressure level corrected on frequency characteristics of sound level meter, dBA; sound pressure levels in octave or 1/3 octave frequency bands, dB; sound power levels in octave bands of frequencies with average geometric frequencies from 125 up to 8000 Hz, dB; corrected for frequency response A of sound level meter sound power level, dBA.
During measurement of noise the microphone in the point of measurement must be oriented in direction of testing engine. Between the microphone and the engine should not be the objects that distort the sound field. The distance between microphone and observer should be at least 0,5 m. The switcher of time characteristic of sound level meter should be installed in position “slow”.
Sound pressure levels should be measured in every of measurement points on the measuring surface with full fuel supply and at the speed of the crankshaft rotation corresponding to gross capacity (external speed characteristic).
In the point with maximal sound pressure level should be measured sound pressure levels in all operating range of crankshaft rotation frequencies. The number of measurements in the given point should be sufficient for determination of regime with maximal noise level.
Noise levels in industry in Russia are evaluated according to hygiene requirements, stated by valid sanitary norms (Sanitary Norms 2.2.4/2.1.8.562-96), Russian State Standards and Building Norms and Rules. Normative parameters for unstable noise are equivalent sound levels L_{Aecv} and maximal sound levels $L_{A\max}$, dBA.
There are two periods of evaluation: day (7.00-23.00) and night (23.00-7.00). If noise level is measured inside of building, the permitted value of L_{Aecv} is no more than 40 dBA (day) and 30 dBA (night), the permitted value of L_{Amax} is no more than 55 dBA (day) and 45 dBA (night). For the territories directly near to the living houses, hospitals, schools etc. evaluation of normative values of equivalent and maximal sound levels is carried out by using of following values (day):

$$L_{A\,ecv\,norm} = 55\ \text{dBA} + 10\ \text{dBA} = 65\ \text{dBA}, \quad (1)$$

$$L_{A\,max\,norm} = 70\ \text{dBA} + 10\ \text{dBA} = 80\ \text{dBA}, \quad (2)$$

For night period $L_{A\,ecv\,norm} = 55$ dBA, $L_{A\,max\,norm} = 70$ dBA.

There are different noise values norms for different operational processes, but in any case noise levels must be lower than 80 dBA.

3. Some Approaches to Mathematical Modeling of Automobile Transport Noise Propagation in Urban Territories

Sound propagation in the urban territory is sophisticated process, characterized by such phenomena as divergence of sound waves, superposition (interference), diffraction, refraction, reflection, scattering, absorption by the elements of external medium etc. All these phenomena making significant influence on the sound field of living area and must be taking into account under noise calculation process [6].

In modern multi-stored building of living territories near to highways with long houses and front houses arrangement along the streets reduction of sound level is determined mainly by divergence and by screening effect. In little-stored building effect of screening is slight, role of sound reflection is increased, significant role is gaining surface type of the territory, and main input is given by the straight sound energy, or sound energy, diffracted on buildings butt-ends. Some influence to noise propagation may give greenery: trees, shrubs. Significant influence on noise propagation inside of living territories are causing the screens: solid walls, land embankments, slopes of hollows etc. Noise propagation inside of the living houses is occurs through the protective constructions, total sound isolation of which is determined by the most weak elements, and first of all by windows and by balcony doors.

Mathematical model have been developed to evaluate automobile transport flows noise propagation to the dwelling territory. Transport flow is presented as a model, consisting of indefinite number of incoherent noise source of equal sound power, situated on one straight line on the equal distance each from other. In general such noise source is considered as complex source of pseudo-cylindrical sound waves (sound pressure level of which is reduced for every doubling of distance in limits from > 3 up < 6 dB depending on the distance between noise sources).

Differential equation of such waves propagation is following:

$$\frac{\partial^2}{\partial}\frac{p}{t^2} = c^2\left[\frac{1}{r^n}\{\frac{\partial}{\partial r}r^n\frac{\partial p}{\partial r}\}\right], \quad (3)$$

where $1 < n < 2$.

If n = 1, we have equation of propagation of cylindrical waves, if n = 2 - equation of propagation of spherical waves.

Section of pseudo-cylindrical surface is determined as:

$$S = 2\pi r^n, \quad (4)$$

Transport flow (independently on it density) may be also considered as linear noise source, what is significantly simplifies calculations. But it should be bear in mind, that this admission is valid only for the cases when noise characteristic of flow is equivalent sound level for the period of time, exceeding duration of vehicle passing. Square of sound pressure at the distance r from linear noise source is expressed as:

$$p^2 = \frac{W\rho c}{2\pi r}, \quad (5)$$

Sound pressure level (dB) with its location on the acoustically rigid surface L_p, is determined by the equation:

$$L_p = L_W - 10\lg 2\pi r, \quad (6)$$

4. Results of Automobile Transport Noise Experimental Research in Conditions of Urban Territories

The task of experimental research of automobile transport noise characteristic may be subdivided in two main approaches: experimental research of automobile transport flows noise and experimental research of separate automobiles noise characteristic. Results of experimental research of automobile transport noise using both approaches are described below.

Measurements were done with using of modern measurement equipment: sound level meter – noise analyser “Octave – 101 AM”, noise and vibration analyser “Asssistant”. .

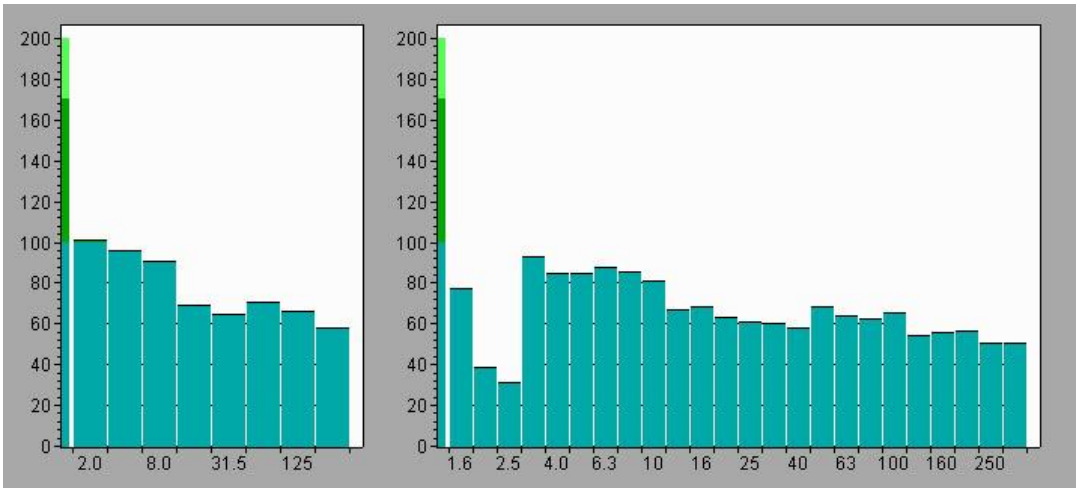

Fig. 1: The diagram of spectral characteristic of low frequency noise and infrasound levels (octave and 1/3 octave ranges) for point Chaykina Str., 67 of living territory of Komsomolsky district of Togliatti city
Description:
Vertical direction: sound levels, dBA
Horizontal direction: frequency, Hz

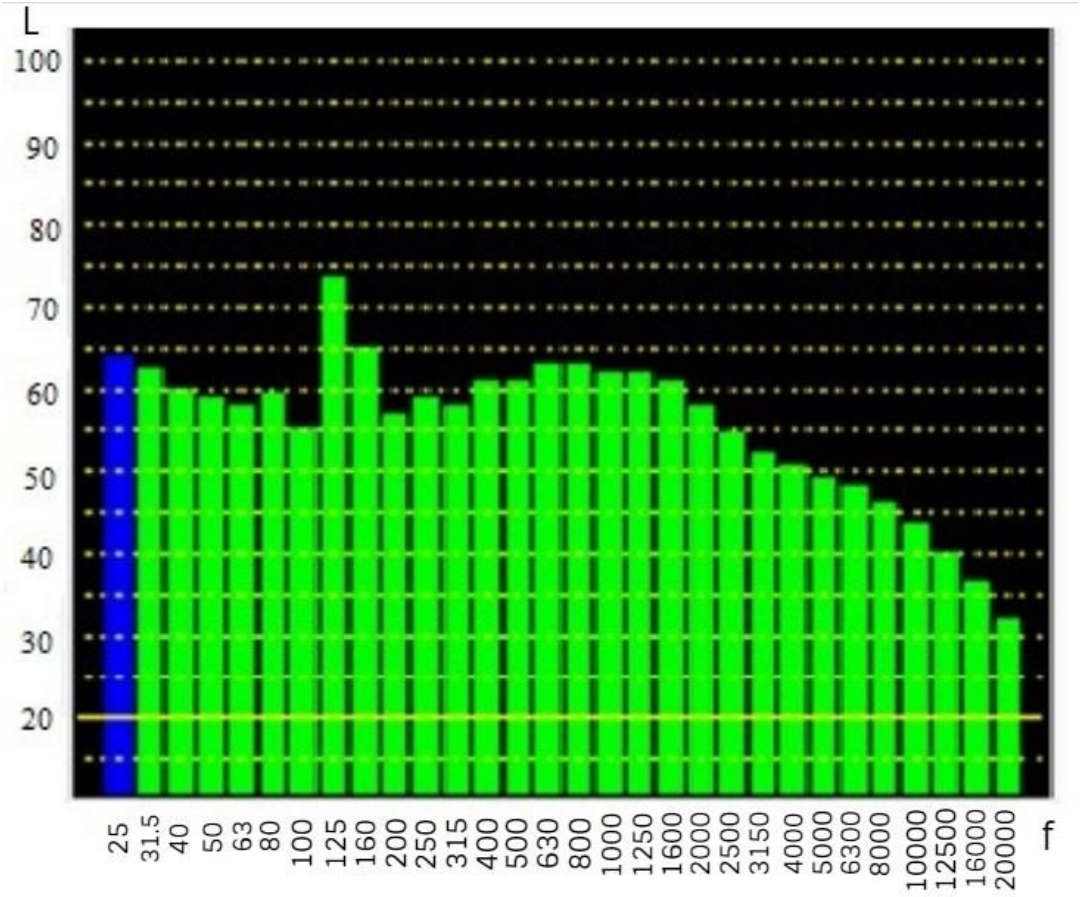

Fig. 2: 1/3- octave spectrum of sound pressure level measured for “LADA Cross” car in acceleration regime at the speed 50 km/h in the second gear at the distance 7,5 meters from a passing car
Description:
Vertical direction: sound pressure level, dB
Horizontal direction: frequency, Hz

In years of 2014-2020 investigations of transport noise influence to the housing estates of the Central and Komsomolsky districts of Togliatti city have been carried out [4, 5, 8]. Results of comparison of measured and calculated values for every point with normative requirements shows, that the most significant excess of standard equivalent noise levels is observed for the following points. Komsomolsky district, night time: point Matrosova Str., 60, the value of exceeding of normative requirements of equivalent noise level is 8 dBA, maximal noise level - 6 dBA; point Yaroslavskaya Str., 11: the value of exceeding of normative requirements of equivalent noise level is 5 dBA, maximal level - 8 dBA; day time: point Chaykina Str., 67, the value of exceeding of normative requirements of maximal noise level is 9 dBA; point Yaroslavskaya Str., 61, the value of exceeding of normative requirements of maximal noise level is 9 dBA. Central district, night time: point Lenina Str., 98, the value of exceeding of normative requirements of equivalent noise level is 10 dBA, maximal noise level - 5 dBA; point Mira Str., 60, the value of exceeding of normative requirements of equivalent noise level is 12 dBA, maximal noise level - 12 dBA; day time: point Mira Str., 114, the value of exceeding of normative requirements of equivalent noise level is 4 dBA, maximal noise level - 3 dBA. . Central district, day time: the point of Mira street (near to bus stop) - 6 dBA; point Banykina street - 4 dBA; point Komsomolskaya street - 3 dBA.

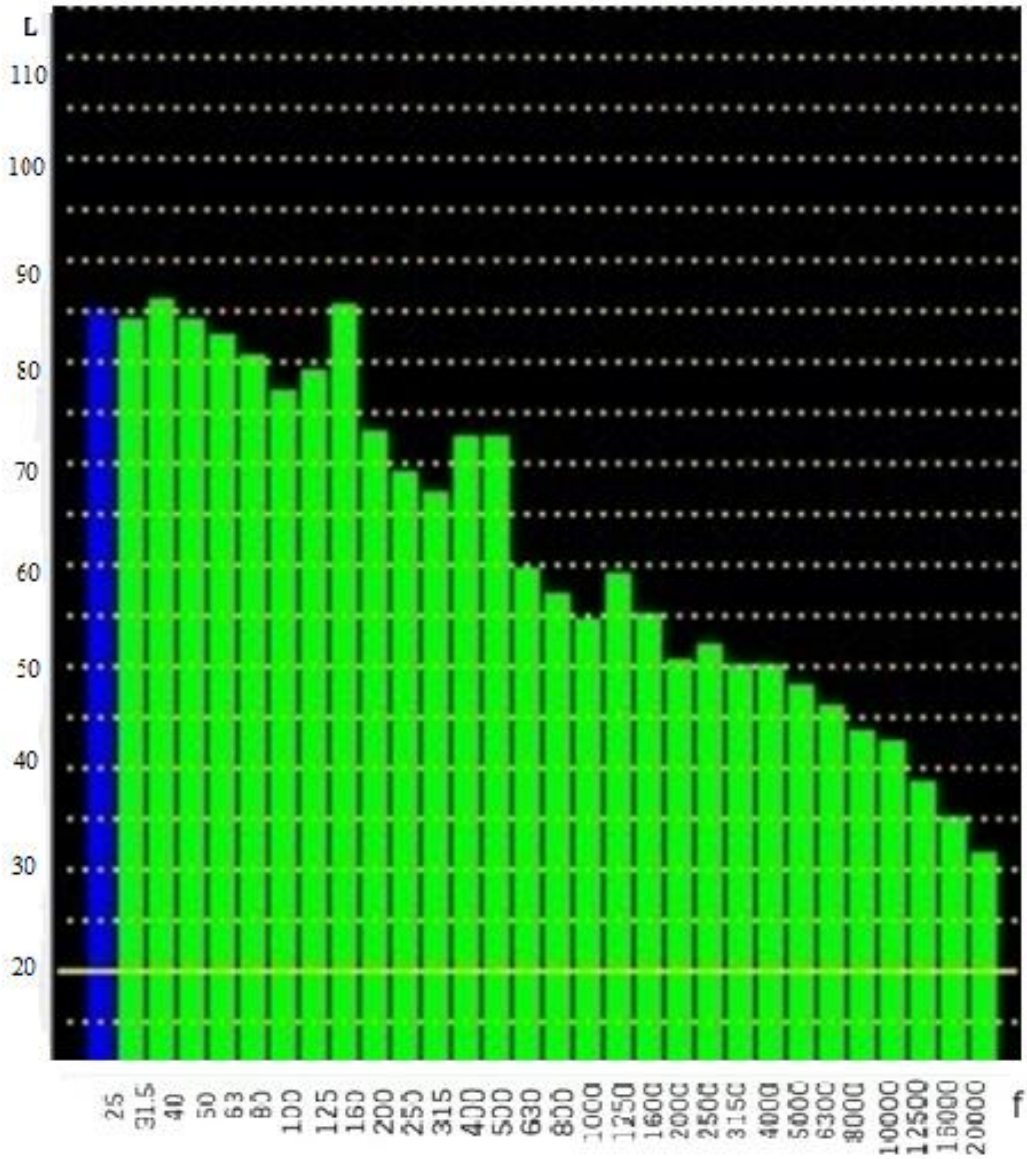

Fig. 3: 1/3- octave spectrum of sound pressure level measured for "LADA Cros" car Ларгус Кросс at idle and high speed at the distance 0,5 meter from exhaust pipe cut-off.
Description:
Vertical direction: sound pressure level, dB
Horizontal direction: frequency, Hz

In years of 2019-2020 Avtozavodsky district living area of Togliatti city was investigated. Again the zones with the exceeding of normative requirements of equivalent noise level were found: night time: point Dzerzhisky Street, the value of exceeding of normative requirements of equivalent noise level is 8 dBA, maximal noise level - 3 dBA; day time: point Topolinaya Street, 21, the value of exceeding of normative requirements of maximal noise level - 19 dBA; point Dzerzhisky Street, 31, the value of exceeding of normative requirements of equivalent noise level is 3 dBA.
In total from 250 points of measurements only 67 meets to the normative requirements of equivalent noise level and 71 - to maximal noise level. Values of more than half of measurements in night time are exceeding the normative requirements. Comparing with previous periods of noise measurements in any measurement point noise level reduction have not been obtained.
Spectral analysis of results of transport noise measurements is showing that the most significant noise levels are in low frequency range. Example of presentation of spectral characteristic of low frequency noise and infrasound of the living territory of Komsomolsky district of Togliatti city near to transport roads (point Chaykina Str., 67) is shown in figure 1.
Noise characteristic of different cars were also investigated. In figures 2 and 3 1/3- octave spectrum of sound pressure level measured for "LADA Cross" car in acceleration regime at the speed 50 km/h in the second gear at the distance 7,5 meters from a passing car and 1/3- octave spectrum of sound pressure level measured for "LADA Cross" car at idle and high speed at the distance 0,5 meter from exhaust pipe cut-off are shown.
Results of measurements of sound pressure level for "Largus Cross" car in acceleration regime at the speed 50 km/h in the second gear at the distance 7,5 meters from a passing car are showing that maximal is sound pressure level at the frequency 125 Hz, which is corresponding to the main engine operation frequency.

6. Conclusions

Russian methods and approaches to experimental research of automobile transport noise were considered. Some approaches to mathematical modeling of automobile transport noise were also described.
The task of experimental research of automobile transport noise characteristic may be subdivided in two main approaches: experimental research of automobile transport flows noise and experimental research of separate automobiles noise characteristic. Results of experimental research of automobile transport noise using both approaches are submitted.
Automobile transport noise levels on the living territory of the Avtozavodsky, Central and Komsomolsky districts of Togliatti city was measured near to the city streets with intensive transport movement. In total over 500 points have been investigated. Results of measurements in many points are showing significant exceeding of permissible sanitary values.
Noise characteristic of different cars were also investigated. Results of measurements of sound pressure level for "Largus Cross" car in acceleration regime at the speed 50 km/h in the second gear at the distance 7,5 meters from a passing car are showing that maximal is sound pressure level at the frequency 125 Hz, which is corresponding to the main engine operation frequency.
Thus, in order to reduce efficiently automobile transport noise, it is necessary to attenuate both automobile transport flows noise and separate automobiles noise, especially in low frequency range. The main reason of generation of noise at the main engine operation frequency are low frequency gas pressure oscillations (pulsations).

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MUSME, Museum of the History of Medicine, Padua (Italy). A tool for the dissemination of medical-scientific culture

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Abstract
The article addresses the controversial issue of scientific dissemination through the events of MUSME, the Museum of the History of Medicine which was inaugurated in Padua in June 2015. The museum was set up in the building complex that from the first half of the 15th century to the end of the 18th was the home of the hospital of San Francesco. Built for a specific function, the complex was located in the city centre, in the street dedicated to Santa Margherita, today via San Francesco. Its origin is closely connected to the memory of the important research work that has taken place over the years in the medical field and derive from the presence of Padua university in the city, the only one that over the centuries the Serenissima Republic of Venice wanted in its domains, encouraging its activity. The decision to locate the museum in the complex that was home to the hospital of San Francesco was particularly significant given that this ancient medical structure was most likely the first place there was clinical training, namely where pathologies were studied and taught by professors to students on the body of the sick rather than on a theoretical basis.
The purpose of the article is to reach an assessment, albeit provisional, regarding the impact of the new museum on the city community and on visiting tourists at the end of this first period that the museum has been open, naturally taking into account the health emergency of last year.

Keywords: Padua, MUSME, Museum of the History of Medicine, history of health.

1. Introduction
The MUSME, Museum of the History of Medicine, in the city of Padua was built in the building complex that for centuries had housed the city hospital of San Francesco on the initiative of the University of Padua and other institutions, completing the renovation works and fitting out over more than a decade (2001-2013).
The monumental complex was built from the beginning of the XV century on the initiative of Baldo Bonafari of Piombino, who had been an adviser to Francesco Novello of Carrara for some time and then well integrated into the new Venetian administration, and of his wife Sibilia Cetto. These people supported the financial burden of the project, directly at first and then through the commissary of wills until completion at the end of the century. Baldo Bonafari and Sibilia Cetto were authorised to build the hospital by the bishop of the city Marcello and the doge Michele Steno. Near the hospital there were also the lodgings of the Observant Friars, the original part of the future monastery. The presence of Observant Friars was necessary to provide spiritual assistance to the sick.
When work started, there were already *hospitals* in Padua, but they were mostly structures for the poor, travellers and the infirm, where the spirit of charity prevailed. The construction of the San Francesco hospital, instead, was part of a time of a great building renewal of Italian hospitals: these were the years when other important similar structures were built, such as the Maggiore hospital in Milan and the Innocenti in Florence.
The ancient Paduan hospital complex had completely original characteristics, combining medical-health aspects with characteristics of the architecture of a monastery (Fig. 1), including the presence of the church with the cloisters for the friars, built as the final part of the complex.

2. Historical events of the ancient hospital of San Francesco

The hospital occupied a consistent part of the block defined to the north by via S. Francesco, to the west by via del Santo, and to the south by what was then Contrada dei Vignali and is now via Galileo Galilei (Fig. 2). It was designed and built on the basis of specific use from the beginning, and so was not an adaptation of pre-existing buildings. The construction of the adjoining church, with a convent attached, was started a little later. The archived documentation provides a good deal of information on the start of the building work. According to a record made by Bartholomew of Astorellis, archpriest of the Cathedral, the first stone was laid on the 25 October 1414 while contracts for the supply of worked stone were signed on the 6 August and 23 November (50 columns including bases and capitals according to the specified heights and thicknesses, and other items) and wood for the floors and rooves (210 beams about 12 metres long). As Giulio Bresciani Alvarez wrote, “from the substance of those documents it is certain that work on the actual project was already underway in regards to the shape and size of various small construction jobs and the quantity and quality of the materials" [1].

The building site developed the large quadrangular courtyard which was articulated in a double row, with porticoes and loggias, demolished at the end of the nineteenth century, placed on octagonal brick columns. The female ward for hospital stays was completed in 1429, and initially occupied a two-storey wing with the upper rooms equipped with skylights so that the rooms would be well illuminated. The male ward should already have been completed. The building of the church proceeded in the meantime, with the construction of the church and hospital porticoes running along Via S. Francesco, porticoes still present today. A document from the XVI century [2] refers to health personnel being active in the building. There was a medical physician to visit all of the ill at home, both men and women, a surgeon to apply ointments on all of the poor workers, a barber who had to blood let both men and women and be as good a surgeon as he could, a herb or special garden for a pharmacy, and all other things pertinent to it in addition to an unspecified number of male and female nurses.

The hospital of S. Francesco is distinguished by being the first clinical teaching centre (Fig. 3). In 1543, the year in which Andreas van Wesel (Andrea Vesalio, 1514-1564), a professor of surgery at the University of Padua, published the *De humani corporis fabrica* [3] (Fig. 4), Giovan Battista da Monte (1498-1551), who taught ordinary practical medicine and then ordinary theoretical medicine, started by taking his students on to the hospital wards, instructing them about the illnesses being treated.

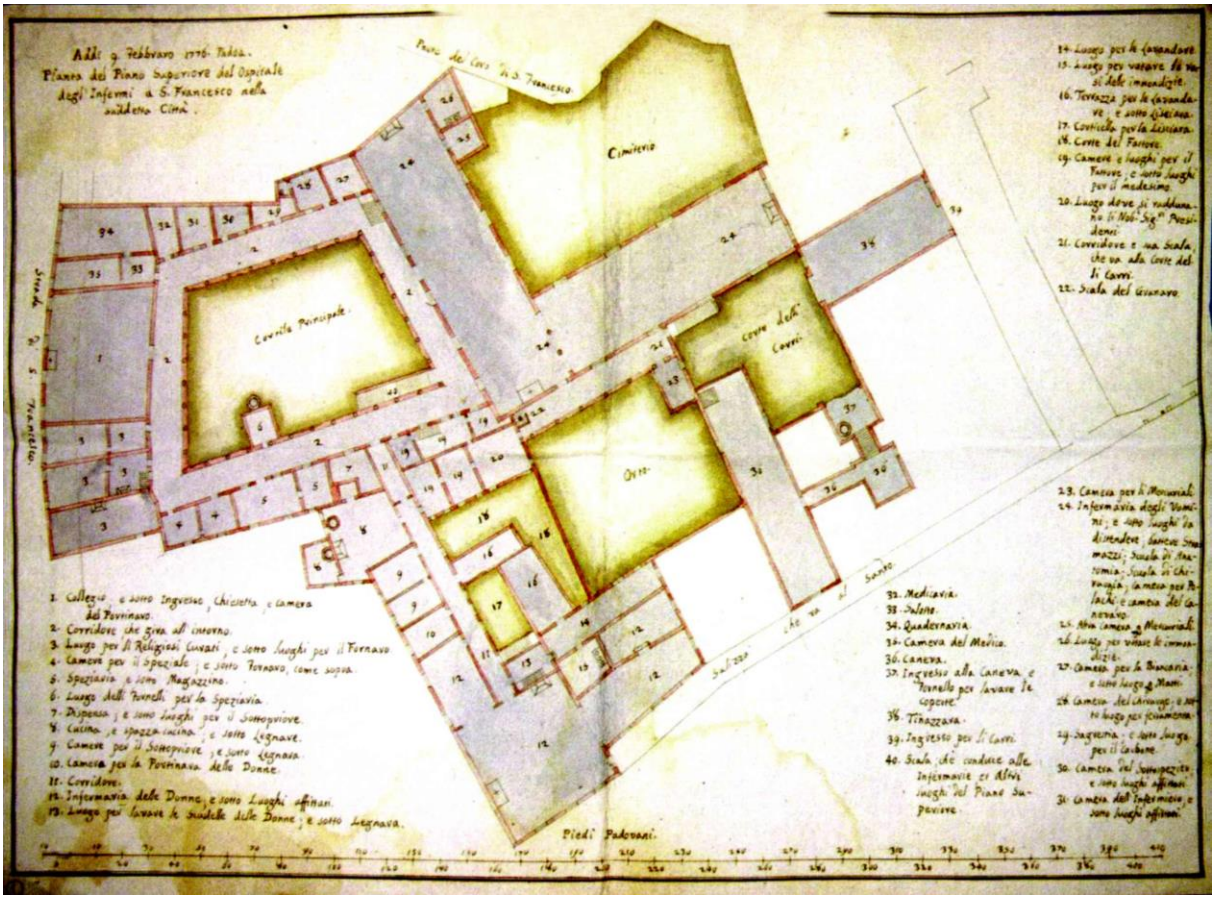

Fig. 1: Domenico Cerato or his school, plan of the upper floor of the ancient hospital of San Francesco in Padua, 1776. Archivio di Stato di Padova, Archivi Privati Diversi, Brunelli Bonetti, b.46.



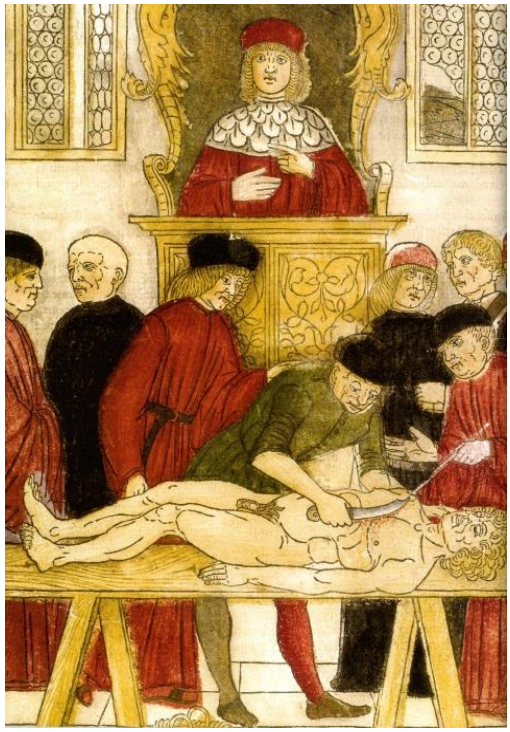

Fig. 2: Map of Padua by Giovanni Valle (1781-1784). The position of the ancient hospital of San Francesco is indicated in the city drawn from the Venetian walls. The university premises are located a short distance away, within the circle of the medieval walls.
Fig. 3: *The Anatomy Lesson*, representation taken from the volume *Fasciculo de Medicina*, possibly by Johannes de Ketham, 1494.

We also know that Albertino Bottoni, from 1576 holder of the first chair of extraordinary practical medicine, conducted clinical activity in the winter of 1577 by leading German students, once the lesson had finished, to the hospital of San Francesco where, together with the excellent Marco degli Oddi – doctor at the very same hospital and holder of the first chair of extraordinary theoretical medicine – examined many patients afflicted by various illnesses. He showed to students precisely how to apply those doctrines that were the subject of his public lessons in practice, exercising his listeners in everything he observed and practiced for their illnesses" [4]. In this regard, the dispute that arose between doctors and professors between the sixteenth and seventeenth centuries regarding the use of corpses for research and teaching purposes, was by no means trivial, as Virgilio Giormani explained at length in one of his essays. Among other things, "there were fewer executions, because since 1545 the lack of oarsmen in the Venetian galleys ensured that sending prisoners to the galley soon imposed itself on other types of sentences" [5]. In the final analysis, the corpses of the poor, who died in the hospital of San Francesco, were extremely valuable, although the practice generated a certain apprehension among the patients.
It would have to wait until 1619 for a university teaching to specify the obligation to visit the sick in the hospital of San Francesco. Moreover, it was in 1764 that the university presence within the hospital walls was officially recognised with the establishment of the medical clinic and the surgical clinic.
The design of the building was not the work of a famous architect. The monumental part, with high arcades and a large door, overlooked the current via San Francesco, where the main entrance was. Here, there was a large double-height room, overlooking the street and the main courtyard, where the Board of Directors most probably met. Four huge windows opened onto via San Francesco (Fig. 5), traces of which remained in the masonry even after the room, once the activity was closed, was divided by an intermediate floor and the openings were transformed into regular windows that illuminated the two new floors. In the restoration project, it was decided to mark the position and size of the ancient openings on the façade by treating the plaster of the affected wall portions with its own colouring.
One of the major problems deriving from the central position in the urban setting of the area chosen by the founders, in the immediate proximity to the circle of the medieval walls, was the impossibility of enlarging the site following the growing needs that were emerging over time. The hospital, however, was able to operate for three and a half centuries, and it was quite important for the progress of medical science and the development of the clinical method of teaching, that its location was very close to that of the historic home of the university, located just inside the walls, beyond the course of the Naviglio Interno that the walls defended.





Fig. 4: Illustration from the set of books on human anatomy written by Andrea Vesalio *Humani corporis fabrica* (1543). *Human Muscle Figure* is the title.
Fig. 5: Façade of the museum on via San Francesco, with the entrance, after the restoration. The backgrounds marked in black correspond to the giant windows of the double-height room that was once present in the ancient hospital (Photo by Andrea Avezzù).

3. The San Francesco building complex after the hospital was moved to its new site

The hospital of S. Francesco stopped being a hospital in 1798 when the new hospital planned by Domenico Cerato (1715-1792) came into operation near the Venetian wall. Cerato was a professor of practical architecture at the University of Padua. He designed a modern Enlightenment-inspired hospital not far from via San Francesco, larger and more modern in concept. He was also the author, in the same years, of the design of the large urban space in the city called Prato della Valle, for which Cerato drew his inspiration from Andrea Memmo, who arrived in Padua with the post of extraordinary Superintendent in 1775.
The S. Francesco complex was used by the military from the start of the nineteenth century and consequently lost several of its buildings. When it was acquired by the Province of Padua in 1960, it was composed of the building on via S. Francesco with the two wings that started along the side of the internal courtyard, partially occupied by later additions. Among the more substantial modifications compared to the original conditions, the complete demolition of the two-way porticoes of the cloister which radically distorted the distribution and the subdivision into two levels of the large room placed between via S. Francesco and the internal façade by inserting a new floor. The subdivision caused the reordering of the fixings in the façade overlooking the road (Fig. 6) where to strengthen the building, the portico columns were covered in masonry.
The initiative of the Regione Veneto, Province and Commune of Padua, Hospital Trust, ULSS 16 (Unit of the Local Health and Social Security Services), and the University of Padua aimed at transforming the remaining part of the old hospital into a centre for public archives housing the history of healthcare, and was finalised in a preliminary plan drawn up by the architect Camillo Bianchi, professor of Architecture and Urban Composition at the University of Padua. The history of Padua and that of healthcare have always been closely interwoven as testified to by the great fifteenth century Paduan work, marking the evolution of medical science, as well as the Botanical Garden, named *Orto dei Semplici*, and the anatomical Theatre.
The public documentation centre was designed to catalogue and safeguard the relevant scientific heritage - books, instruments, furniture and fittings – preserved in various public, private, and university buildings. There was, in this introductory project, a museum space in the old hospital as well as a space for temporary exhibitions, a library with an archive, consultations rooms, a two-hundred seat lecture theatre, small study rooms, and a teaching laboratory in addition to a sector for cataloguing and reproducing images. The repair and restoration of the items characterising the history of the S. Francesco hospital complex constituted one of the main aims of the restoration project.

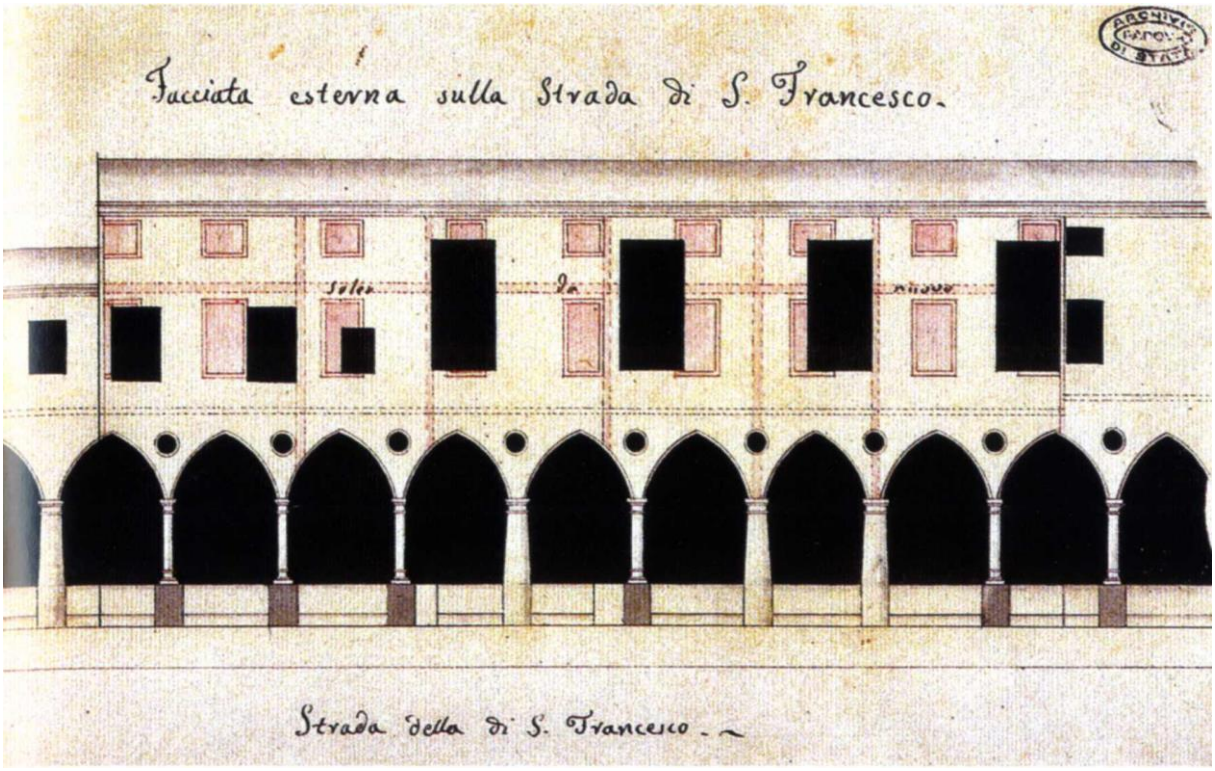

Fig. 6: Giovanni Antonio Businari, façade on via San Francesco, 1817. State Archives of Padua, hospital of San Francesco Grande, b. 1295. The drawing shows the four large windows that illuminated the double-height hall before it was divided into two parts by an intermediate floor.

4. Notes on the restoration and fitting out of the museum

When the restoration project was developed, what was left of the historic complex, mainly the part on via San Francesco, occupied an area corresponding to about a quarter of that on which the hospital stood at the time of its maximum development. The initial arrangement of the spaces was distorted from a typological point of view, since the portico of the main courtyard and the loggia above, which provided access to the rooms on the first floor, had been demolished. New internal stairways had been inserted, and as already noted, the high-rise main hall overlooking via San Francesco was divided into two floors. Other substantial changes were made in 1881, with the demolition of the last arch of the portico on the street at the west end, on the right looking at the façade. Furthermore, in 1909 the long front of the shops under the portico was reorganised and numerous internal changes were made within the various units for residential and commercial use. Finally, two industrial warehouses were built inside the main courtyard that occupied a large part of it, one in the early twentieth century and the other in 1953 [6]. The province of Padua, after purchasing the property in 1959, used only the courtyard, as a parking lot, until the restoration work began in 2001.

The restoration, reorganising the spaces for museum purposes, addressed, among other things, the two main themes, the demolished portico and loggia and the hall divided into two levels. In the first case, the solution studied in the design phase involved a new steel structure, which was only possible to build in the lower order, as a new portico. The hall was restored to its original volume.

The outfitting, designed as a cross between a traditional collection of artefacts and a modern science centre, proposed an exhibition itinerary that interests users of different ages, but in particular younger visitors. In addition to being a museum of medicine, for exploring the theme of the human body and medical sciences, it is also a history museum that tells the story of the development of medicine from an ancient discipline to a modern science, with the focus on the contribution provided by the Paduan medical school.

It is an exhibition that develops history and technology and directly involves the visitors. Many ancient artefacts have been provided by the University of Padua, by the Civic Museums, by the Hospital and by ULSS 16, now ULSS 6 Euganea. There are numerous devices that visitors can interact with, videos and multimedia games designed to illustrate the finds and clarify the themes covered. The rooms contain medical instruments and human remains. Ancient books, normally inaccessible to the public, can be browsed here in a virtual way. Games with different levels of difficulty teach the anatomy of the human body and some stations, with explanatory animated drawings, allow you to measure blood pressure and other physiological parameters for educational purposes [7].





Fig. 7: Interactive experiences in the Museum of the History of Medicine in Padua, designed for young people.
Fig. 8: View of a human figure measuring 8 metres in length located in the hall on the first floor where the double height has been restored, and which is the subject of three-dimensional projections that show the functioning of the human body. The exhibition intends to reinterpret the first anatomical theatre of modern medicine, inaugurated in 1595 in the nearby historic site within the University of Padua.

5. About the first years of the museum's activity

MUSME was inaugurated on 5 June 2015. In the first three years it had a total of about 50,000 visitors each year, a growing number with more and more people coming from outside the region. According to TripAdvisor, the American review website that includes evaluations of tourist and cultural sites, the Museo di Storia della Medicina is ranked third in terms of visitor numbers in Padua, after the Scrovegni Chapel with Giotto's frescoes and the religious-artistic centre of the Basilica of Sant'Antonio [8]. The budget was close to being balanced when the health emergency caused by Covid19 interrupted the development of the project, which positions the museum as a tool to promote and spread understanding of medicine.

In addition to being a museum in the traditional sense of the term, i.e. an exhibition of objects of great historical value, MUSME is an interactive centre enhanced by significant use of cutting-edge technologies, ranging from augmented reality to touchscreens (Fig. 7). One particularly effective example is the virtual anatomical theatre, inspired by a the sixteenth century original preserved in the nearby central building of the university [9], Here, three-dimensional mapped projections can be performed on a 8-metre long human figure that tells the story of the development of anatomy and the functioning of the human body as we know it today (Fig. 8).

A strong component of play is essential in making the museum attractive for young people. More than 700 schoolchildren visited the MUSME museum each year, and teachers report that when the students were back in the classroom after the visit they paid much more attention to anatomy lessons than before. The intertwining of play and education definitely facilitates young people's familiarisation with medical issues. Indeed, the value of MUSME lies above all in the fact that it is a museum that is also suitable for non-specialists, where an attempt is made to spread its message widely among a varied public while still maintaining a scientific rigour thanks to the advice of authoritative doctors.

In the spring of 2020, the health emergency almost caused the permanent closure of the museum as there was no revenue from ticket sales to cover management of the museum and employee pay. As training and conference activities ceased, another important source of revenue was also lost. At the time the outlook was very uncertain. Backed by extraordinary economic support, MUSME reopened in May of this year, initially on Saturdays and Sundays by appointment, counting on a new post-pandemic stabilisation.

6. Conclusion

Medical museums — which also include displays on hygiene and preventive care — have a history dating back centuries, effectively reflecting the political and socio-cultural orientations of the time. In this sense, a key example is provided by the DHMD, Deutsches Hygiene-Museum, built in Dresden in 1912

on the occasion of a hygiene exhibition on the initiative of the entrepreneur August Lingner [10]. The exhibition was a huge success, with visitor numbers reaching five million. The anatomical and scientific collection illustrating the human body and medical advances formed the central nucleus of a full museum, which was specially conceived and built in 1930 by the architect Wilhelm Kreis in pure Neues Bauen shapes. The rise of National Socialism transformed the initial intent of promoting construction and social sanitation practices into a powerful propaganda mechanism for the Rassetheorie. Having been restored and redesigned in 1992 according to modern exhibition concepts, it is currently aimed at a vast and varied public, combining science, culture, art and social evolution with the use of the most up-to-date means of multimedia communication.
In Italy, the history of science museums goes hand in hand with the establishment and development of university teaching collections. Scientific and medical museums have rarely captured the interest or gained the favour of the wider public, with little desire to promote elitist themes at a cultural and institutional level, these being perceived as unseemly and socially delicate. In Turin, the Luigi Rolando museum collection of human anatomy originated in 1739 as an anatomical museum in the Regia Università (Royal University); in 1898, after various transfers, the anatomy collections were rearranged in their current location, the Palazzo degli Istituti Anatomici (Building of the Anatomical Institutes), in specially constructed monumental rooms [11]. The display did not undergo significant alterations during the twentieth century and today it constitutes an exceptional example of a nineteenth-century scientific museum that has remained practically unchanged. The display cases are full of specimens and almost devoid of explanatory texts, as was usual in nineteenth-century museums, yet they constitute a objective obstacle to the promotion of medical culture among a non-specialist public. To remedy this issue, visitors can only consult three video stations positioned along the route, supported by a paper guide and a *brochure*. The permanent exhibition, which is part of the regional system of natural science museums, features display cases containing wax, wood and papier-mâché models and dry- and fluid-preserved anatomical specimens. These categories of objects correspond to two distinct phases of anatomical museology, the "artificial" anatomy practised between the end of the eighteenth century and the first half of the nineteenth century and "natural" anatomy, which was established later.
The limits of this museum concept can be measured by the success otherwise enjoyed by the MAcA museum, Museo A come Ambiente (Environmental Museum), the first European museum entirely dedicated to environmental issues, conceived and built in 2004 on the basis of a design by Agostino Magnaghi with a layout by Carlo Degiacomi at the Pirelli former industrial centre [12]. Since its inauguration, the institute has achieved extraordinary popularity with young audiences, ranking first place in terms of visitor number among Turin's scientific museums. The museum experience is based on experimentation with a strong element of play, and is supported by a team of entertainers specialised in scientific communication aimed at school and preschool age groups. This model has now been tested to great effect in the well-known MUSE, Museo delle Scienze di Trento (Trento Science Museum), designed by Renzo Piano [13].
The exhibition of anatomical models within the 14 scientific museum sections that make up the SMA, Sistema Museale di Ateneo dell'Università di Bologna (University of Bologna Museum System) in the historic site of Palazzo Poggi is no different from the example in Turin. Established in 1907 and reopened in 2013 with updated exhibition concepts, it includes an exquisite eighteenth-century collection of anatomical wax models made for medical and surgical clinics [14]. In the example from Bologna, thanks in part to its strategic location in the heart of the university city, the positive balance achieved in the pre-Covid period highlighted a positive trend in visitor figures. Unfortunately, this stopped in the pandemic, during which time, in keeping with the general situation, the museum's activities faced considerable difficulty and were exclusively supported by virtual and remote exhibitions and educational initiatives. Due to necessary restructuring works, the partial relaunch scheduled for June 2021 will involve only some museum collections and will not include the sectors related to medicine and anatomy.
At the moment in which the Covid 19 health emergency seems to be surmountable, the main aim of the Museum of the History of Medicine of the city of Padua is again to combine history and current events. Contemporising history and the enhancement of tradition are the tools that will play the greatest role in the success of the museum.

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Fortified complexes in Puglia: macroelements structural analysis and consolidation proposals for the restoration of the Ginosa Castle

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Abstract
The case study of an ancient vital structure, like the castle of Ginosa is capable of contributing a unique importance to the cultural heritage, not only because of the historical rule of the castle during the old centuries, but also as a monument that has lost many aspects through the time due to the natural risks and the unaware human interventions. The abandonment as well as the lack of maintenance have played a fundamental role in the progressive deterioration of the fortified complex. Thus, this case represents an opportunity to shed light on the meaning and causes of the restoration of forgotten architecture.
The growing interest in saving the abandoned architecture results in improving the operational skills related to the safeguarding of historic buildings, typological characteristics, formal and constructive values, which give the architectural organism its unrepeatable individuality.
This article deals with the structural problems that involve the Castle of Ginosa. The activity has been conducted through an initial cognitive phase based on a detailed survey of the crack pattern and the characteristics of the materials; subsequently the structural behavior of the building has been assessed by an analysis with macro elements and the probable local collapse mechanisms. Only after this in-depth analysis it was possible to carry out checks on the elements and evaluate possible consolidation interventions.

Keywords: Fortified masonry structures, crack patterns, collapse mechanisms, consolidation interventions.

1. Introduction

The castle of Ginosa or "the Normand Castle", is the most important landmarks of the town of Ginosa (near Taranto, Southern Italy). It was built at the end of the 11th century by Robert Guiscard who became the duke of Puglia, Calabria and Sicily for long time during that period. The castle has been raised on the most strategic position entirely surrounded by the valleys protecting the town from any threat. Nowadays, the castle gives the impression of a palace rather than a castle, mainly as a result of the construction modifications during the 16th century when the castle became the baronial seat of the Doria family (e.g., removing the crenellated towers and the drawbridge).
The castle was built on a krast-nature land, which was, as many as other historical buildings in Italy, always threatened by the geological and hydrological instability due to the high potentiality of landslides which could develop in the location. As a consequence, this led to the partial evacuation of the inhabitants of the surrounding areas as an inevitable result of the lack of daily use and the constant maintenance. Furthermore, the castle was subject to different manipulations during the 20th century ended up by the fragmentation into various residential units which contributed to jeopardizing the distribution of the rooms, the statics and, ultimately, the state of general conservation. The critical point is that the building was not only compromised but also has lost essential part of its identity and cultural meaning. Deep knowledge, then, becomes a fundamental and urgent requirement, for the purposes of

a reliable assessment of the fortified complex [1], and for a correct choice of the intervention that could respect the consecutive historical stratifications [2].



Fig.1: Ginosa Castle. South view (from [3]).

The perception of a fortified architecture in its external appearance is almost absent; only the presence of the four-arched bridge and the slight escarpment remind to a fortified building.
The building material consists of local tuff of calcareous origin that we find in the historic buildings of the town. This material is similar to the famous *leccese* tuff but more compact and with a more reddish color.
The architectural complex is divided into two main volumes, distinct from the height and accessible from two staircases. The two volumes were formerly connected by a narrow flight of stairs with a rampant barrel vault created in the wall thickness, now partially buffered. The Normand tower continues its development in height with an additional level, reachable by a staircase also obtained in the wall thickness and now accessible from an external balcony. The top floor of the tower then gives access to the large terrace overlooking the southeastern slope of the ravine.
The main facade of the castle and the north-west elevation overlooking Matrice road (Fig. 2), mostly show the elements of a fortified architecture.
The north-east elevation dominates the view from the plateau (Fig. 3), while the south-eastern elevation, on the other hand, is the least known to the inhabitants, showing itself in its entirety only from the opposite side of the ravine (Fig. 4).

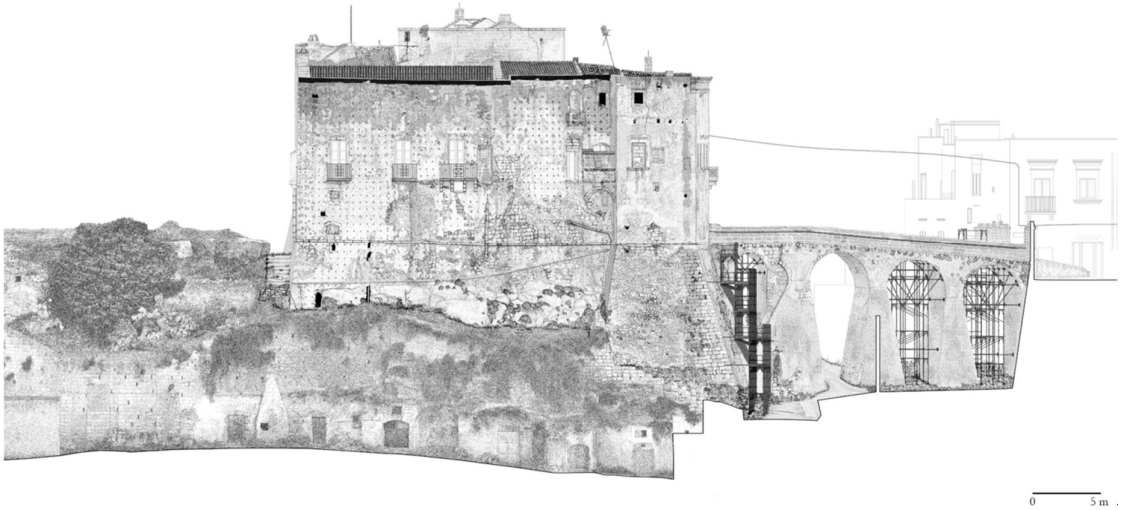

Fig.2: North-West view of the Ginosa Castle (relief and graphic rendering from [4]).

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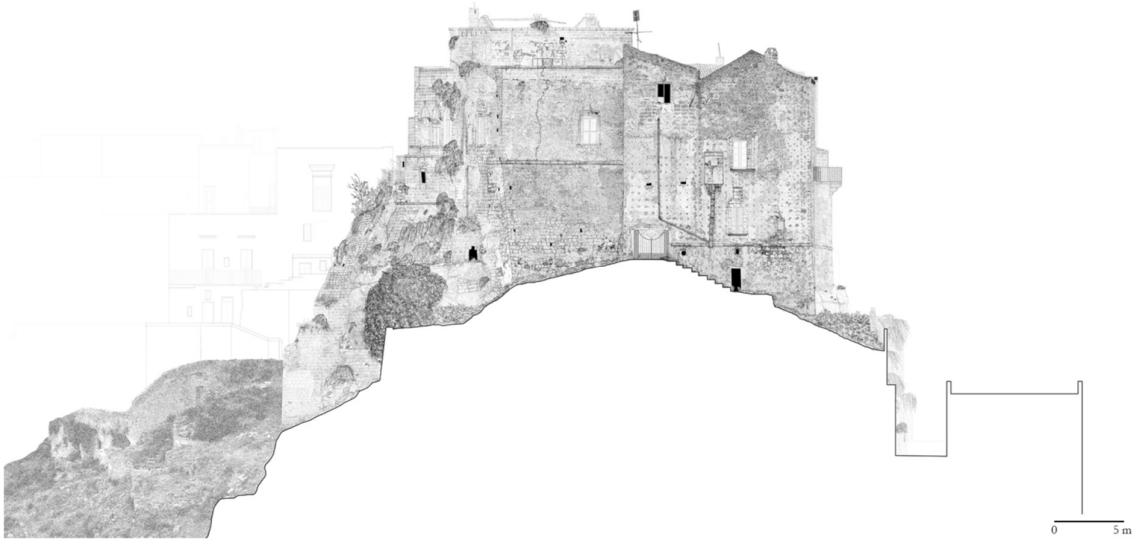

Fig.3: North-East view of the Ginosa Castle (relief and graphic rendering from [4]).

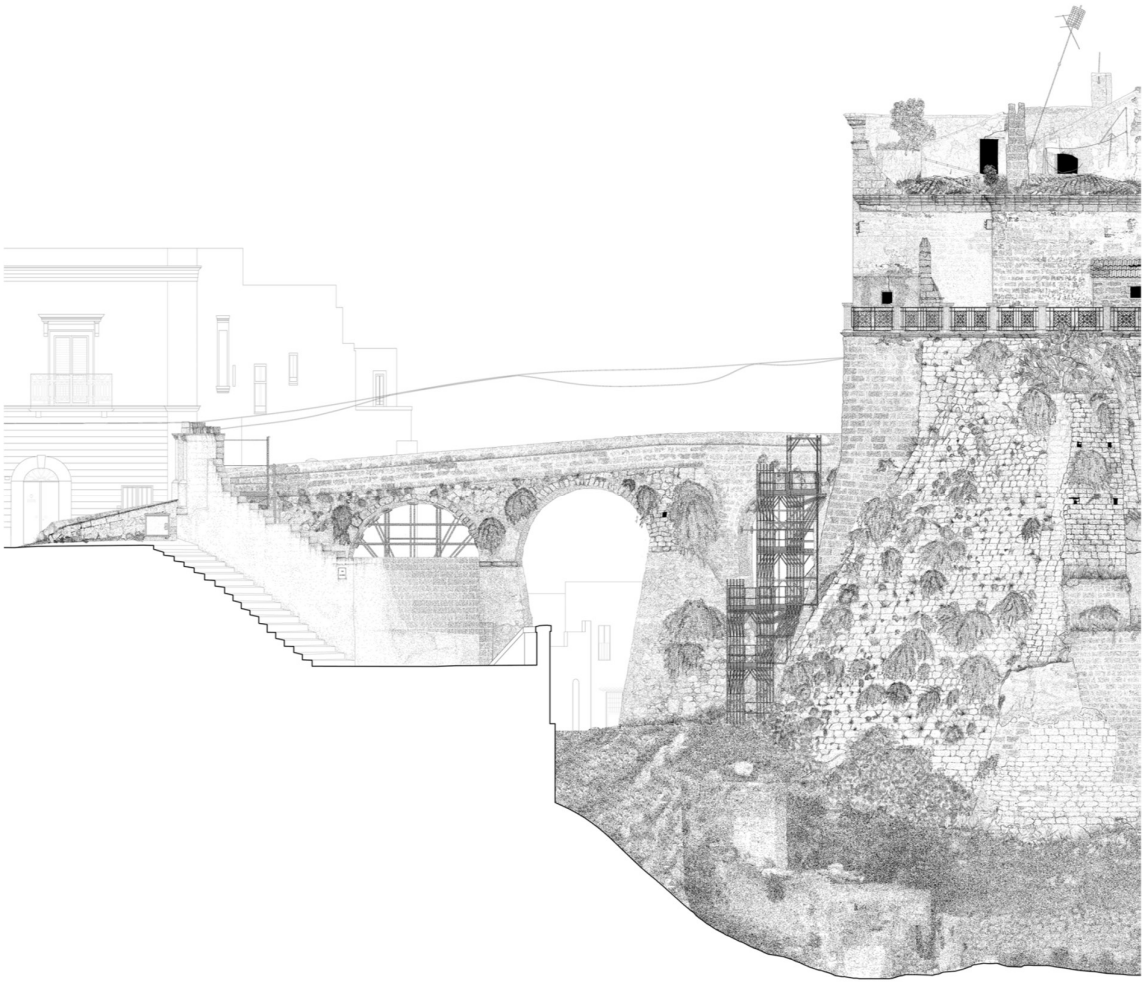

Fig.4: South-East view of the Ginosa Castle (relief and graphic rendering from [4]).

The present paper deals with the structural problems that involve the Castle of Ginosa [4] starting from an initial cognitive phase based on a detailed survey of the crack pattern and the characteristics of the

materials, followed by the study of the structural behavior of the building by means of a macro-element analysis and the probable local collapse mechanisms. Only after this detailed analysis it had been possible to evaluate possible consolidation interventions.

2. Survey of the crack pattern

From a structural point of view, the structures of the Ginosa Castle are made up of wall faces connected to each other and to the relative horizontal structures represented by vaulted roofs at the first levels and by horizontal wooden structures at the roof level. All the elements are sized in such a way as to fulfill the structural tasks entrusted to them.
To this end, the quality of the materials, the effective connection of the masonry walls, the adequate presence of foundation structures capable of withstanding the load conditions to which they are subject, the presence of an internal tension regime compatible with the resistance capabilities of the materials, represent the positive conditions that characterize the Castle.
At the same time, there are significant situations of extreme vulnerability that undermine the structural safety of the entire organism. In fact, after a careful thorough visual inspection of the structures of the entire castle, numerous defectological phenomena were found that tend to weaken the resistance of the material, thus making the conditions of the built and handed down artefacts precarious. Among these phenomena we recognize the age, the thermal and hygrometric variations, capable of determining even considerable continuity solutions, the poor mechanical quality of the foundation substrate aggravated by anthropogenic activity linked to the creation of environments literally excavated in the foundation rock.
All these vulnerabilities have inexorably led to have a series of cracks and instabilities that mainly undermine the connection between the vertical walls and the related horizontal structures, inevitably leading to a bad and unbalanced structural behavior of the entire building system.
The static instability starts from the characteristics of the cracks and follows an intuitive procedure, based on direct observation having firmly established the principles of construction mechanics, which investigates the qualitative nature of the phenomena, ascertained, which it is therefore possible to formulate reliable hypotheses on the causes and establish the related remedies. Fig. 5 shows a survey example of a failure.



Fig.5: Representation of the survey of a rather significant crack pattern (analysis and graphic ri-elaboration from [4]).

The analysis of crack patterns leads to the evaluation of localized phenomena that, under particular conditions analyzed below, can degenerate to collapse mechanisms. The study of all possible kinematic phenomena leads to the necessary global approach on the entire building organism. Specifically, construction resumes without depreciation are highlighted, subject, under stress, to horizontal and/or vertical deformations; scarce wall connections that allow the sliding between the different wall portions; construction resumptions due to enlargement and elevation interventions, which determine points of

construction discontinuity, constituting the preferential track for the formation of hinges or sliding surfaces.

3. Collapse mechanisms

Starting from the survey of the crack pattern, the analysis of the state-of-the-art now proceeds through the identification of the static instability that originated it. The first aspect of this analysis concerns the recognition of the conditions that could activate local collapse mechanisms. In this case a mechanism is defined as the kinematic representation model with which the earthquake behavior of a unitary structural part (macro-element) and the consequent damage is interpreted. It is entrusted with both the role of dynamic-mechanical interpretation of the damage that has occurred and of predicting further damage. In fact, the future behavior can be hypothesized as a progression of the mechanism, whether it is already activated or not, and the damage associated with this progression. In this regard, the types of collapse mechanisms escribed in the following have been identified [5].
The simple overturning of an entire wall portion favored by pushing roofs that generate off-plane actions that the masonry is unable to cope with. This phenomenon is accompanied by the dragging of parts of the masonry structures belonging to the transverse walls. The pushing action of the vaults therefore contributes to generating this rotation mechanism, made evident by the presence of continuous cracks in the keystone on the barrel vault that propagate in the adjacent pavilion vaults. The mechanism is also favored by the absence of a constraint at the top and by an effective lateral connection with the orthogonal walls which triggers the dragging. The activation occurs through diagonal cracks on the bracing wall and out-of-plane of the overturning wall.
A further mechanism is that of vertical bending, which involves the body of the north-eastern stairwell for its entire height (Fig. 6).



Fig.6: 3D view of the collapse mechanism for vertical bending (analysis and graphic ri-elaboration from [4]).

This situation is shown by the presence of a horizontal cylindrical hinge, which divides the affected wall into two blocks which rotate reciprocally around this axis. Furthermore, this vulnerability is guaranteed by particular constraint conditions, represented by a lack of connection to the orthogonal walls and, above all, by an effective retention at the head of the wall. From a morphological point of view, the presence of horizontal and vertical cracks on the orthogonal walls and the bulging of the involved wall are the symptoms of the activation of this mechanism.
The Norman tower is also affected by an ongoing instability; the wall structures are in fact affected by a simple overturning, activated by the thrusting and incorrectly balanced force of the horizontal vaulted structures. The mechanism manifests itself through the rigid rotation of the entire monolithic walls with respect to horizontal cylindrical hinges placed at the base that run through the masonry structures stressed by out-of-plane actions. The absence of a constraint at the top due to the collapse of the roof structure represents a favorable condition for the activation of the mechanism, as evidenced by important out-of-plane of the overturning walls and vertical cracks at the wall intersections.

4. Verification of local collapse mechanisms

After the analyzes on the state of conservation of the monument, we now proceed with a preliminary study of the structural consolidation interventions that are necessary to cope with the planned instability mechanisms.
This is divided into a pre-intervention and a post-intervention analysis, in order to highlight the structural behavior of the entire masonry body before and after the planned operations.
In existing masonry buildings subject to seismic actions, local mechanisms and overall mechanisms may occur. For the seismic analysis of local mechanisms, the methods of limit balance analysis [6, 7] are generally used. This type of analysis is based on the two-dimensional modeling of rigid blocks subject to seismic action through a horizontal force statically acting on the center of gravity of the macro-element involved in the mechanism [8,9]. For the purposes of modeling, it is necessary to keep in mind that the behavior of historical masonry is strongly influenced by the system of connections, vertical and horizontal, which keep the structural organism together in static and dynamic conditions, as well as by the nature and characteristics of the individual building elements themselves [10, 11, 12].

If the acceleration a_g expected on the ground exceeds the one that activates the mechanism, the macro-element will be subject to overturning.
Basically, the analysis method is divided into the following steps:
1. Transformation of a part of the building into a labile system (kinematic chain), through the identification of rigid bodies, defined by fracture planes conceivable due to the low tensile strength of the masonry, able to rotate or slide together (damage and collapse);
2. Evaluation of the horizontal multiplier of loads α_0 which involves the activation of the mechanism;
3. Determination of the mass M* participating in the kinematics;
4. Calculation of the spectral acceleration of activation of the mechanism at a^*_0;
5. Calculation of the participating mass fraction e*;
6. Safety checks, by checking the compatibility of the movements and/or resistances required by the structure.
For the application of the analysis method it is generally assumed:
- null tensile strength of the masonry;
- absence of sliding between blocks;
- infinite compressive strength of the masonry.
Therefore, leaving aside the elastic deformability and adopting the rigid body model, the motion of the structure is activated when the seismic input reaches an intensity sufficient to generate a kinematic system.
The code, as regards the evaluation of safety and the design of interventions on existing buildings, and, at the same time, the choice of the limit analysis method, obliges the verification of ULS (Ultimate Limit States) at least with respect to the condition of safeguard of human life (SLV), with the possibility of neglecting SLD (Limit States of Damage). As an example, the portions of structures analyzed and the related kinematic schemes are shown in Figs. 7-9.



Fig.7: Plan-view Identification of the mechanism (analysis and graphic ri-elaboration from [4]).

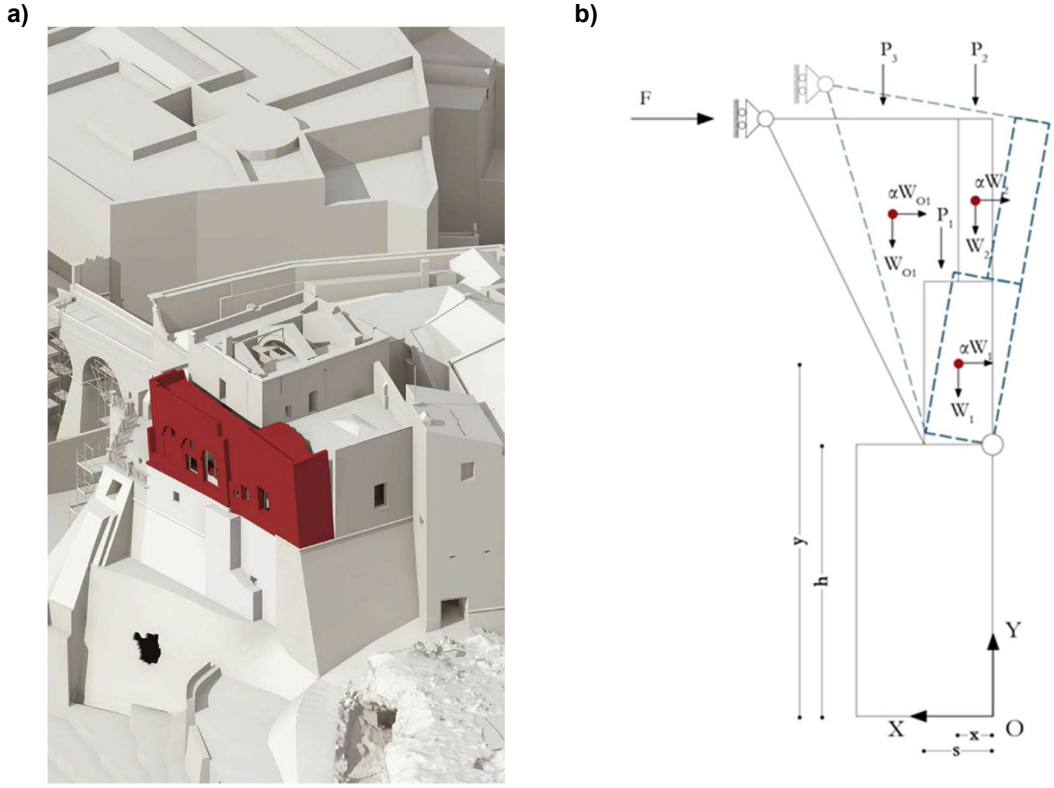

Fig.8: a) 3D representation of the mechanism of compound tipping; b) kinematic scheme of the mechanism in a) (analysis and graphic ri-elaboration from [4]).

5. Structural consolidation interventions

From the results of the analysis and subsequent verifications of the structural problems of the Ginosa Castle characterized by an important deformation framework, it was necessary to face this state of precariousness with interventions aimed at improving the static behavior of the building, guaranteeing a better behavior in the event of an earthquake.

In accordance with the current legislation, the consolidation interventions are aimed at increasing the ductility, i.e. the ability to withstand cycles of stress or deformation, even beyond the plasticization and fracture threshold, and to improve the response of the building to horizontal actions.

Therefore, a structural consolidation project of the building is necessary to combine the conservative aspect of the problem, at the basis of the intervention, and the seismic improvement imposed by the legislation.

The identification of the type of consolidation intervention to be carried out remains consistent with the philosophy of minimum intervention and recognition: in fact, the insertion of tie rods and/or bandages with fiber-reinforced materials is proposed, in order to safeguard the box-like behavior of the masonry and to preserve, at the same time, its aesthetics and usability, after consolidating and improving the masonry affected by serious vulnerabilities and poor mechanical characteristics through injections of binder mixtures (Fig. 10) [13-14], deep styling of the joints and sealing of the cracks with mortar lime base with the best mechanical performance.

The improvement interventions aim to restore the monolithicity of the walls concerned, guaranteeing a greater unity of response to stresses.

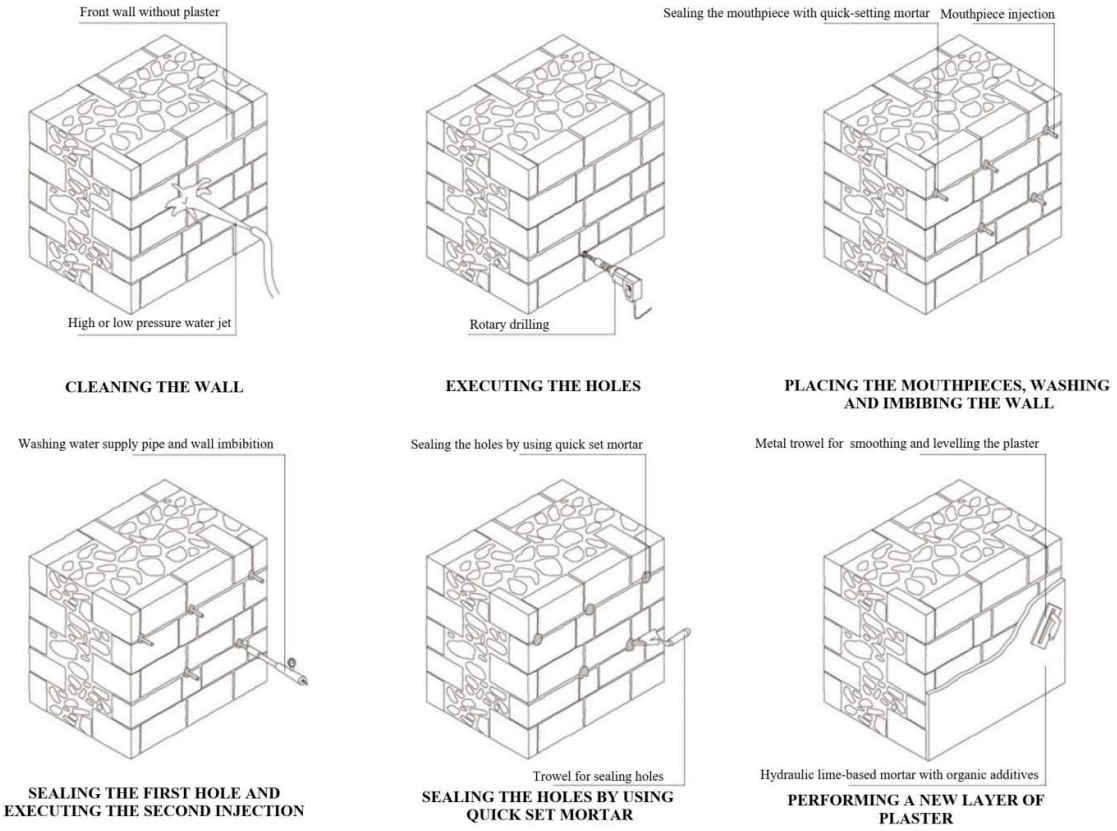

Fig.10: Type of intervention with injections of binder mixtures (graphic ri-elaboration from [4]).

6. Conclusions

This work presents the case study of the castle of Ginosa as an example of the fortified complexes in Puglia region in Southern Italy. Crack patterns, material characteristics have been identified by means of wide survey. Then, structural behavior aspects of the castle have been evaluated by a macro-element analysis and probable local collapse mechanisms. Finally, a structural intervention inspired by the minimum intervention philosophy has been proposed by means of using tie rods and/or bandages with fiber-reinforced materials. The considered solution can protect the structural system and conserve the aesthetic value of the castle, given that the weak parts of the masonry is to be treated to assure having the best possible mechanical performance. This work aims at highlighting the importance of the restoration of forgotten architecture, the possibility of preserving them, then the integration of these historical vital structures with the urban and modern life aspects around.

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The architecture design at different scales: a question of landscape

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Abstract
"From the spoon to the town" is an expression becoming famous after E. N. Rogers' Zurich conference (1946).
Since then, the world has changed, the architect's profession and the ways of teaching architecture have also changed.
Today, futuristic techniques are taught in place of architecture and students are encouraged to design buildings that are beautiful, shiny, fashionable … but no one thinks about man anymore. Everything seems to be subject only to the laws of economy and finance.
Is this contemporaneousness?
We need to combat the progression of these upheavals, seeking to start again from the sense of the architecture design.
Architecture should be able to combine innovative techniques and materials with the values of the locations, history and traditions: this could become a new challenge for those building the landscapes of the third millennium.
Landscapes - and not just buildings - because the locations in which we live are a compendium of houses and spaces, and because the architect's activity should embrace all scales, from the general to the particular.
Perhaps, again, we need to question everything.
We must try, every time, to give an additional definition of landscape, to seek to add something new to our scientific research.

Keywords: Architecture design, scale, landscape, architectural project

1. Introduction

"From the spoon to the town" is an expression, perhaps coined by Hermann Muthesius in 1912, definitely used by Walter Gropius in 1919 as a slogan for Bauhaus, but later becoming famous after Ernesto Nathan Rogers' Zurich conference on 3 November 1946 [1], when he used it to explain the typical approach of the architect who, in his daily activity, must be able to manage simultaneously designs at different scales (of representation and execution).
Since then, the world has changed, the architect's profession has changed, and I believe the ways of teaching architecture have also changed. I think the evolution of the profession has been accompanied by serious attempts - as well as fundamental educational experiences - to consider together the changing of the times and the ways in which to equip design culture for the duties and responsibilities that accompany the passing of the generations. Unfortunately, however, these examples appear to have been forgotten. After their removal, the research and debates faded away and the discussions dried up. Their gradual fading out is now followed by a silence that is deafening due to the concerns that it evokes and the undisputed perspectives that it seems to open up.
Today, futuristic techniques are taught in place of architecture and students are encouraged to design buildings that are beautiful, shiny, fashionable, fantastic, striking, astonishing … but no one thinks about man anymore; architecture celebrated by the media no longer seems to care about the final recipients of the city spaces.

It is a generational issue, perhaps; a reflection of the times, someone said a few years ago. Today, globalisation and the single market reign supreme. Everything seems to be subject to the laws of economy and finance.
In all this, the role of Architecture and of architects has gradually been devalued.
Is this contemporaneousness?.

2. About contemporaneusness

Beyond the sentiments that this can all arouse in us, the conflicting moods that this situation can induce (we may get depressed, shocked or be indifferent), for those who have now formed an opinion on the utility of this contrast of slogans (moreover short-lived) there only remains negation, refusal, as a possible way out.
I mean to say that these facts create a sort of break with the profound sense of the design and the link to territories, to inhabitants, to history, to the city, and to landscape.
The impoverishment of thought, I would say, is slow but inexorable, as is the reduction in the positive charge of the architecture design, as an engine of transformations, in the face of a hypertrophy of samples of materials, high technologies, almost at the exclusive service of the image of the artefact, of the culture of the ephemeral, and of the market.
There is a strong detachment, today, between the physical city and the citizens, between the urbs and the civitas, with clear crises and consequent inadequacy of the models of the contemporary city.
I believe that we cannot remain indifferent to this state of affairs.
So, I think that we need to combat the progression of these upheavals, seeking to start again precisely from the sense of the architecture design, analysing case by case, investigating the requirements and the potential aspects that a certain environment expresses in nuce, revisiting every time all those specific aspects linked to the territory, to its culture, and to its history.
Perhaps what is strange, extravagant, what challenges the laws of physics and nature, what exploits technological innovations to exalt the load-bearing capacities of the materials, going so far as to produce extreme, unlikely and sometimes even ridiculous solutions to simple, ordinary products, is not so contemporary.
In order to appear in the media (and no longer those of the industry, but also mass media) the fashionable architects - by now archistars - produce very beautiful buildings, if you like, but they are almost always clearly detached from their context, uprooted from the specific aspects of the locations, indifferent to the needs of man.
I do not believe, however, that modernity means abandoning traditions, denying the values that characterise the location, forcefully imposing forms and materials entirely extraneous to culture and to collective memory.
Modernity should not even be synonymous with fashion; rather than fitting in with the trends of the moment, I believe that we must adapt to time and to uses. I think that architecture is contemporary when it meets the needs of the certain timeframe in which it is created, the needs of those who commission it, using all the possibilities offered by technique: this does not mean, however, that it should manifest its impertinence at all costs!
Perhaps being able to combine innovative techniques and materials with the values of the locations, history and traditions could become a new challenge for those building the landscapes of the third millennium.

3. A question of landscape

Beyond the sentiments that this can all arouse in us, the conflicting moods that this situation can induce (we may get depressed, shocked or be indifferent), for those who have now formed an opinion on the utility of this contrast of slogans (moreover short-lived) there only remains negation, refusal, as a possible way out.
I talk about landscapes - and not just about buildings - because I believe that the locations in which we live are a compendium of houses and spaces, and because I still think that the architect's activity should embrace all scales, from the general to the particular.
I believe that we should start with a search that originates from what is there, from its history, from the latent signs of the past, even from the small details, to seek adequate responses to the problems, to operate with tones suited to whatever level you are working at, whether it be a construction detail or a master plan: therefore, I believe that we need firstly to have a little silence, to restore calm, to pay attention and to rethink things, to return to the locations, to assess with great dignity even the small signs, often latent, that are just emerging from the landscape, just visible. Then perhaps we need to question everything, to start again, and to re-listen.
We must try, every time, to give an additional definition of landscape, to seek to add something to our scientific research.
To explain more clearly what I mean, I want to introduce another concept.

We are used to thinking about the world in which we live in the three dimensions of space: width, length and height.
We can then consider a fourth dimension: time.
However, I think there is also a fifth dimension [2] of space, of the landscape in which we live: culture.



Fig. 2: The fifth dimension of architecture (photomontage by the author).

The culture of cities, of the landscape. This, in other words, could mean the acquisition of knowledge which we must learn in order to propose a change to the landscape that we inhabit.
Culture of the city, therefore, not so much in the sense that Lewis Mumford [3] talked about it.
As I understand it, the culture of the city is a difficult dimension to measure and quantify but perhaps it is that which most belongs to man, since it is a question of memory, of history, of stratification, and of individual sensations: architectural, topological, topographic, urban, social, etc. - in a word - cultural heritage of a city, it belongs to the people who live there, who inhabit it, to their imaginations.
For this reason, it is a question of landscape.
This landscape is not just the background, or the photography or the portrait, the scene of our daily life, but it is also an entity, an image reworked by the memory of feelings linked to experiences in the locations, which can manifest with different tones.
We can all have a subjective perception of the landscape relating to time, or the incidence of light, or even our moods. In some sense, the landscape forms part of our being, we must inhabit it (and therefore, as architects, we must design it).
In this sense, architecture - not just that with a capital A – does not only have the task of making the world beautiful but, above all, it must help man to inhabit the land, giving him spaces and paths in which to best perform his daily functions: spaces to be lived, spaces to be visited, landscapes to be inhabited.
The concept of landscape, in some sense, belongs to the culture of men, and therefore to the culture of cities. Therefore, to transform the landscape, we need to know it, in all senses. This means, before anything else, knowing its History.
I believe that in the relationship with History there may (or must) also be an explicit, voluntary reference to tradition: as a representation, memory, citation or as melancholy, as nostalgia; sometimes, even with irony, why not?
Tradition, however, does not mean uncritically repeating, unimaginatively copying; on the contrary, it means recognising the permanence of the past to redevelop it critically in contemporary key.
One of the most intriguing and characteristic features of the quality of our Italian, European cities is precisely the stratification of architectures, of matter and space over time, throughout History.
And we must design - this is our mission - to give a response to the question of inhabiting which is there and always will be there: because it is a question inherent to being man on earth.
Every location has its own specific features and every design has its own story.
Every architecture design, by definition, produces a change: the difficulty lies in making this transformation become an improvement to the initial condition of the locations.
An architect's first concern should always be that of not damaging the site: we must always think of the buildings that we design as a way of dialoguing in an interesting, intriguing way with what was pre-existing.

Sometimes modifying the landscape means densifying, building in the interstices that are still free, thickening the wings of the building blocks….
It certainly means paying attention to the real historic and architectural values of the locations but always with the aim of improving the urban and environmental quality, to create widespread quality.
The design of the city, rather, for the city, should always be capable of defining a strategy, proposing new aspects and implementing the urban system by involving all local players and all necessary skills.
Today, we need to know intricately the differences that constitute our knowledge, and to gather the question of inhabiting that emerges, to give a responsible, authentic, mediated, and therefore scientific response.
To give such a response, we need to bring to the field our knowledge, albeit limited, even that gained outside our disciplines, but, also and above all, that consolidated in the practices, often arduous, of everyone's life.
The design attitude to which I referred previously is not exclusive to Architecture: it is multidisciplinary; it is a behaviour that Architecture and Urban Planning share with Geography and History, interpreting, far from the objectifying paradigms of the description, the data, the document. It also involves Technologies, Structural and Energy Sciences, Environmental Engineering, ICT.
I certainly do not want to claim the abandonment of that element of architecture that has been built in history, which indeed remains visible as the basis of our actions, but I believe, on the other hand, that we need to assume these differences from the perspective - rich and fundamental - that the question of inhabiting poses to us.
We must, therefore, also open the languages of our disciplines towards other knowledge, towards other cultures, and towards others.
We need to perform multiple explorations, at the different scales of the design and according to different perspectives, which have in common that design stance aimed at rendering hospitable the locations of the design, at making them live. This is a way of working that leads us to immerse ourselves in the reality of the locations with awareness, and perhaps also humility, seeing architecture on the part of those who live there, designing the landscape looking also from inside, ensuring the buildings once again dialogue with those who inhabit them, belong to the imagination of their users, contribute to improving the quality of the world in which we live.
Landscapes to be seen hanging outside of windows, outside of frames that hold the views of painters, precisely like the wanderer above the sea of fog painted by Caspar David Friedrich.



Fig. 2: Caspar David Friedrich, Wandererer above the sea of fog, 1818 (kept at the Hamburger Kunsthalle, Hamburg).

Seeking what exceeds the design, going beyond what already exists, to rediscover our identity.
We cannot deny our roots, the histories that belong to us and to which we belong; the landscapes that host us and which will host those who come after us. We must design locations from which we can look out over a horizon that has not yet been designed, but that, in the end, must belong to us, must be our friend.
It is a theme, but also an ethical issue, which must involve us all.
It is the essence of our work on landscape, that is, architecture as landscape.
Our landscapes are not only to be preserved; they are not residues of time- as some would have us believe - but, increasingly often, they are to be re-invented, re-designed.
We need to re-start - I believe - from the fifth dimension of the world in which we live.
Our position as architects with respect to the issue must be mobile, ductile, never absolute or apodictic. I think that our trade is real precisely because it is available to others, in a specific location: the architect cannot, in himself, be an authentic inventor, almost alchemist, closed away working in his workshop among mysterious ingredients, with processes known only to him. Conversely, I think that technologies, constructive elements, and details must constitute a language available to everyone, comprehensible by everyone, must become something more than a simple part of a performance system: a beam, a window frame, a pergola on a terrace can even - in my opinion - be a gift, offered to those who see, use, inhabit the building that includes it.
Because the houses, locations, landscapes that we design – let's not forget - will then be inhabited by others, they are and will remain in front of us, for many years of our existence.
This is - I think - our responsibility (from the Latin responsare, that is, to give a response); the responsibility of our trade as architects. It is in this direction that I like to think our designs, our research, and our teaching, are moving.

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UAV photogrammetry, a feasible methodology for the documentation of shallow water geoarchaeosites

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Abstract
Several archaeological sites attest past activities along the coast of Italy. These remains are nowadays totally or partially submerged because of sea-level fluctuations as a result of climate changes. Moreover, those sites were recognized as a reliable indication of sea-level rise to the present, from a reconstruction of functional properties since the age of carving. The knowledge of present-day elevations and their ancient use requires detailed geo-archaeological and topographic surveys. Unfortunately, partially or totally submerged sites could not be surveyed with traditional surveying methodology and the reconstruction of functional properties in a such complex environment is difficult. In this paper, the feasibility of unmanned-aerial-vehicle-based photogrammetry was assessed to reconstruct the high-resolution topography and geomorphic features of a millstone coastal quarry of the Roman Age located in Polignano San Vito (Apulia, Italy). This new generation of 3D products represents a valuable base to extract geomorphic features, to derive the functional properties of such geo-archaeological site. The combined use of different attitude of the UAV camera is shown, and a brief discussion about the need of refraction modelling and correction solutions is introduced. Specifically, the addition of off-nadiral imagery has been tested to evaluate its contribution to accuracy and resolution of generated products. In conclusion, few tips about the best practice required for a 3D survey of shallow water site are provided.

Keywords: Shallow water photogrammetry, Geoarchaeosite, 3D documentation, Water refraction

1. Introduction
Recent underwater and terrestrial archaeological prospection methods used along the coasts of southern Puglia (Italy) have contributed to the mapping and analysis of geoarchaeosites. Thus, allowing the establishment of relative and/or absolute chronological relationships between historical and archaeological data of human presence in the past and data relating to environmental dynamics.
The archaeological artefacts of certain Roman age identified in the sites of Torre Santa Sabina and Egnazia suggest that around 2500 years ago the sea level was about 2-2.5 m lower than the present position [4, 5]. Both coast sides of southern Puglia (the Ionian to the west and the Adriatic to the east coast), are mainly characterized by late Tertiary and Quaternary calcarenite lithologies (Fig. 1a). Numerous geoarchaeological sites (mainly quarries) coinciding with the outcrops of calcarenites, are now partially or totally submerged (Fig. 1a). They were widely exploited from ancient to very recent times, also favoured by the ease of maritime transport. They can be easily recognized through the signs of extraction and processing activities.
Mastronuzzi [16] and Lo Presti [14] underlined the archaeological and historical evidence provided by remnants of coastal quarries. These places can be defined as geoarchaeosites, as they provide useful indications for reconstructing the past oscillations in sea level due to climate change and enable to determine the position of the ancient coastlines compared to the current one. Nowadays, many quarries plunge into the sea and are partially submerged. Geoarchaeosites often preserve artifacts, significant elements of archaeological interest, and evidence of past cultivation techniques and activities. Some studies [6] used models of the glacio-hydro-isostatic curve [13] to hypothesize the

date of some sites lacking chronological references. The data of a site with certain chronological references (i.e. Scario in Campania, Italy) can be used as a reference. Then, an estimation of the sea-level fluctuations in correspondence of other sites (i.e. S. Vito di Polignano, Palinuro and Castellabate) can be performed and compared with the current elevation above sea level (a.s.l., see Fig. 1a for a spatial distribution of sites).3D surveying techniques represent an effective tool in the study of geoarchaeosites. Mass data techniques, such as laser scanning and UAV photogrammetry, produce photorealistic 3D models with high resolution and accuracy, allowing the detection of a large amount of information [2, 3, 17]. UAV photogrammetry has proven to be the most efficient methodology for surveying large areas (few hectares) characterized by complex and sharp geometries [12, 21]. The privileged point of view offered by the UAV and the limited work for a ground survey, make it well suited for the coastal environment and semi-submerged/shallow water sites. In fact, in calm and clear water systems, acquired images could also be representative of seabed, enabling the reconstruction of the entire site. In these conditions, the generated 3D model is affected by refractive effects as it passes between two different mediums (air and water). The refraction of light causes depths of underwater points to appear shallower than the actual depths and they must be properly modelled and corrected [1, 7, 11, 23]. A simplified procedure for refraction modelling is achieved considering only the depth of a reconstructed 3D point [23]. A more complete procedure considers the multicamera combination that generates the point during the photogrammetric processing [11].
A multidisciplinary investigation, including chronological classification of the finds present on a site and historical-topographical analysis, is required. The definition of the population dynamics and exploitation of the area is mandatory for investigations capable of reconstructing the rise in sea level standings and fluctuations and the position of the coastline during the last millennia. Investigations carried out within this paper are focused on an area situated in San Vito close to the San Vito Abbey (Puglia, Italy). The study site is constituted by a Saracen tower and a submerged Roman quarry. Analysis of data acquired during a UAV photogrammetric survey with nadiral and off-nadiral cameras and their support in the investigation of submerging geoarchaeosites area are discussed. The paper focuses on data acquisition procedures (aerial images and ground surveys), generated products, a refraction modelling simple, freely available, and well suited for archaeological 3D documentation and mapping is introduced.

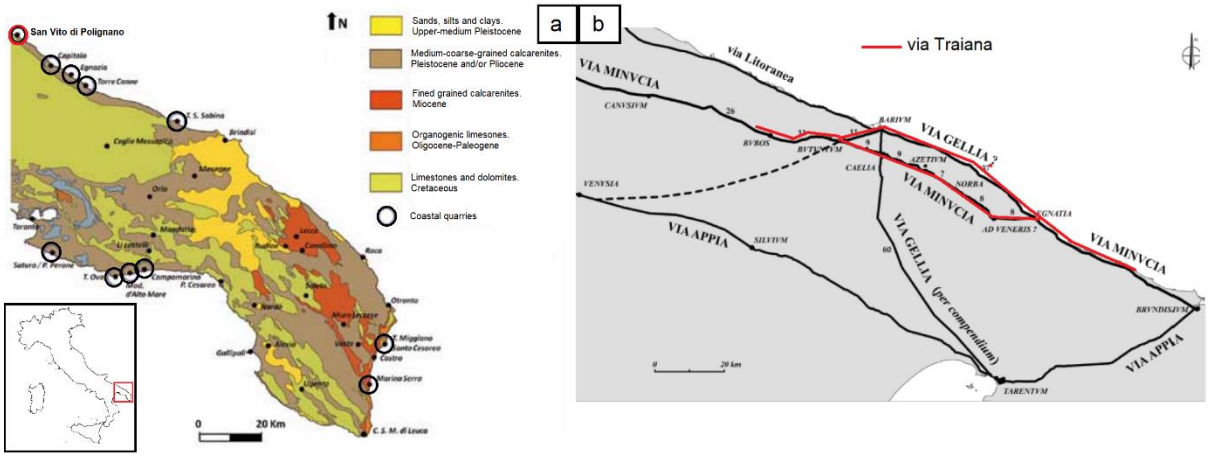

Fig. 1: a-Schematic geolithological map and location of the ancient coastal quarries (from [8] with modifications). Red Circle denotes the location of San Vito di Polignano (Apulia. Italy). **b**- main roman roads in Puglia region, red line represents the via Traiana.

2. Site description

As in the case of many regions conquered by the Romans, also in Puglia an efficient road system was created from the III-II century BC via the construction of new roads and the reorganization of existing routes starting. The Romans improved ancient roads, dated back to the prehistoric age, which, adapting to the morphology of the land and connecting various inhabited centres, allowed a safe connection with the coast [15]. Fig. 1b show the main Roman roads: via Appia, via Minucia, via Litoranea and Gellia. The routes Minucia, Litoranea and probably Gellia formed via Traiana, built in 109 AD by Emperor Trajan as alternate connection between Benevento and Brindisi, in order to facilitate and immediate connections with Greece and middle East for legions, goods and mans. This efficient and fast road system played a fundamental role in the Roman expansion policy, in the management and administration of the empire's territories. Furthermore, the vitality of many of the

settlements in the area up to the early Middle Ages testifies to the existence of a well-structured road network of which it was possible to see some portions till a few decades ago [15].
In the north area of Polignano in the locality of San Vito, an imperial heritage is recognized, the traces of the organization of the territory by the Romans seem rather labile. The geomorphological conditions of the territory, the impervious nature of the places, prevented the extension of the centuriation of the territory. The site is composed by a watchtower and an Abbey dedicated to San Vito, whose first construction date back to the 10th century. Roman age literature reports that, the tower is located near the church of San Vito, above an ancient port. As Labate clearly described [10], near the tower of San Vito the erosive activity of the sea exposed a long stretch of stratigraphic section (Fig. 2a). Under the arable land, there is an archaeological deposit that preserves a quarry. At the base of the archaeological deposit (Fig. 2b, US 4) there are grooves dug in the rocky bank, signs of the quarry cultivation showing the preparatory work for the extraction of stone blocks. The furrows are about 56-57 cm wide and 40 cm thick, or about 28 cm wide and about 30 cm thick, these measures are multiples of the Roman foot (about 29.6 cm). After obtaining a vertical and a horizontal surface in the quarry face, the extraction consisted of cutting deep grooves with a pickaxe to isolate all the facades of the block except the lower one. Other small grooves were then engraved at the base of the block to be extracted. Inside these grooves iron or wooden wedges were inserted to facilitate detachment. A non-detached block still retains the grooves for the insertion of the wedges at the base (Fig. 2a, M and C; [10]). On the quarry floor, large stone blocks extracted in ancient times and then abandoned are shown in Fig. 2a, B. Four of these blocks are approximately 65-66 cm wide (one of which is 210 cm long). In another area (Fig. 2a, N) the furrows traced on the rocky bank show, instead, blocks of different sizes, about 135 cm long and 50 cm wide. In the westernmost part of the quarry there is a long trench, 143 cm wide and more than 30 cm long, with parallel grooves joined every 63 or 43 cm by other perpendiculars, from which blocks of about 103x50 cm were extracted (Fig. 2a, E). In zone C, the ring grooves that delimit at least 18 column drums, some of which with a diameter of 78 cm or 103 cm, have been traced. Near the tower there is a 55x140 cm tuff sarcophagus (Fig. 2a, D), probably abandoned in situ due to a small break that occurred during the processing before extraction. The quarry also preserves the footprints of some milestones used in the construction of a hypogeum crusher within the complex of the San Vito Abbey.
The archaeological deposit is made up of two layers: one of the basal types (Fig. 2b, US 3), about 60 cm thick, with the presence of Roman age finds including tuff blocks, quarry waste, tiles, mosaic tiles, fragments of coloured plaster, a triangular marble slab [10]. The other (Fig. 2b, US 2), is at a higher level and about 40 cm thick. It is characterized by the notable presence of ceramic fragments of northern Italic sealed earth, clear sealed earth, raw terracotta, common ceramics, different types of Italic, North African and Eastern amphorae, remains of bricks and rare glass fragments [10]. The archaeological deposit can therefore be dated to a phase that goes from the end of the 1st century BC to the 5th-6th century AD.
The need to carry out multidisciplinary surveys has therefore been defined, including a topographical study aimed at defining the dynamics of population and exploitation of the area starting from the Roman era.

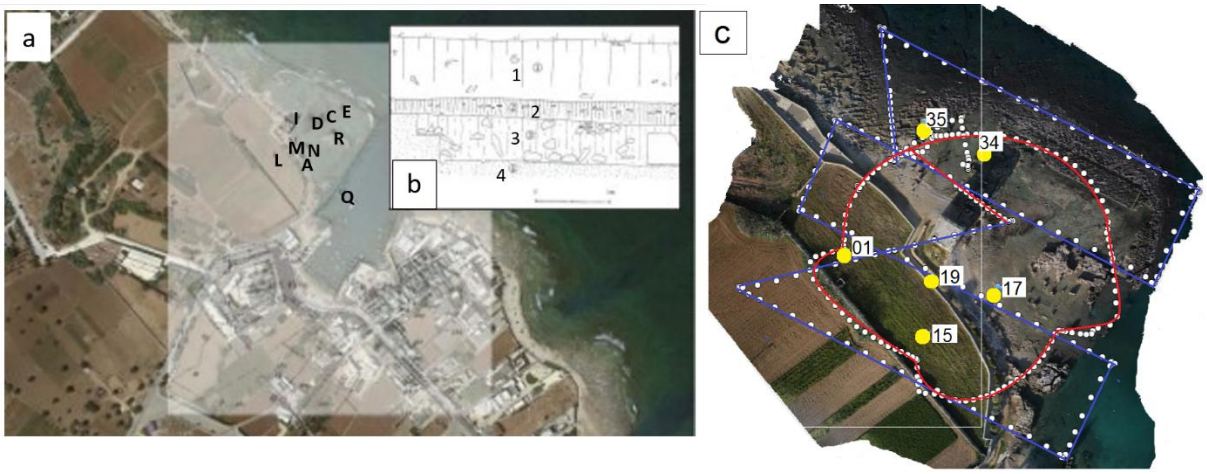

Fig. 2: a- map of the area with cadastral information in transparency, letters represent some areas of the quarry (from [10], p.54, fig. 14, with modifications). **b**- a representation of stratigraphic section in the area: US1, arable stratum; US 2 and 3, archaeological strata; US 4, quarry stratum (from [10], p.54, fig. 14, with modifications). **c**- map of the acquired data: Withe dots, the images; blue line, nadiral flight; red line, off-nadiral flight; yellow dots, GCPs' position

3. Data acquisition and processing

A Canon EOS 550D, mounted on a hexacopter ESAFLY A2500 (designed and manufactured by SAL Engineering, Italy), was used for image acquisition of an area of about 2.8 ha. The focal length was fixed at 25 mm, enabling a ground resolution of about 1 cm/pixel with a flight altitude of about 60 meters above the ground level. Two flights strategies were executed. During the first one, few parallel flight lines with a nadir attitude of the camera were imposed., The second was performed with a camera off-nadir angle of about 30° and with converging poses towards the tower. An autonomous mode of image acquisition with a shot per second was set resulting in 330 images acquired: 166 nadiral and 164 off-nadiral with a forward and side overlap of about 85-90% (see Fig. 2c).

A ground survey of Ground Control Points (GCPs) coordinates was designed with GNSS. A rapid-static GNSS surveying in a master-rover configuration was set up, then the absolute coordinates of the master station were calculated within the Puglia GNSS permanent infrastructure. A compact GNSS L1/L2 antenna was placed on a small tripod with fixed dimensions over the targets that identify the GCPs. The followed methodology ensured accuracy of about 1 cm. Six GCPs were homogeneously distributed in the area of interest, three were positioned on the coast and three over structures emerging from the sea (Fig. 2c).

Low-quality images were automatically filtered during the preliminary processing steps. The photogrammetric processing was performed in Agisoft Metashape software, applying a Structure from Motion approach to obtain 3D georeferenced point clouds, Digital Elevation Models (DEM), and orthophotos. Two datasets were processed: nadiral imagery and nadiral+off-nadiral imagery. A standard processing procedure was followed, consisting of images orientation, GCPs' integration, optimization of raw orientations, dense cloud generation, DEM and orthomosaic creation [22].

Metashape resulting projects were examined by running a Matlab routine (DBAT – Damped Bundle Adjustment Toolbox). DBAT implement a statistically rigorous bundle adjustment able to process projects from closed-source photogrammetric software (such as Metashape and Photomodeler) [19, 20]. In this study, DBAT was used to obtain information about the acquisition geometry and reconstruction of the sparse cloud. QGIS (https://www.qgis.org/it/site/) was used to analyze and compare the 3D products generated by the processing of nadiral and off-nadiral imagery and discuss the potentialities of the two different datasets.

4. Results

The photogrammetric processing of the nadiral dataset generated a sparse point cloud composed of 86000 tie points and 420000 projections, with a total error on imposed GCPs of 1.7 cm. The overall processing, from images to DEM/orthophoto, required about 4 h on a standard workstation (12 GB RAM, 2GB GPU) and about 2 h for the processing of GNSS survey and collimation of GCPs in the acquired images. The nadiral+off-nadiral dataset provided a sparse point cloud of 131000 points and 1100000 projections with an error on GCPs of 1.3 cm. The processing required 13 h and about 2 h for GCPs. The analysis performed through DBAT routine focused on incidence angles of optic rays for reconstructed tie points. The mean ray angle of tie points is 20° in the nadiral dataset and 24° in the nadiral+off-nadiral. The nadiral dataset has the 50% of tie points with an incidence angle between 0° and 15° and for the 80% of points it is lower than 30°. In the nadiral+off-nadiral dataset, the percentages decrease: the 40% of incidence angles are smaller than 15°, and the 70% are smaller than 30°.

The comparison of the generated DEMs allows the identification of differences introduced using oblique imagery. Figure 3 shows the Difference of DEM (DoD) for the two datasets (nadiral+off-nadiral) - nadiral), and profiles obtained with vertical sections. In Figure 3, the marked blue line represents the average sea level during the acquisition (about 44 m), this value was empirically derived from the processed images. The two 3D reconstructions are very similar in the emerged or partially submerged areas. Discrepancies ranging from +3 cm and -3 cm (coloured in white) are considered not significant because of the accuracy of the methodology and the resolution of the products (4 cm). The discrepancies tend to increase at higher depths. The nadiral DEM is deeper than the other one and guarantees a better definition of the submerged geometries (see profiles on Fig. 3). The high quality of the 3D model and orthophoto generated from the nadiral dataset allowed a high quality and complete view of the area and the seabed (see the generated orthomosaic in Fig. 4)

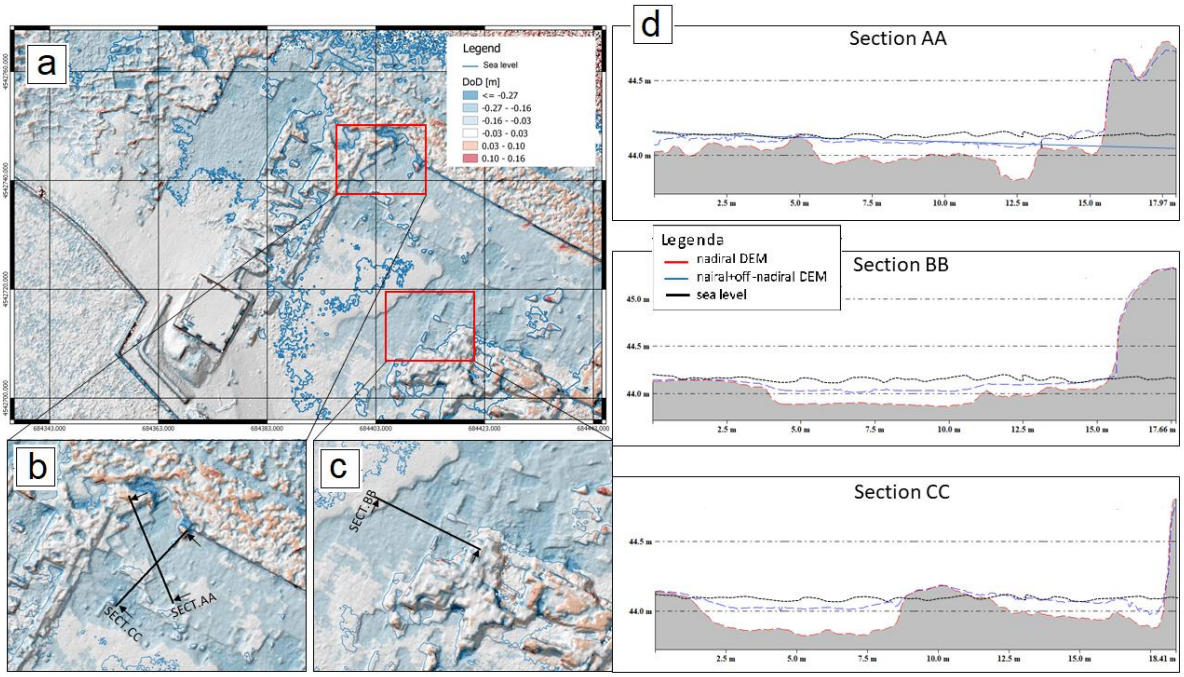

Fig. 3: a- figure shows the DoD with colour-coding represented in legend, white colour was assigned to values ranging between ± 3cm, and considered as not significant, the blue line represents the level of the sea. b,c- a zoom on two small portions with a representation of vertical planes used for section extraction. d- three profiles extracted from DoD; red lines represent the elevation of the elevation model from nadiral images only; dashed blue lines depicts the elevation model from nadiral and off-nadiral images; the black lines represent the average sea level seat the time of surveying.



Fig. 4: Top left: orthophoto of the site generated with the nadiral images only. White rectangles delimit areas of historical relevance. Letters denote the location of zones as noted in Fig. 2. Zone B: large stone blocks extracted in ancient times and then abandoned; zone C-D: ring grooves that delimit at least 18 column drums, some of which with a diameter of 78 cm or 103 cm; zone N: furrows traced on the rocky bank, blocks of different sizes, about 135 cm long and 50 cm wide

5. Discussion

The comparison of products generated by the processing of the two datasets (Fig. 3) allows establishing that the nadiral dataset is the most suitable for the reconstruction of a shallow water seabed. Due to the absence of a reference dataset, we decided to use a criterion based on the ability to reconstruct the sharp geometries of this seabed. The nadiral+off-nadiral dataset did not allow an accurate reconstruction of the seabed, submerged geometries are smoothed, it is not possible to identify excavation activities, and the elevation is highly affected by refraction (see profiles in Fig. 3). In contrast, when a nadiral dataset is processed, refraction effects are reduced by the low angles of incidence allowing to reach greater depths (Fig. 5), thus, assuring a better quality 3D reconstruction of the seabed.

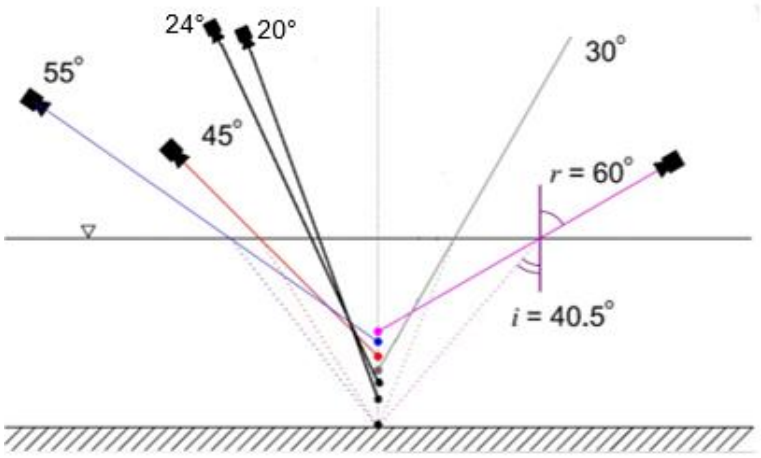

Fig. 5*:* Refraction angle and apparent depth locations from different camera angles/locations (from [11] with modifications).

If only the numerical results are considered (e.g., discrepancies on GCPs, number of tie points and projections, incidence angles) the results from the two datasets seem to be very similar. Also, the generated orthophotos do not show significant differences.

However, refraction's effects are strengthened where the depth of investigation and the angle of incidence increase. Processed datasets produce a mean incidence angle, in sparse point clouds and air, of 20° and 24°, equivalent to 14.8° and 17.7° in water. This produces larger refraction effects if off-nadiral images are considered, as shown in Fig. 3. Several studies deal with the correction of refraction effects between water and air [1, 9, 18]. We introduce two refraction models, easy to use and effective for the reconstruction of semi submerged areas. Woodget [23] proposed a simplified approach suitable for nadiral imagery (<10°). The approach attempts to circumvent complications caused by the use of multiple cameras but provides good modelling of refraction effects. Dietrich [11] proposed an approach suitable for SfM photogrammetry. It considers off-nadiral imagery and solves the necessary trigonometry for each point/multi-camera combination of the dataset. The tool is freely available at GitHub and the required inputs can be easily generated by commercial SfM software. Ground reference data are required to calibrate refraction models and validate obtained results.

The archaeological documentation confirms the presence of the site at least from the late Republican age up to the 5th-6th century AD. At that epoch, the area of the tower was characterized by the presence of a quarry of stone material and related activities (extraction and transport of blocks) through the via Traiana and by sea thanks to the presence of the port. The quarry, abandoned during the Roman era, was reopened in medieval and modern times for the extraction of smaller stone blocks (35x22x26 cm approximately), most likely used during the construction of the abbey of San Vito, perhaps during the 10th century, and in other minor buildings such as the Saracen tower, built in the 16th century. The tower seems to have also been built by reusing cornerstones and tuff blocks perhaps abandoned in the ancient quarry [10]. From the foregoing, it is conceivable that, at least until the 15th-16th century, the quarry was still above sea level and that the coastline was seaward of the modern one.

6. Conclusion

Within this paper, the acquisition geometry of UAV-based survey and resulting 3D reconstruction of a shallow water site has been assessed. Our work suggests that nadiral imagery has a low angle of incidence and allows to obtain a detailed reconstruction of the seabed with less refractive effects. Off-

nadiral imagery provides a robust acquisition geometry, datasets with fewer systematic errors, a better camera calibration, and a higher definition of subvertical walls (especially in emerged areas). In shallow water areas, slightly off-nadiral imagery (ranging from 10° to 30°) is suggested to combine both effects [11]. This requirement prevents the use of simpler refraction models because incidence angle can range from 0° to 8°. A proper approach for refraction modelling is required (see [11] for an open-source tool). Ground reference data are necessary to calibrate the refraction models and validate obtained results. Targets with known coordinates or water depth measurements can be used. A uniform random pattern (both in horizontal and depth) is suggested. The operator must optimize the SfM processing using “in air” constraints, while coordinates of underwater targets must be used only to calibrate the refraction model and to perform a validation of the overall process.
The most obvious limitations for UAV photogrammetry in bathymetry applications are the water and atmospheric conditions. In order to perform a 3D reconstruction, the camera needs to see the bottom: water must be clear and calm, shadows must be avoided/reduced. Furthermore, hazy or overcast days can produce unwanted surface reflections reducing the photogrammetric potential. In favourable conditions, surfaces in depths up to 5 m are visible in acquired images and potentially recoverable. It is necessary to assess if the generated products are suitable for the intended purposes. The three-dimensional reconstruction of geoarchaeosites benefits from high-resolution products of the emerged and submerged parts. These products can improve our knowledge of the past of places and people by providing a chance to perform accurate measurements (punctual or areal) and analyze the site at a different scale than traditional (on-site) investigations. Studies aiming at assessing changes in the sea level mainly exploit functional details of the area of interest. The geometric aspects are less important, and even accuracies of a few centimetres are achievable. The proposed methodology is useful for a multidisciplinary investigation of coastal geoarchaeosites and for reliable estimation of past sea levels.

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Drawing the time through HBIM: the case study of San Lorenzo ad Septimum in Aversa

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Abstract
The current analysis and the survey's activity are based on studies already in progress, in the context of which archive research, retrieval and purchased analysis of the sources, photographic campaigns and preliminary graphic elaborations have been carried out, basic to the subsequent implementation of the direct and instrumental surveys.
This contribution is part of the safety measures of the sixteenth-century Cloister of the Monumental Complex of San Lorenzo at Septimum in Aversa, currently headquarters of the Department of Architecture and Industrial Design of the Luigi Vanvitelli, University of Campania.
Overall, evident signs of static instability were recorded, deriving from an overturning mechanism of four columns, both on the ground floor and on the first level, located on the east front of the main cloister.
The focus of the paper is to secure the clock and the two sundials present in the complex by using HBIM's technologies. Starting from scan to bim systems the creation of a parametric model of the current state of the building is completed, by bringing the point cloud elements back to objects to which historical and construction data can be associated. Moreover starting from acquired data, the 3D model shows the reconstructive hypothesis of the original structure and the virtual reconstruction of the building based on traces found on-site and on the comparison with coeval creations allowing to properly hypothesize the design of point features.

Keywords: Survey, HBIM, Keywords, Drawing, Restoration, Cultural Heritage

1. Introduction

The outcome of this study has led to interesting results for the understanding of the dynamics of settlement and transformation of the cloister in the ancient monastery of San Lorenzo ad Septimum in Aversa; identifying a methodology applicable in contexts similar to this one, which is also useful in the foreshadowing of future dynamics of urban transformation not only referred to the consolidated fabric of the historic center. The survey was carried out using drawing first as a tool for reading and investigation and then as a means of graphic representation of the results of the previous analysis, characterizing itself as an element of connection between past and present, aimed at understanding the peculiarities of the transformations occurred during the years, because of the changement of destination. Then, the study it was also the moment to think about the limit of technologies that is in positioning themselves in the history of technologies and not in the history of thought. With this I don't believe that we must exclude the use of technologies in representation but, precisely as technological prostheses, connote them in their time frame of use without entrusting them with a boundless trust. The risk is that we no longer think about what we observe but we look at the technology that replaces our gaze on the horizon.



Fig. 1: The activity of the survey in San Lorenzo ad Septimum, Aversa. Focus on the cloister.

This contribution intends also to define the essential role of the monitoring and knowledge activity aimed to preserve the Cultural Heritage and so guarantee the transmission to the future generation; thanks to the use of HBIM methodology, it has been possible create the model of the cloister and in particular of the clock that is in a several state of decay. Only in this way it is possible organize the correct restoration of cultural heritage because if we know the survey we can also think to the restoration for the transmittion to the new generations.

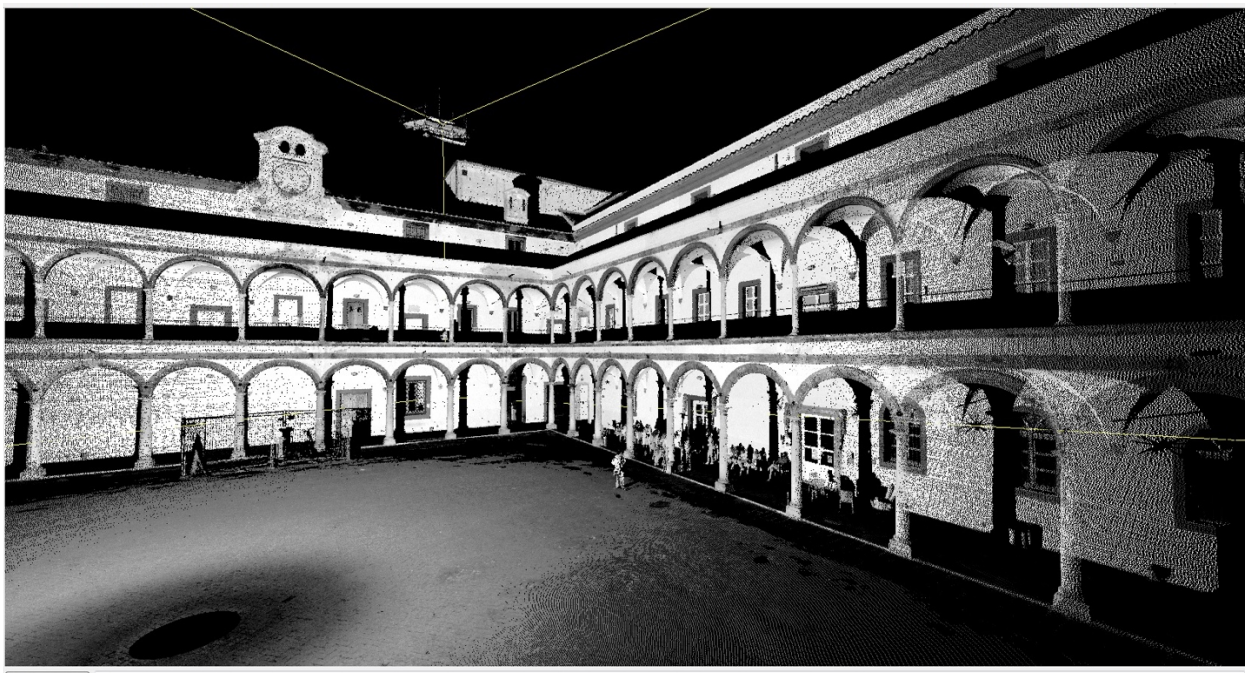

Fig. 2: Point clouds model during the phase of elaboration in the software.

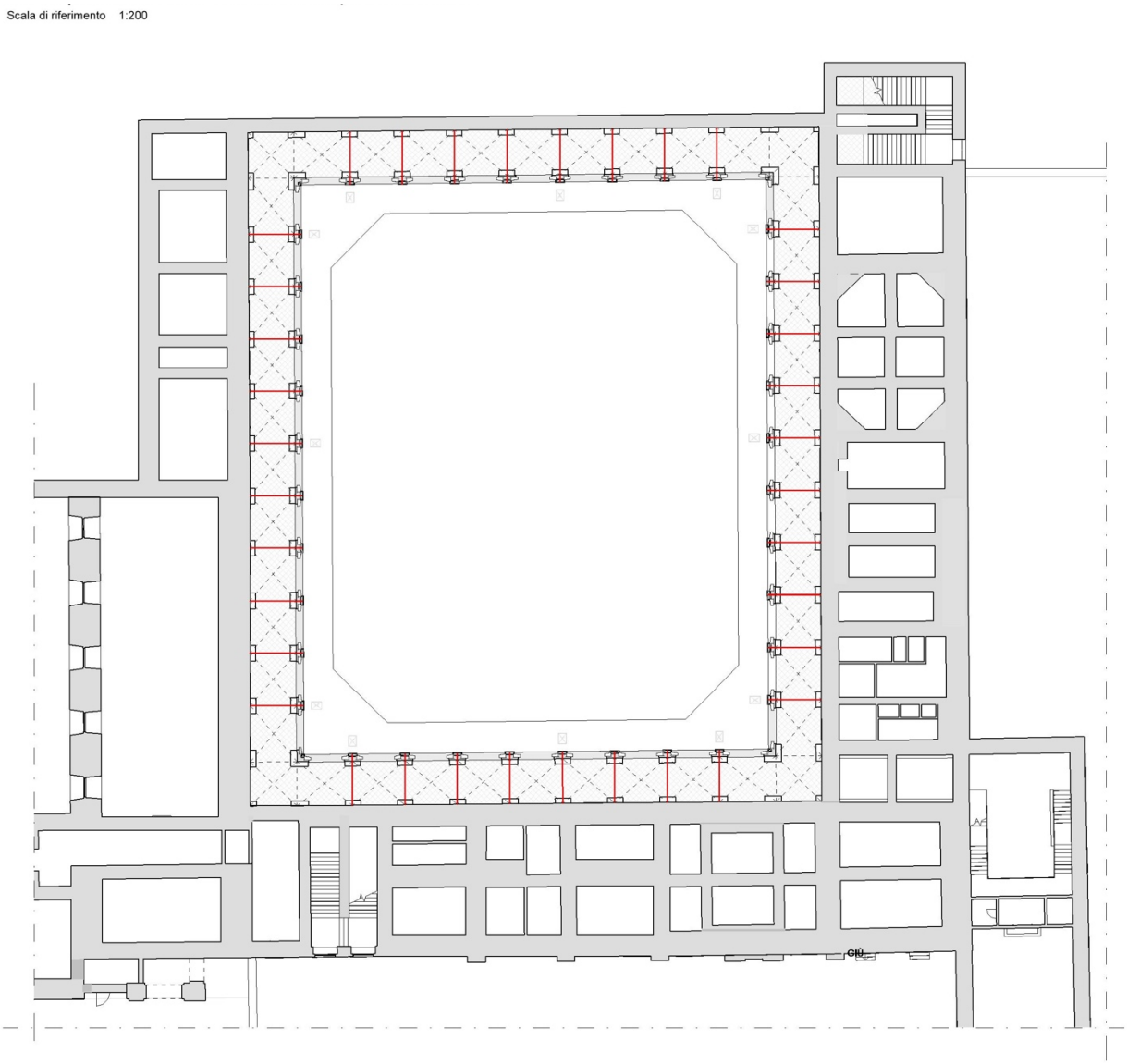

Fig. 3: Drawing plane of the Cloister in San Lorenzo ad Septimum, Aversa.



Fig. 4: Render of the Cloister – focus on a particular arcade and axonometric projection.

The complex of the Benedictine Abbey of San Lorenzo ad Septimum, probably founded in the Norman age (11th century) on pre-Roman, Roman and late ancient pre-existences, has a large Renaissance cloister with loggia in which the clock and two possible sundials are located. The monastery, suppressed in 1807, was the first seat of the college for noble girls "Casa Carolina", then, from 1812, the Military Orphanage of Mars, then from 1818 it housed the Artistic Institute, called in 1874 "Istituto Artistico Meccanico San Lorenzo ", after other changes of name and address, in 1959 it was entitled" O. Conti ".
The mechanical clock and the probable sundial dial almost certainly date back to the late nineteenth-century phase of the complex. The possible sundial can be recognized in the façade of the sail to the right of the one that houses the mechanical clock: you can see a painted writing with the numbers << 18 ... >>, now completely illegible. The specimen is proposed with a dubious formula: in fact, there is a dense geometry of lines arranged in a radial pattern but no figures can be seen, however in the center of the dial the signs of the interlocking of a stylus, of any type, seem to be absent. The sail on the left also shows a dial, even less legible than the one on the right and even more doubtful to be recognized as a possible sundial, in the confused structure of convergent lines.

1.2 Survey activity for the creation of HBIM model

The research envisaged a first survey phase in the site through laser scanner technology using, specifically, the instruments available at the facilities of the Consortium of Universities Benecon, thus obtaining a first discrete model for points from which to derive metric and morphological data. The survey was carried out with a number of scans using some checkerboard targets, carefully studying any shadow areas that might arise.
The recognition through the survey of practices, morphologies, decorative choices that are able to identify and qualify the culture and that appear linked to the specific construction traditions of the workers allows a deepening of non-secondary aspects of architecture, in comparison with the solutions construction and decoration adopted by contemporary architecture or previous to their realization, in different cultural and territorial contexts.
The reasoned collection of similar systems of clock in Campania Region, diversified by age, by materials used, by shape and organization of the spaces, is formulated in synthetic reference sheets, which first outline the structural components, identify the functional types, pay attention to the geoemtrical representations that they regulate the dimension in plan and elevation.
It was found in this first phase that the investigations on the nature of the elements constituting the architectural organism of the cloister and in particular of the clock imply the need to develop a more in-depth knowledge of these surfaces in the different geometric-spatial components and in the construction methods they developed throughout the architectural history of the place.
This prior theoretical knowledge necessarily precedes the survey phases, to lead to a conscious approach and a critical interpretation of the structure; in this way it will be possible to subsequently focus attention on those parts for which it is believed that there may be greater discrepancies between the state of fact detected and the hypotheses previously formulated, based on a theoretically pre-set geometric model.
As for the implementation of the survey campaigns, which are described in the table, they provide for a continuous and essential integration between the different survey techniques, traditional and new generation.
The direct surveys conducted with traditional instruments for the accessible areas have been planned and partly carried out, but for the most part we have operated, with indirect instrumental survey techniques, more suited to the general conditions of surface inaccessibility: general topographic framework, GPS control campaigns, photogrammetry and laser scanning applications (time-of-flight and triangulation)

394 files	Survey by camera
1 days	Survey by VX e GPS
17 days	Survey by laser scanner
217	Total number of scans
20,3	GB raw data
2.170	Points

The focus of the paper is to secure the clock and the two sundials present in the complex by using HBIM's technologies. Starting from scan to bim systems the creation of a parametric model of the current state of the building is completed, by bringing the point cloud elements back to objects to which historical and construction data can be associated. Moreover starting from acquired data, the 3D model shows the reconstructive hypothesis of the original structure and the virtual reconstruction of the building based on traces found on-site and on the comparison with coeval creations allowing to properly hypothesize the design of point features.
Starting from the point clouds, the built is therefore detected in its virtual cast and, through the parametric modeling, it is given a reconstruction conforming to the real, augmented by information and data that are correlated to it and constitute its underlying historical, compositional and constructive foundation.
Modelling in architecture allows to study an artifact in all its metric and materic specifications as well as in its volumetric organisation. It also allows to investigate reality well over its contingent physical form. This is precisely why there are studies in architecture and archaeology aimed at giving reconstructive hypotheses based on specific studies and researches and on latest generation modelling and survey technologies.
The activities of research aimed to create a model in H-BIM environment for enrich an interdisciplinary knowledge on architectural heritage, resulting in a systematic reading of built environment, where a model is created for its meaning rather than for its shape and geometry, since its definition necessarily requires the ontological identification of the individual parts and the connections linking them and referring to them in their lexicon and semantics.
Moreover starting from acquired data the 3D model shows the reconstructive hypothesis of the original structure and the virtual reconstruction of the building based on traces found on site and on the comparison with coeval creations allowing to properly hypothesise the design of point features.



Fig. 5: Photographic survey of the clock in the survey

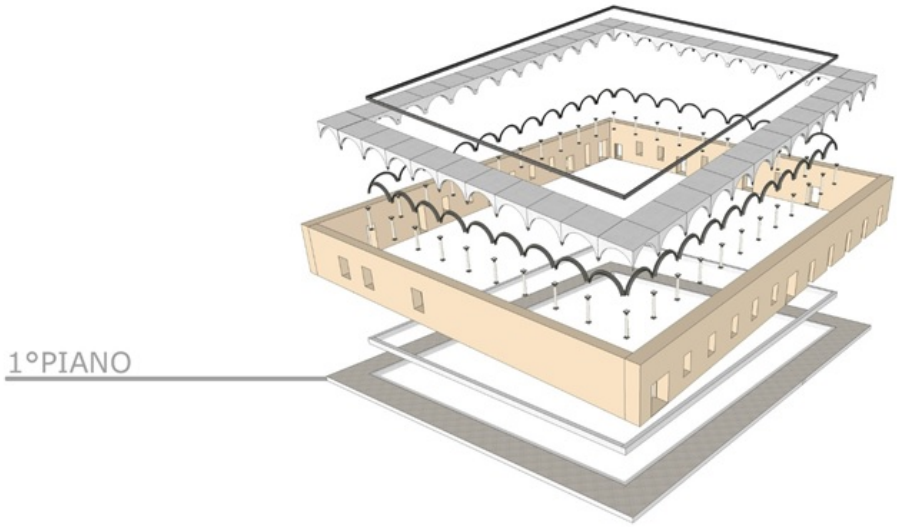

Fig. 6: HBIM model of the cloister

2. Restoration program for the clock

As result of survey activity, it was possible to draw the ancient structure of the clock and so have a program of interventions fro restoring plaster

1. Mapping of the plaster parts to be demolished performed on the basis of a visual analysis, hammer auscultations and punctual investigations
2. removal of deposits on plaster, if present, of the wall structure to be made with fiber-reinforced mortar with volumetric stability (Type G - Class M10)
3. Possible filling of the cracks, if present, of the wall structure to be carried out with thixotropic fiber-reinforced mortar with volumetric stability.
Surface consolidation of plasters, stones and bricks, after brushing and removal of its valuable deposits and possible fixing of the unsafe parts, to be evaluated separately, by applying a product based on silic acid ethers, in two coats, the first using a impregnated with the product and the second to be applied after about 15 days to complete the treatment
4. Restoration for the purpose of consolidation and fixing of the plaster detachments of the masonry by means of
a) injections and pouring through existing cracks and small holes of suitable acrylic resin in aqueous emulsion;
b) injections and pouring through existing lesions and small holes, of suitable acyclic resin in aqueous emulsion added to inert fillers with different concentrations
c) injections and pouring through existing small holes and cracks, of fluid mortar with adhesive after soaking the plaster with water
5. Reintegration of the missing parts of plaster with hydraulic lime mortar of the same composition as the existing ones
6. Consolidation and / or final protection of the plaster surfaces with acrylic resin in a 3% solution and / or waxes in aqueous emulsion
7. Pictorial reintegration, of small lacks and wear of the pictorial film and of the plastering of the gaps

The same work has been made for the restoration of stucchi:
1. Consolidation and fixing of the detachments of stucco from the masonry by:
a) and b) as per phase 4 PLASTER
c) injections and pouring through existing cracks and small holes of liquid mortar composed of lime (Hydraulic lime malate of the same composition as the existing ones), sieved sand and ventilated pozzolan and purified of salts by washing in a 1/3 ratio, after soaking the 'plaster with water and 50% alcohol
2. Cleaning of the surface of the stucco cleaning of the surface with water added to Desogen at 5% water saturated with ammonium bicarbonate and possible compresses of paper pulp and kaolin to

absorb the soluble salts present in the stucco. The most resistant carbonate flights are mechanically consumed with a scalpel
3. Plastic integration of stucco with foils and decorations painted in easy strip
4. Cleaning of the surfaces, consolidation and / or final protection of the surface of the fillers with acrylic resin in a 3% solution and / or waxes in aqueous emulsion.

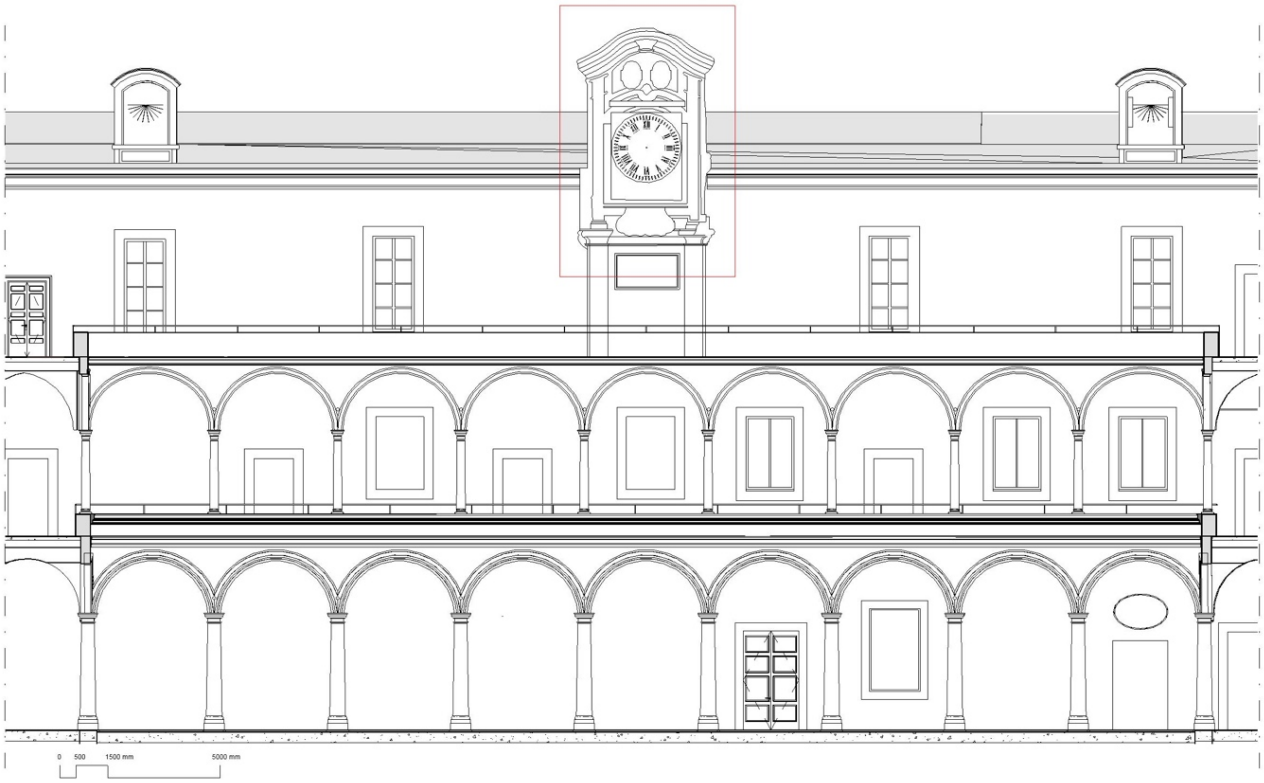

Fig. 7: Nord Facade of the Cloister – focus on the clock.

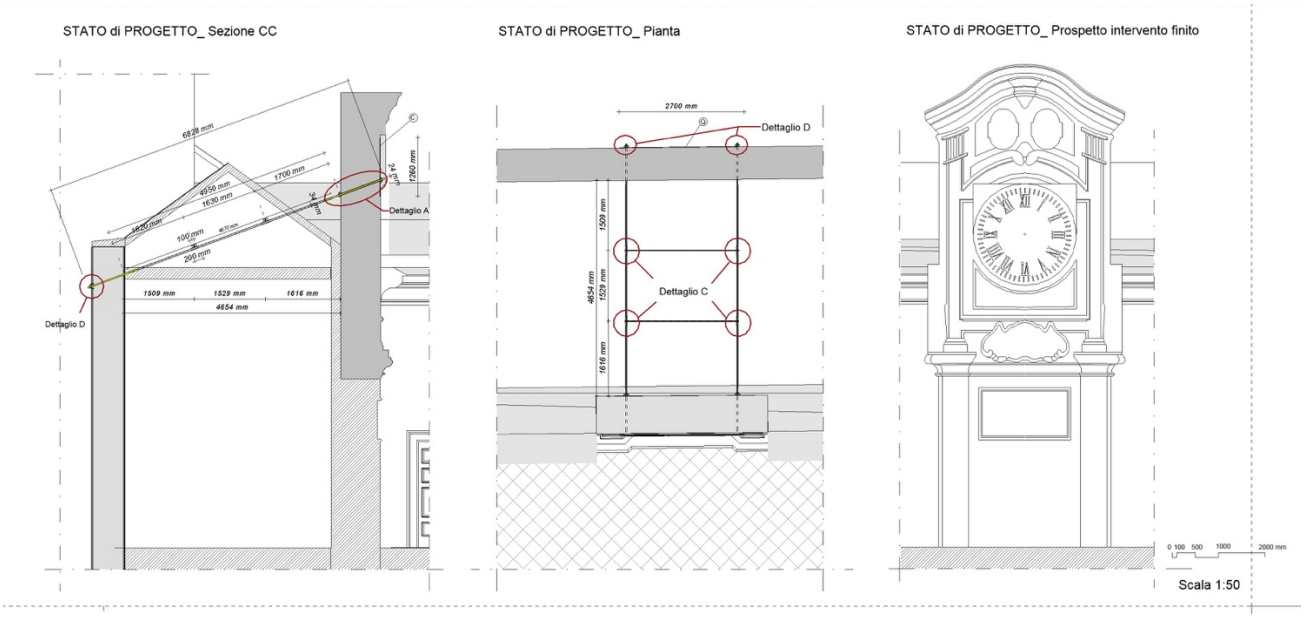

Fig. 8: Project of the clock: a section, drawing plane and facade

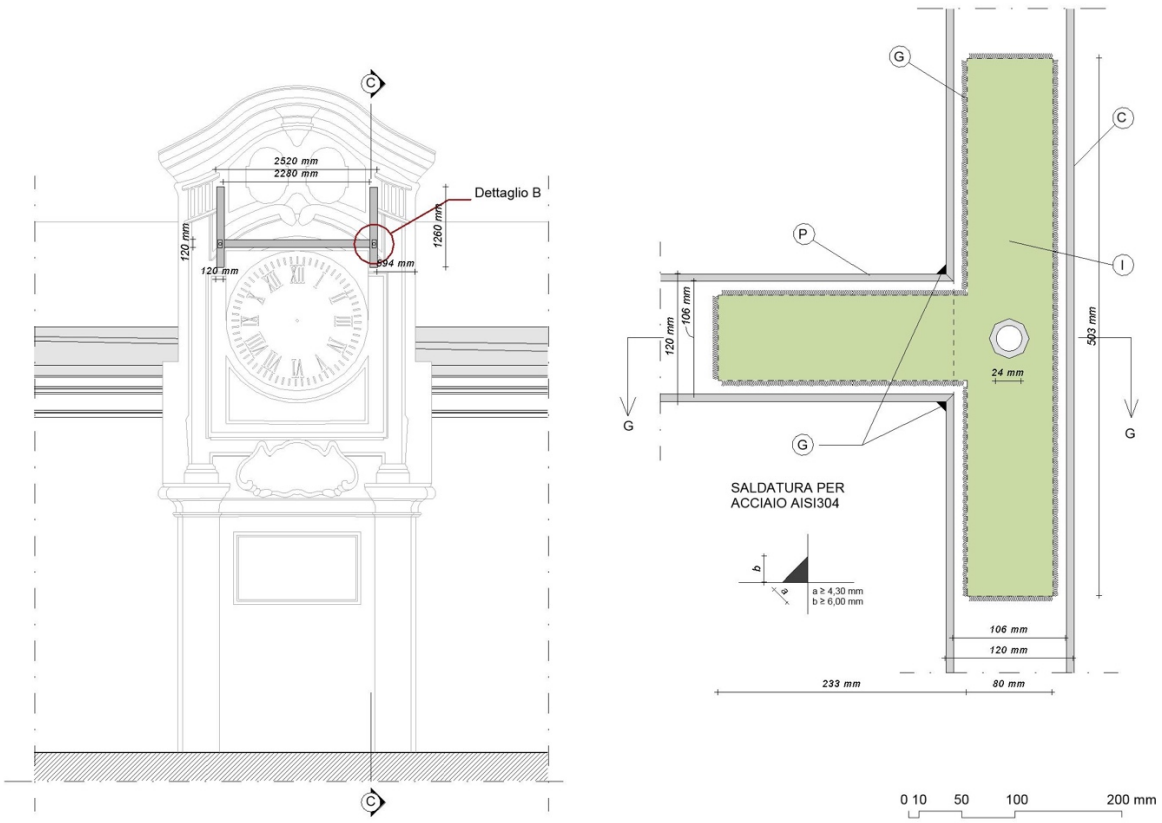

Fig. 9: B detail on the clock.

3. Conclusion

The contribution of different diagnostic techniques was envisaged for the degree of detail and in-depth analysis, with the involvement of other research sectors operating in the field of conservation of cultural heritage.
In this sense, the representation must necessarily be based on a lecture of the system taking in consideration every single part of the complex architecture, in order to identify the formal / structural system to which at the same time associate all those who are able to document its compositional specificities, construction, historical and material. This operation presents considerable difficulty, having to delineate processes that identify the regularity of forms in the built, simplifying what is in reality deeply complex and giving a logical order to the system of knowledge.
As always, it is necessary to understand the objectives for which the survey is carried out and consequently its representation. The representation in fact always decides the outcome of a program built with knowledge and structured on a clarification and is influenced by the culture of the time.

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The evolution of the sacred hill

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Abstract

Naples is one of the world's great cultural attractions, with a very high number of the most representative historical, artistic and cultural testimonies on the international scene. An immense open-air museum to be leafed through like a book, page by page, step by step, in a hypothetical walk through its 27 centuries of history in the alleys, streets and squares of the historic centre, which is like a treasure chest of beauty, inscribed on the UNESCO World Heritage List in 1995. Seventeen square kilometres of surface area in which the past can be perceived with the five senses due to the high concentration of points of interest: it is one of the largest historic centres in Europe. A walk through history, accompanied by the tale of the head of the mythical Parthenope and her immortal Neapolis. Its Acropolis, a centre of sacredness and immutable beauty, hidden beneath today's Caponapoli hill, continues to tell us its infinite story after centuries.

Keywords: Representation, Survey, Heritage, Territory, Analysis.

1. The evolution of the sacred hill

Looking at her today takes us back to the mystery of her legend, her gaze enrapturing those who pause to admire her. She was young, the age that looks towards the future of maturity, fascinating, like almost all the women of the time, with a clear profile line between her forehead and nose, no bulge between the two arches of her eyebrows, her glabella almost flat, and a regal and still modern Hellenic hair, gathered into plaits, perhaps tied with small cords of wool and cotton, depicted in this way by the expert hands of a Greek master sculptor. It was there that a stone was seen for the first time, submerged by the rubble in a cellar, near Piazza Mercato near the sea, which immediately caught the eye of the curious and came out in the seventeenth century 'a Capa' e' Napule. A marble head depicting the face of a woman, but not just any woman, but one bearing the name of the myths and legends that have accompanied Naples since its birth, the siren Partenope.

1.1 The ancient heirloom of Parthenope

The troubled life of Neapolitan history is the same as that lived by the head of the mythical siren, its presumed origin dating back to 470 BC when the ancient Neapolis was founded. 'A Capa' e' Napule or the head of the alleged Partenope, was supposedly placed in the temple dedicated to her as a eulogy to her divinity, there on the highest hill of Neapolis - the ancient Acropolis - which we know today as Caponapoli. A relic from the very distant past which, in the 17th century, was either hated or loved by the Neapolitan people. In fact, during the festivities that proliferated through the streets of Naples, the people would pay homage to it with jewellery and flowers, or, as when an indulgence was unsuccessful, they would vent their ill-feelings and resentments on it. And it was in July 1647 that her nose was cut off during Masaniello's revolt, as a sign of revolt against the tax burden imposed by the Spanish viceroyal government. The event had as much repercussion as the value that head had for the whole city of Naples, so they declared national mourning that day. In 1879 the head was given a place worthy of its importance, thanks to the intervention of a Neapolitan patrician, Alessandro di Miele, the head was

restored by reattaching the lost nose and was placed on a piperno base near the Church of Sant'Eligio at the crossroads with Via Duca di San Donato. With the passing of time, around the nineteenth century she was baptized with the new name of Marianna, the reason is not known, although presumably it was done for pagan issues of fact in those years, Marianna was placed in front of the church of Santa Maria dell'Avvocata and became a real religious icon. Marianna did not have a happy life, just like the city she created, in fact she was damaged again during the Second World War and in 1961 moved to Via Duomo to become part of the Filangieri Museum collection. It was only a few years later that the memory that remains of the myth of Partenope found a safe home in which to continue its story: its splendour can still be admired today in Palazzo San Giacomo, the seat of Naples City Council.



Fig.1: "'A capa' e' Napule" photograph of the head of Donna Marianna, presumed Parthenope, located in Palazzo San Giacomo.

1.2 The birth of a new world

In the chronicle of the time, located on the hill of Caponapoli, defined as sacred, “Vedesi una bellissima piazza detta Sant'Aniello che serve da delizia in estate per i Napoletani... e la sera in questo luogo si vedono adunanze di uomini eruditi e letterati" - You can see a beautiful square called Sant'Aniello that serves as a delight in the summer for the Neapolitans... and in the evening in this place you can see gatherings of learned men and men of letters - is how the literary and religious historian Carlo Celano described it in the 17th century; this is the part of Naples that, more than any other, can narrate to us, with a nostalgic taste, what was once the most important part of Neapolis, its Acropolis, as well as the most inviolable area of a city seen as a "second Athens". The mythical Caponapoli is the highest part of the ancient Greco-Roman city, a hill that prevails and stands out from today's Via Costantinopoli and Piazza Cavour, “Un luogo speciale dove si intrecciano mito e leggenda, storia e archeologia, arte e scienza, religione e antropologia, esoterismo e medicina.” - A special place where myth and legend, history and archaeology, art and science, religion and anthropology, esotericism and medicine intertwine - the words that best represent the dominance of these few square metres, as recounted by Gennaro Rispoli in "Collina Sacra".
The history that we can tell of the city of Naples today, since its birth, is given by the possible reading of the membranes concealed beneath metres of earth, or for enhancement, thanks to the science of archaeology, which since 1980, the date of the last major earthquake, has raised awareness and shaken the interest of scholars in the city's urban history. The underground holds an archive of useful pieces for the reconstruction of its history, where, however, it finds no little complexity in its reading and is often a source of problematic interpretation due to the variation in chronology and multiplicity of its genesis. Naples, like a book of beauty and history that can be read and leafed through, walking through the streets, squares and dark alleys, places rich in a unique past, page after page, step after step. Naples, a land of myths and legends, among the founding stories, the impossible love between the young Posillipo and the beautiful cold-hearted girl named Nisida, who committed suicide because of the lack of affection for her, gave its name to the hill that is now the site of the gods, who transformed Nisida into the small island facing Bagnoli, which overlooks the open sea with a natural tufa amphitheatre and still houses the juvenile prison. Neapolis, the new city, was founded in 470 BC, a date that generically refers to the victory of the Greeks over the Etruscans in the sea of Cuma, a city that was part of the great kolpos kymaios, the protagonist of the wonderful postcard of Naples, namely its gulf, refers to the ancient site where it all began, in the area that we now know as the Pizzofalcone high ground, but once the military base of the Greeks of Cuma from the end of the eighth century BC. And just as every watercourse has its source, ancient Neapolis was born following those rivers that quenched the thirst of the ancient Greeks. From today's Capodimonte and Vomero, the hills from which the water flowed to

the sea, circumscribing the area of the “New Town”. In Via Foria there was the impluvium of the Virgins and the Museum; once through the area of S. Giovanni a Carbonara, the waters branched off into the area known today as the Central Station, formerly marshy and the eastern part of the city, today Arenaccia the third Municipality of Naples. On the other hand, the waters that came from the Vomero hill, flowing along the coast, caused accumulations in the areas between Piazza Bovio and Piazza Municipio. The archaeological remains of the walls, surviving from the past, show us the propensity of a commercial city with its opening to the west towards the sea and a defensive walled line towards the hinterland.

Entering the Neapolitan urban layout, one immediately notices the evident geometricity and symmetry of the intersecting streets. A pattern that has always been recognised as being of ancient origin, which has come down to us thanks to a process of monumentalisation that began in the first century AD, during the reign of Augustus. Naples, like the ancient Neapolis, is crossed mainly by three main streets, in the east-west direction called plateiai or decumani - Via Anticaglie-Pisanelli, Via Tribunali, Via S. Biagio dei Librai - and by about twenty secondary streets in the north-south direction called stenopoi or cardini. This pattern is reminiscent of those drawn by the Greek architect and town planner Ippodamo da Mileto, which may suggest something sacred in the morphology of the city, but the pattern is interrupted by the absence of about three stenopoi, for the vastness of an area of about five insulae, in the area of Caponapoli. This suggests that it was all attributable to an entire area, defined to the west by vico San Gaudioso and to the east by via Armanni. In addition, recent geoarchaeological investigations together with archaeological excavations have brought to light that on the high ground there was a vast area for agricultural use and cultivation, paleosols, i.e. ancient soils testifying to the Neolithic and Enolithic periods. These paleosols have characteristics that are not compatible with current environmental conditions and coincide with the current area from Largo Donnaregina to Sant'Andrea delle Dame.

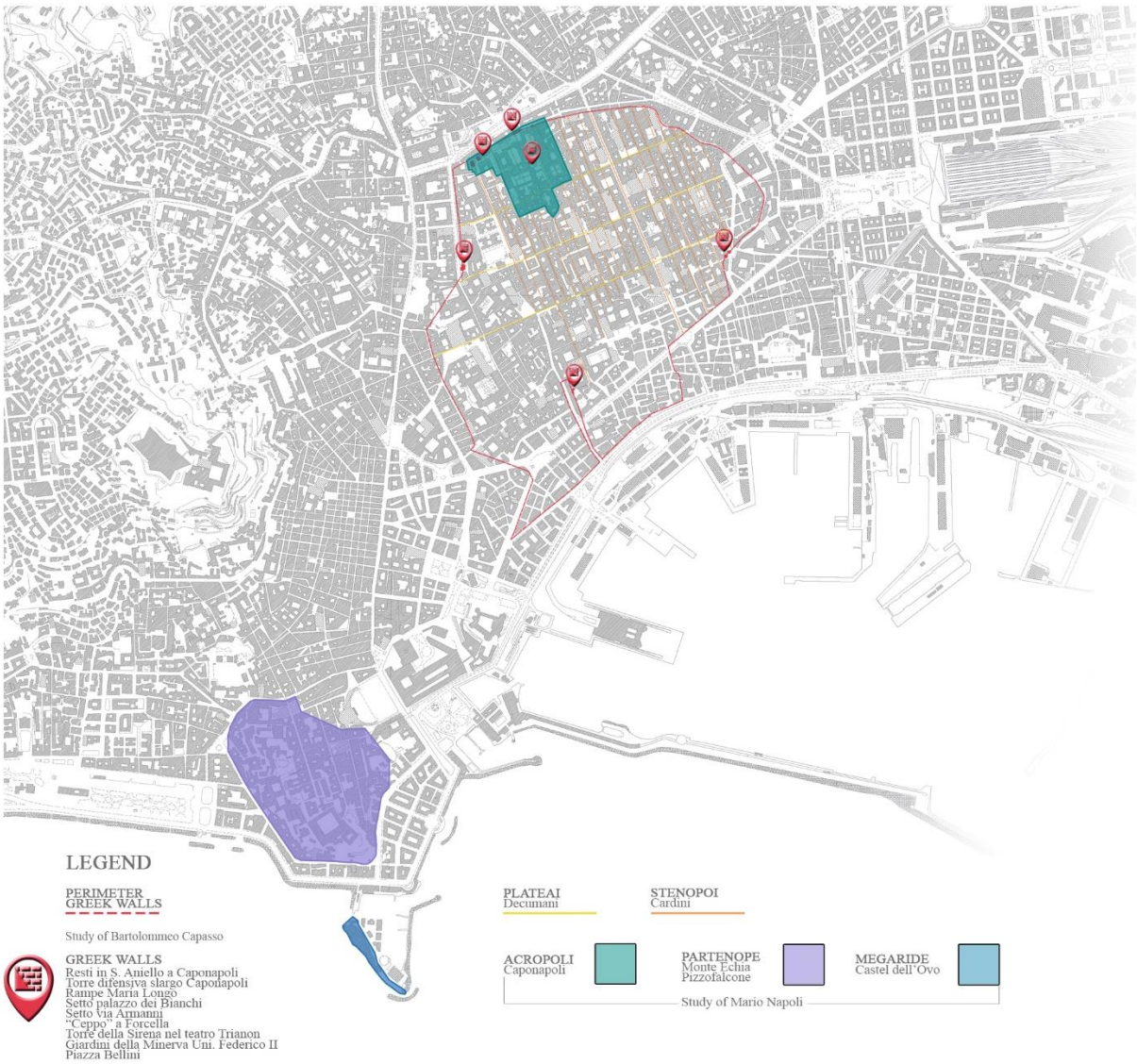

Fig.2: Graphical representation of the city of Naples with the perimeter of the Greek walls according to the study of B. Capasso and the district of Neapolis according to the study of M. Napoli.

1.3 The City of the Sun

Around the middle of the fifth century, the population reached thirty thousand inhabitants and in addition to the acropolis, mentioned above as today's Caponapoli hill, the city was also characterised by the presence of the Greek agora and then the Roman forum, where the public buildings were built, we indicate the area we know today as the main segment of Via dei Tribunali, where once there was the time of the Diòscuri, a place where past and present merge together, in fact, look up and admire the seventeenth-century Basilica of San Paolo Maggiore superimposed on an earlier temple dedicated to the Diòscuri represented by the Greek gods who were the protectors of sailors Castor and Pollux, sons of Zeus and Leda: Christianity dialogues with pagan worship even today, in fact a few steps between the Basilica of San Paolo Maggiore and the church of San Lorenzo, the little street of shepherds and nativity scenes, San Gregorio Armeno, here too the dialogue with the present continues unabated. A recent study carried out in 2019 by two professors from the Federico II University, Nicola Scafetta and Adriano Mazzarella, from the Department of Earth, Environmental and Resource Sciences (DISTAR), shows how the city of the siren may have been built according to the cult of Helios or Apollo, the sun god for the Greeks. A study based on the street interpretation of Neapolis designed as a microcosm inspired by the cosmology of Pythagoras and based on the harmony of the golden section which places the divine sun at the centre of the universe characterised by ten concentric spheres. The centrality of the city, where the temple of the Diòscuri once stood, a Roman temple on whose ruins stands the basilica of San Paolo Maggiore in Piazza San Gaetano, developed around a square measuring 2x2 with a length of 190 metres on each side, a typical measure used for the construction of Greek stadiums. This area is limited by the upper and lower decumani and the hinges of Via Atri and Via Duomo. According to Professors Scafetta and Mazzarella, from the Department of Earth, Environmental and Resource Sciences (DISTAR), the central square is rotated with respect to the cardinal axes by approximately a 1:16 circle and the sixteen-rayed star, which for the Greek population was none other than the one and only Apollo, the sun god. This central square is segmented into ten sectors by the hinges that pass through and defines a circle with a radius equal to $\sqrt{5}$ of 190 metres (Greek stadia) that limits the space of the city inside the walls. This circle also defines another concentric circle with radius equal to $1+\sqrt{5}$ of 190 metres, i.e. twice the golden section, which inscribes a decagon or ten-pointed star that, in turn, simultaneously circumscribes both the outer space of the city and the central square itself as well as the distance between the decumans. Neapolis' special link with the sun appeared on the day of the winter solstice when the sun rose above the Lattari mountains at 36° south-east and during the summer solstice at the same time it appeared 36° above the eastern point. The 36° angle is the golden angle that defines the pentagram and the Pythagorean decagram, and is the fraction of the arc of the ten sectors of the great decagon that characterises the geometry of the city. The geometric proportions between the streets and the walled circle of Neapolis are therefore determined by the golden section, which is linked to the number ten, the decagon and the pentagon, all sacred Pythagorean symbols. In addition, the dawns and evenings on the days of the spring and autumn equinoxes involved the sun, the volcanic complex of Somma-Vesuvius, the hill of Sant'Elmo, and the constellations of Virgo, Aquila and Taurus. The first two constellations recalled the cult of Partenope as goddess and siren, while the third recalled the cult of the Sebeto, the deified river of Neapolis. These indications come directly from the ancient coins of Neapolis showing Parthenope, a bull and a winged goddess in positions that recall the rising of the sun above Vesuvius during the autumn equinoxes when the sun was in the sign of the Virgin, which in Greek is called Parthenos, from which the name Parthenope derives. A city that never ceases to amaze, not even with the passing of the centuries, Professor Nicola Scafetta, quoted earlier in an interview for the corriere del mezzogiorno, said: “La città è stata costruita avendo ben in mente i miti della popolazione che l’ha ispirata, da Apollo a Partenope, servendosi di una simbologia astronomica e matematica. Oggi tutto ciò può risultare casuale, ma in realtà tutti gli indizi ci portano a credere che la perfezione architettonica di Napoli sia stata perseguita per uno scopo ben preciso: omaggiare gli dèi" - The city was built with the myths of the people who inspired it, from Apollo to Partenope, using astronomical and mathematical symbolism. Today this may seem random, but in reality, all the evidence leads us to believe that the architectural perfection of Naples was pursued for a very specific purpose: to pay homage to the gods. -

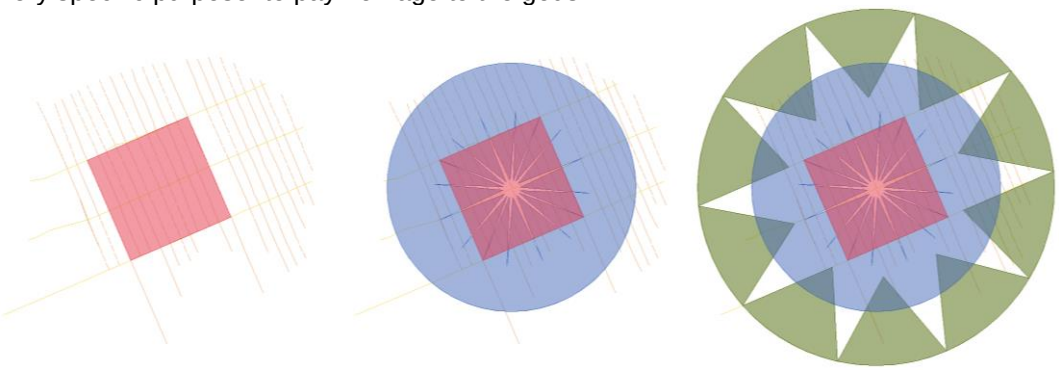

Fig.3: Graphical reconstruction from Prof. Scafetta and Mazzarella's study on the City of Apollo in Naples

2 Naples and its hidden treasures

Over time, the city of Partenope became a focal point for trade thanks to its immense gulf, where ships from all over the world docked every day, but this strategic link between the Mediterranean and Europe sealed the city's importance, at that time, however, it had to defend itself from possible incursions from the hinterland, so here is the evidence of the tufa stone of pyroclastic origin that represents its defence and fortification with walls that still today tell us of a great city that has never completely disappeared. “Un muro con andamento a scarpa costruito con lastre di tufo disposte a ortostati; il muro era ammorsato al retrostante terreno con briglie trasversali poste ad intervalli regolari. La cinta muraria si sviluppa lungo una linea ancora oggi particolarmente evidente nel tessuto urbano” [1] - A scarp-shaped wall built with slabs of tufa stone arranged in orthostats; the wall was anchored to the ground behind it by means of transverse weirs placed at regular intervals. The walls run along a line that is still particularly evident in the urban fabric today. - Fortifications described in full by Antonio De Simone, professor at the University of Suor Orsola Benincasa, Cultural Heritage. Walls built by the Greeks, reused and fortified by the Romans and, unfortunately, often demolished in the not too distant past to make way for new urban settlements. However, it is still possible to nourish knowledge there, and among the many testimonies of particular interest are those surviving on the hill of Sant'Aniello a Caponapoli. The church has undergone major restoration work, after a troubled history, bombed in '43 and damaged by the earthquake of '80, remaining closed for 20 years. This building site of knowledge in 2011, brought to light with a restoration project by the architect of the Soprintendenza BAPSAE, Ugo Carughi, has made it possible to appreciate the ancient remains and decorative apparatus of the 16th century church. Outside, enclosed in a metal cage, are other fortifications of ancient Neapolis. Not far away, near Vico dei Bianchi, there is a short section of wall, also from the Greek era. Subsequently, the urban and anthropic evolution leads to forget what Neapolis tries to tell, as happened in 1959 during the demolition of an old building, in front of Piazza Cavour, to make room for both a new school building and for the construction of the Rampa Maria Longo, walls about 40 meters long, "proseguendo i miei studi sulla fortificazione greca di Neapolis, ho riconosciuto un avanzo delle mura in Piazza Cavour, sotto l'Ospedale degl'Incurabili. Sto procedendo ad accurate ricerche per delimitare esattamente tutto il lato settentrionale della cinta murale. L'avanzo suddetto è rappresentato da un rudero di muro a scarpa, di eccezionale importanza topografica" - continuing my studies on the Greek fortification of Neapolis, I recognized a remnant of the walls in Piazza Cavour, under the Hospital of Incurabili. I am carrying out careful research in order to precisely define the entire northern side of the wall. The remnant is a ruin of a scarp wall of exceptional topographical importance - said Italo Sgobbo, who reported the discovery to Superintendent Amedeo Maiuri on 28 June 1929.
Descending from the Caponapoli hill and walking along Via Santa Maria di Costantinopoli, in what is now a meeting place for nightlife, there are the remains of other Greek walls. They were discovered and brought to light in 1954, during the installation of an electrical cabin, a fortuitous find in the heart of the historic centre between Port'Alba and Via San Sebastiano; according to some scholars, it was part of a tower attached to the gate opening onto the Decumano Maggiore, what we now know as Via dei Tribunali. Other walls have been found and can be appreciated by the students of the University of Naples Federico II, located between Via Mezzo Cannone and Corso Umberto I, in the Minerva courtyard inside the university building, another example, in the Forcella district, located between the Pedino and San Lorenzo quarters, and from there the famous Neapolitan saying "cipp' a Furcella" to indicate something very old, a set of stones, found during the renovation works. Other Greek-Roman remains have been quivering to come to light ever since Naples was eviscerated during the period of the Restoration, noted by the studies of Neapolitan archaeologists Johannowsky and Gabrici, and defined in recent years by resolute documentation during excavations for the construction of the Underground Line. Even today, Naples and its eternal construction site, ranging from Piazza Nicola Amore to the latest finds in the underground area of Piazza Municipio with the discovery of two 11-metre-long Roman ships; eternal precisely because every metre below street level conceals evidence of an ancient past that never ceases to survive beneath our feet. The same thing happened in the basement of a "basso" in an old dwelling in Via Cinquesanti, a road leading to the Caponapoli hill, where the owner invited the most curious tourists to visit the remains of opus reticulatum and brickwork under a trapdoor beneath his double bed, an unexpected visit in exchange for a small fee. Only later, in 1859 for the excavation of a sewer, did the remains of a hidden treasure come to light, and so work began on emptying out this place hidden by more recent buildings, Nerone's amphitheatre partly coming to light again. A particular engineering work of the first century BC, structured with the ancient technique of opus mixtum, particularly used in seismic areas, in fact composed of the reticularum whose task was to disperse the seismic wave and the latericium to block it. A work that saw the exploits of the great emperor Nerone, who chose the amphitheatre of Neapolis as the area in which to perform before his great debut in the Athens Olympics “Nerone fece venire altri Alessandrini, scelse giovanetti dello equestre ordine, che insieme a più di 5000 robustissime persone, prese nella plebe, dovevano imparare, divisi in fazioni, diversi generi di applausi, con istrumenti che chiamavansi bombi, embrici e cocci” [2] - Nerone brought in other Alexandrians, chose young men of the equestrian order, who together with more than 5000

sturdy people, taken from the plebs, had to learn, divided into factions, different kinds of applause, with instruments called bombi, embrici and cocci - words described by the Patenopean historian Bartolommeo Capasso, in which we can understand the importance of this place, at the foot of the sacred hill. The last restoration in Roman times dates back to the Flavian age and it was finally abandoned after a flood and the fall of the empire. Also, in the same area and not far away, in Via Anticaglia, other evidence of Nerone passage in the palace of the Marquis Artiaco conceals the remains of walls made of opus reticulatum, incorporated into the 17th-century structures.

2.1 The great complex of the Incurabili

Quickly turning the pages of the ultra-secular history of the city of myths and legends, and arriving at our recent time, a few days after the evacuation of the former Hospital of Santa Maria del Popolo of Incurabili following the collapse of the church's vault in March 2019, the former extraordinary commissioner subsequently appointed director of Asl 1 of Naples, Ciro Verdoliva, urgently requested funds for the design and execution of the works necessary to “restore, as soon as possible, dignity and new life to this extraordinary, as well as unique, monumental complex in the ancient centre of the city of Naples” [3] In record time with resolution n.171 of 24/04/2019 the Campania Regional Council finances about one hundred million euros for urgent work to ensure the functionality and safety of the site. [4] After the overall historical vision of the city and its geo-social-urban context and with the interpretation of the data starting from a nomothetic approach to an idiographic one, i.e. from the general to the particular, when dealing with the problem of a design intervention for the recovery, restoration and overall re functionalization of a complex such as this one under consideration, the continuity of the complex in elevation, foundation and subsoil must always be taken into account. Respect for the integrity of the monument, a very complex issue that can be framed from many angles, has also been addressed in many important scientific works in the field of geotechnical engineering applied to the conservation of cultural and monumental heritage. An interesting and comprehensive study on the Incurabili Complex was recently carried out by nine working groups, including the Benecon University Consortium based in Frignano in the province of Caserta, whose collaborators included myself, who took part in the digital survey and representation of the architecture. This survey was commissioned by the Asl 1 of the Campania Region with the title: “Requalification, Restoration and Re-functionalization of the Monumental Complex of Santa Maria del Popolo of Incurabili” Campania Region, Asl 1 Naples 2019. Among the surveys and studies carried out on the entire complex, of particular importance were those conducted by INGEO srl, led by the geologist Gianluca Minin, with the assistance of the archaeologist Francesca Longobardo, which brought to light, by conducting 5 geoarchaeological surveys with continuous vertical bending, the presence of geological layers marked by the presence of paleosols and other archaeological materials, presumably originating from structures prior to the construction of this complex. The excavation, comparable to the discovery of the Holy Grail, in the subsoil of the mythical hill of Caponapoli, brought to light the emplèkton, i.e. a building technique typical in Greek antiquity and attested in the Hellenistic period, of the walls of ancient Greece. Another survey concerned the area located on Via Della Consolazione, which during the pre-excavation phase uncovered an early mediaeval or late antique ground surface, due to the characteristic herringbone paving, presumably a road leading towards the city's north gate. Finally, the evidence of a hill that was created as the healthiest place to live close to its pulsating heart, in fact the discovery of eight wells testifies to the presence of former inhabited nuclei, demolished to make way for the important Complesso degli Incurabili, and even deeper down, the presence of yellow tuff quarries, probably used in the past for the construction of the same nuclei of buildings and later destroyed in the 16th century. The wells were probably part of that very line of buildings that gave way to the Pharmacy, the church and the Congrega dei Bianchi, on that hilly area which therefore, together with the discovery of the Greek wall, was once one of the insulae of Neapolis. Among the endless excavations, due to the reemergence of old traces, those relating to the "pool of the incurables" have never come to light. Filippo Ammirati, a professor at the Royal University, described in his essay "Gius Sagro" what was macabrely concealed beneath the sacred hill: “Di che si può temere dall’aria di questa capitale per il fetore che giornalmente esalava dalla piscina ove si gittavano i cadaveri di coloro che muojono nello spitale degli Incurabili, il re fe costruire il nuovo cimiterio fuori Napoli, chiamato Campo Santo (maggio 1762)” - What can be feared from the air of this capital for the stench that daily exhaled from the pool where the corpses of those who die in the Incurabili were thrown, the king had a new cemetery built outside Naples, called Campo Santo (May 1762) - In fact, the Complex and its entire hillside had difficulty finding a healthy area, where not even kilos of lime could stop the stench, the same healthy area that Francesca Maria Longo had chosen to build her devout and charitable work for the sick. The poor remains of patients who could not afford a burial or funeral were thrown into this pool. The solution soon emerged when, in 1762, King Ferdinand IV of Borbone commissioned the enlightened architect of Florentine origin, Ferdinando Fuga, to design and build the 366-pit cemetery, typical for the interesting presence of 366 pits that each correspond to one day of the year, including leap years, real mass graves. A grave capable of housing thousands of corpses, as many as were victims of the plague of 1656, but which was never found. Many explorations have been carried out since the late nineteenth century by Guglielmo Melisurgo and in the last forty years by the

irreducible Clemente Esposito, who has recently given detailed accounts of his search for the unobtainable Incurabili pool, “The pool of the incurables has become a nightmare together with Bruno Miccio and Professor Gennaro Rispoli we are looking for it everywhere under the Acropolis, so when on the afternoon of Monday 14 September 2015 Lucio Orfei phoned me saying that he had found the incurables A strange hatch I replied: I'm coming. The next day I was on site. I was looking at the rectangular trapdoor, right under the centenary camphor tree, on the right; this juxtaposition of the smell of camphor dampening the field of corpses enlightened me” [5], a trapdoor that unfortunately led to nothing more than yet another well, used as a cistern to collect rainwater, located under the threshold. “...in the area of dialogue and care for the sick there was the same space destined for the burial of bodies, like a parable of death and life that was aligned parallel to the streets of the hill that followed the course of the Sun. Today it would seem incredible, yet at that time there was an extraordinary social unicum that encompassed man from birth to death according to a concept of the Latin salus that merged the body with the mind, once again the soul of Caponapoli dictated and inspired the laws of the ethics of science and life.” [6] Gennaro Rispoli's words, which best describe the concept of how sacred and profane, life and death, black and white, in the Neapolitan city, are in fact very often part of the same meaning. This sacred space, as we have already mentioned, is the place where, in Via Maria Longo, a street not far from the upper decumanus and in the heart of the S. Lorenzo district, the Complesso di S. Lorenzo was born. This sacred space, as we have already mentioned, is the place where, in Via Maria Longo, a street not far from the upper decumanus and in the heart of the S. Lorenzo district, the Monumental Complex of Santa Maria del Popolo degli Incurabili was born. As described by Carlo Celano in one of his books from 1692, it was founded in 1521 by the will of a noblewoman of Catalan origin, Maria Longo, who had been miraculously cured of a serious disabling illness and who fulfilled her vow to Our Lady of Loreto, dedicating herself to caring for the sick. Maria Del Popolo, a place where they could take in “i poveri incurabili del popolo napoletano” [7] - the incurable poor of the Neapolitan people - among the diseases they treated were also the "incurable infirmities". In order to build the hospital, Francesca Maria Longo, “aveva provveduto ad acquistare ‘alcune case’ in una zona salubre come quella “detta di S. Aniello”, cioè il sito più elevato dell’impianto greco di Neapolis, l’area che prenderà il nome di Caponapoli e dove sorgerà la chiesa di sant’Agnello Maggiore fondata nell’alto medioevo” [8]. - had provided for the purchase of 'some houses' in a healthy area such as that "called S. Aniello", i.e. the highest site of the Greek settlement of Neapolis, the area that would take the name of Caponapoli and where the church of Sant'Agnello Maggiore founded in the early Middle Ages would rise. - It all starts from the base of five insulae delimited to the west by the alignment of stenopoi, which descend the hill - largo Madonna delle Grazie, Vico San Gaudioso, Via Atri, Via Nilo and Via Paladino) and to the east by the junction of Vico Consolazione and Via Santa Patrizia, which vanishes under the Complex of Santa Patrizia and under the seat of medicine and surgery of the University of Campania "Luigi Vanvitelli" and then reappears in Piazza San Gaetano to continue in Via S. Gregorio Armeno, today the protagonist of the city. Gregorio Armeno, now a protagonist and famous for its nativity craft shops. The evidence that has come down to us today, thanks to the Neapolitan jurist and philosopher Gaetano Filangieri, and his monumental reconstruction of the view of a hill that over the centuries has undergone continuous volumetric changes in terms of town planning and settlement, is of fundamental importance for retracing its history. In fact, before arriving at the "monastic citadel" that it took on in the 16th century and that we all know today, it is good to understand its metamorphosis and evolution. A careful analysis of the provisions described by Filangieri: “…nel ricercare diligentemente della sua ubicazione, rifacendoci sulla disposizione antica delle strade e degli edifizii di vario genere, che occupavano l'area, su cui sorsero poi la chiesa ed il monistero, o che stavano intorno all'area medesima, ci siamo abbattuti nelle case della famiglia del nostro famoso Giambattista della Porta, in quelle dei Golino, nelle case del famoso protomedico di Carlo V, dottor Narciso Vertunno, in quelle del Conte di Potenza, in quelle degli Stendardi, in quelle dei della Gatta, ed in quelle infine di messer Jacopo Sannazzaro, poste a Capo de trio, di fronte a Regina Coeli.” [9] - …in diligently researching its location, referring to the ancient layout of the streets and buildings of various kinds, which occupied the area, on which the church and the monastery were later built, or which stood around the same area, we came across the houses of the family of our famous Giambattista della Porta, in those of the Golino family, in the houses of the famous protomedico of Charles V, doctor Narciso Vertunno, in those of the Count of Potenza, in those of the Stendardi family, in those of the della Gatta family, and finally in those of messer Jacopo Sannazzaro, located at Capo de trio, opposite Regina Coeli. - buildings that have been lost or altered by successive restorations and adaptations, and perhaps to make way for the current Complesso degli Incurabili.

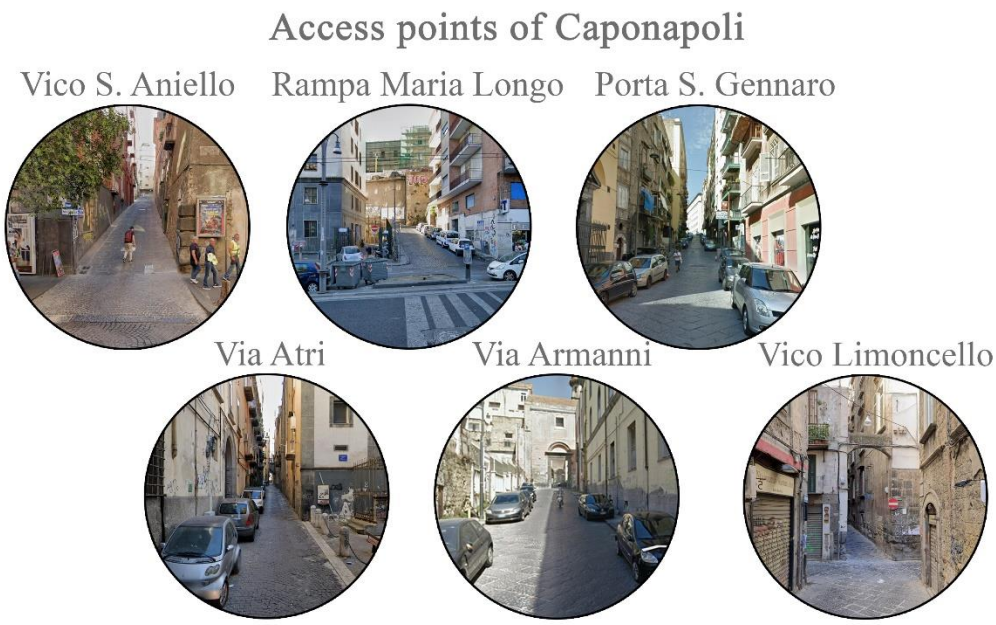

Fig.4: The main access points for Caponapoli.

2.2 The infinite expansion

In 1412, the buying and selling of buildings and plots of land in the area of the Caponapoli hill began, including in 1453 those that would affect the construction of the church of the Padri Pisani, with other purchases at the beginning of the 16th century, the complex reaching its present size. Regarding the Pisan Fathers, Filangieri recounts that they had to 'fight' against the insistence of the Governors of the Hospital Complex, who wanted to purchase the area at all costs. Until 1799, when the convent of the Padri Pisani and the Bottizelli garden were transformed into today's medical garden, which became the most sought-after medical school of the early 19th century, the Cerusico Medical College. This college was founded during the period when Joachim Murat and later the Bourbon rulers had power over the kingdom of Naples. Its destiny came to an end in 1871 when the college was closed by the Unitary government and later reopened as a fee-paying hospital.
The Monastery of Santa Maria Regina Coeli in Via Sapienza, founded after the purchase of Palazzo Montalto by the Lateran nuns, who resisted the pressure of the governors of the nearby complex, was of great importance. In 1812, the Sisters of Charity came to live there and it is thanks to them that the building, including its interior and furnishings, has been preserved as if time had never passed. Two years earlier, in 1810, Gioacchino Murat, under the command of Letizia Bonaparte, Napoleon's mother, signed a decree admitting the order of the Society of the daughters of Charity of Saint Vincenzo de' Paoli, i.e. the reign of the Institute of the Hospitaller Sisters of Charity, and also opened an access that led directly from the Regina Coeli monastery to the nearby Incurabili hospital complex, thus facilitating the coming and going of the sisters who served there. This was a strategic move to stem the problem and allow the most important hospital establishment in the kingdom of Naples to spread like wildfire. After the foundress's death, her charitable work did not stop, but continued to grow, with works of art and patients. In 1656 alone, more than fifteen thousand sick people a day passed through the gates of the hospital, which became a place of hospitality and holiness. In fact, among the beds of the inmates there was also Saint Joan Antida Thouret, founder of the congregation Sisters of Charity, who provided "attività assistenziale" [10] – assistance - and a saintly doctor, Giuseppe Moscati, other luminaries over the years offered their scientific knowledge in the medical-surgical field in this particular corner of the city's solidarity. A chain effect that led to the demolition of the noble palaces and convents on Vico Sole, such as palazzo D'Aponte, palazzo De Curtis, the church of Santa Maria della Sapienza and the church of the Croce di Lucca, which was partly pardoned and deprived of its apse, due to the commitment and opposition of Benedetto Croce. The destruction of the great historical and monastic heritage gave way to today's First Hospital of Naples. In the 2000s, it was planned to demolish the entire hospital, transferring it to the Leonardo Bianchi - a former mental hospital on the edge of the Calata Capodichino - thus freeing the lower part of 20.000 square metres and the upper part of 9.000, to make room for the large archaeological park and bring to light what the nearby Caponapoli hill had already anticipated with its Greek memories, a project that was later abandoned [11]. The sacred hill has always been a point of reference for all kinds of science and life. It was with the decree of 28 January 1807 that Giuseppe Bonaparte set up the astronomical observatory at the nearby monastery of San Gaudioso, run at the time by the director and astronomer Giuseppe Cassella, until Gioacchino Murat moved the Neapolitan observatory a short distance away to Miradois Hill, the nearby rise of Capodimonte. It was in this observatory, with its monumental architecture, that Carlo Brioschi observed the star α Cassiopeia, representing the legendary Queen of Ethiopia, on the evening of 17 December 1819. As we have seen

in the previous pages, Caponapoli was not only a place of doctors and benefactors, but also an enclave of alchemists in search of an elixir to cure all ills, as the frescoed cloister of the Incurabili confirms, and of those academies such as the Otiziosi and the Investiganti that in ancient times were the flower of erudition and knowledge of occult knowledge. This admirable hill was also home to heroes and martyrs such as Domenico Cirillo, whose sacrifice coincided with the renewal of thought that was spreading there. As Gaetana Cantone [12] recalls, in addition to the work needed to meet the new requirements, Domenico Antonio Vaccaro and Alessandro Manni were also involved in artistic matters, so that in 1549 the hospital was equipped with a temporary apothecary's shop, and then in 1744 the drugs were housed in 400 majolica vases finely decorated by master Donato Massa and placed in the hospital's new pharmacy. The pharmacy was located between the Great Hall and the laboratory room, also known as the Counter Pharmacy. During the Bourbon period, in addition to medicine, curative herbs were studied here. Bartolomeo Vecchione was the founder of this pharmacy, one of the most important in Europe. This is a place of research and art, with a painting on the ceiling by Pietro Bardellino depicting a character from Greek mythology, Macaone, healing a wounded warrior. Below, a magnificent tiled floor with wooden allegories at the sides of the imposing apothecary's shop, perforated to house the ceramic vases, and embellishing the vast hall with frescoes under the vaults of the porticoes, symbolic representations of Paracelsus's world and the alchemic and esoteric world [13]. Returning to the unstoppable expansion of the hospital complex, the governors, between 1533 and 1545, succeeded in obtaining the addition of a courtyard, previously bought from the friar Pietro Nicolò Scarano in 1522, together with a house with an adjoining kitchen garden in vico del Corniolo [14], an alley of particular importance because it was a common element in the fusion of several settlements, from the area around San Gaudioso to the church of Santa Patrizia. This peace lasted for the convent only 138 years, until 1727, when the governors again tried to obtain new buildings to enlarge the hospital complex, succeeding with the suppression of 1809, when the convent was incorporated into the Filangieri hospital. [15] Naples, a bit like the pages of an old book, stuck together and crumpled by wear and tear and time, difficult to read and therefore difficult to interpret, unclear facts to reconstruct the social economic fabric of a street or an area of the city, probably due to the ephemeral mobility of citizens forced to change houses or shops in order to survive. An example of a cross-section of daily life set in the post-war 1950s is recounted in a comic and surreal key in the film directed by Mario Monicelli "Totò cerca casa" (Totò looking for a house), the story of Beniamino Lomacchio, who was forced to change his home because it was bombed during the Second World War; he lived first in a schoolroom, then in a cemetery, in a painter's studio and even in the Colosseum, and finally in a luxury flat which he rented at the same time to other tenants. “Napoli è un'immensa locanda; perciocché, eccetto le rare mansioni fisse di alcuni prediletti dalla fortuna, tutto il resto si dà in fitto. Il primo di gennajo si appiccano dappertutto i Si Loca, e in forza del diritto che concede un Si Loca si possono girare le più segrete stanze d'ogni famiglia, e spiare i fatti di tutta Napoli domestica (...). Ogni casa domestica è venduta e rivenduta da diverse famiglie, sino a trenta volte il giorno. Voi vedete innanzi d'ora in ora fisionomie sempre ignote: vecchie ciarliere, curiose, farvi cento inchieste; interrogarvi dell'acqua, se di pozzo o di formale, dell'esperienza di buoni o cattivi augurii, se vi è morto qualcuno, se si vede la bella 'Mbriana o il Monaciello: e cento inezie a cui civiltà e usanza vuol che si risponda... È un baccano, un bazar di nuovo genere, di cui non potete liberarvi si che la casa non è affittata e spiccato via il fatale Si Loca.” [16] - Naples is an immense inn; therefore, except for the rare fixed jobs of a few lucky ones, everything else is rented out. On the first of January, the Si Loca are set up everywhere, and by virtue of the right that grants a Si Loca, one can wander through the most secret rooms of every family, and spy on the affairs of the whole of domestic Naples (...). Every household is sold and resold by different families up to thirty times a day. You see in front of you, from hour to hour, physiognomies always unknown: old women chattering, curious, making a hundred enquiries; asking you about the water, if from the well or from the formal, about the experience of good or bad wishes, if someone has died, if you see the beautiful 'Mbriana or the Monaciello: and a hundred trifles to which civilisation and custom wants you to respond... It is a hubbub, a bazaar of a new kind, which you cannot get rid of unless the house is rented and the fatal Si Loca is taken away. - These are the verses that best describe what was happening in the Partenopean city, quoted by the Italian poet and playwright, Giovanni Emanuele Bidera. "O quatte 'e maggio', i.e. the fourth of May, is a day of particular importance for the Neapolitan people, established by the Spanish viceroy Pedro Fernández de Castro in 1611. On this day of the year, families, merchants and entrepreneurs of the time, moved house or renewed their leases. Families would wander the city's alleyways, carrying what they could carry with them from their homes in an agonising search for a new place to live, or merchants would be forced to change location. In short, a tale often disjointed and shuffled like a pack of cards. The last page of the story of the more or less revealed secrets of the siren Partenope takes us back to the beginning of the narrative with 'a capa di Marianna, solitary and thoughtful with her face now pockmarked by time, confined to a corner of Palazzo San Giacomo, the seat of the first citizen. Marianna with her half-closed lips seems to indicate to us, like an oracle, the destiny of Neapolis: everything is unchanged, everything is changeable if there is the will not to forget, preserving and preserving our immense and unique heritage enclosed in this Great Beauty, Naples continues to amaze!



Fig.5: Panoramic view highlighting the Caponapoli hill.

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Design of landscapes out of context

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Abstract
The paper describes the design of murals and installations in public spaces and factories created in the last two years by the author in the Campania Region, Italy. In particular, the murales carried out are: The women's and kids' anti-violence center, Municipal Police in Alessandro Poerio street n. 21 and the Multifunctional Center in the Soccavo district for the Naples City Administration; NapolIDEA in the University Parthenope of Naples; the COELMO industrial and marine generators in Acerra (Naples); the IDAL Group factory for metal carpentry and naval industrial fornitures in Salerno; the Global Logistic System office in Ferrante Imparato st. in Naples; the Luise Pier in Naples with installations for the Carpisa and Yamamay brands. The murales represent cultural assets and landscapes of Campania and international cities, icons of the UNESCO World Heritage, linked to the cultural and entrepreneurial activities of the clients, 'out of context'. The goal is to enhance public and private spaces, and to strengthen, in the case of private murals, a link between the workplace and the art spaces. There is the desire to be inspired by factories built as works of art, in which workers can find an environment that also stimulates their productivity and social life. Best practices and references are Peter Behrens' AEG turbine factory, the industrial city of Ivrea in the 20th Century, UNESCO World Heritage, and the Olivetti factory in Pozzuoli by Luigi Cosenza.

Keywords: Design, representation, landscape, cultural heritage, artwork

The design of non-places and cultural heritage out of context

With the advent of the new millennium, new artistic forms are imposed in the urban space. Street Art in all its forms becomes the undisputed protagonist of the streets. Graffiti Writing and Street Art become the most widespread artistic expressions throughout the planet: it is almost impossible, in fact, to find urbanized cities totally devoid of any form of Urban Art. Abandoned buildings, peripheral walls, facades of buildings, street signs, all the urban settlement is considered as a white canvas on which to paint, also managing to transform non-places into places and to represent places out of context [1] [2].
Alessandro Ciambrone, architect and artist, bases his artistic experience on the representation of iconic places of cities, cultural landscapes, often UNESCO World Heritage Properties, not only in Campania, the region in which he operates, but all over the world. His performances do not belong to the classic repertoire of writers: they are authorized and agreed with public institutions or with entrepreneurs and made in public and private spaces. These do not have the objective of challenging political management or globalization, but of sending a clear message: the enhancement of cultural heritage, in the case of public spaces; and the internationalization of companies, with their cultural and economic exchanges in the case of private customers. Graffiti Writing, that is the practice of painting on walls, usually with a spray can or felt-tip pens, is a democratic and proletarian artistic-cultural expression, contested and enhanced at the same time. For all these characteristics, it can be defined as a dynamic and lively art [3].
Mural is to the walls what tattoos are to the body. By tattooing the walls, the writers free them from their architecture and transform them back into a socially vital substance, in the vibrant body of a city, as it was, before being stigmatized by its functions and institutions [4]. Over the years the murals have settled in the territory, communicating with it and characterizing its structure (they are often

present in industrial or peripheral areas). This expressive form can therefore be understood in the genius loci of a city [5].
Over the years, writers lose their anonymity, assert themselves through the acquisition of a territorial identity, recognize themselves with places [6]. A competitive aspect between artists is increasingly affirmed which leads to the quality of artistic results. The keyword is to innovate: school education is certainly not discriminatory, what counts is creativity and inspiration that is based on images produced by mass culture or found on the street, but subjectively reinterpreted [7].
With writers and murals, the urban scene is enriched with colors in freedom, with imaginative sketches, genius and rebellion. One always tries to do better, to amaze with things never seen before; each representation had to be as big as possible, be admired, overcome the distraction of the metropolis, attract all eyes to itself in the moment of its greatest glory [8].
The characters of the spectacular are reflected in the artworks of Ciambrone. In particular, with regard to works in factories, the desire is to bring art back to the workplace. For example, the factories that scientific historical critics have considered real works of art such as Peter Behrens' AEG turbine factory, the industrial city of Ivrea by Adriano Olivetti, or the Olivetti factory in Pozzuoli, Campania [9].
In architecture Behrens renounced the decorative elements of art nouveau in favor of greater functionality, with rigorously simple, square and sober volumes, stripped of any ornamental virtuosity if not connected to a better visual explanation of the functional logics intrinsic to the building organism: thus, industrial constructions were obtained which rose to artistic dignity and, in line with the AEG's aim, were configured as the supreme synthesis of man and machine [10].
Ivrea, industrial city of the twentieth century, is included in the World Heritage List. The site, which is located in Piedmont and extends for over 71 hectares, consists of an urban and architectural ensemble, almost exclusively privately owned, characterized by 27 properties including buildings and architectural complexes, designed by the most famous Italian architects and urban planners of the XX century. These are buildings built between 1930 and 1960 for production, social services and residential purposes for the employees of the Olivetti industry. The overall unitary value of the site lies in the union between the new expressive capacity of these modern architectures and the recognition of their being part of an exemplary economic and social project. Olivetti's proposal stands out in the panorama of 20th century community proposals for the heterogeneity of cultural references at the basis of the idea of community, and for the role assumed by the factory, which is entrusted with the task of driving wealth and fulcrum of social relations.
The proposal was realized thanks to the means made available by Olivetti and the city became the experimental laboratory of the theories and urban planning debate of the XX Century. The Olivetti plant in Pozzuoli, designed in the 1950s by Luigi Cosenza, is an example of architectural integration in the natural landscape of the Pozzuoli coast. At the inauguration in 1955 Adriano Olivetti stated: Facing the most singular gulf in the world, this factory has risen, in the architect's idea, in respect of the beauty of the places and so that beauty was a comfort in everyday work. The factory was therefore conceived on a human scale, so that one could find in his/her orderly workplace an instrument of redemption and not a device of suffering.

The Women's and Kids' anti-violence Center, Municipal Police in A. Poerio 21 Naples

On 25 November 2020, on the occasion of the World Day against women's violence against in the space outside the Center for Women, headquarters of the Municipal Police for the Protection of Social Emergencies and Minors, in Alessandro Poerio 21 street, was presented the 'Illuminated Scugnizzi' mural donated by Ciambrone to the City of Naples. A beauty intervention to make even more visible, to those in need, a 'friendly' place in which the 'Listening Room' of the Municipality of Naples is located



(a protected listening place) dedicated to women and minors, where one can go to report conditions of abuse and start the difficult but necessary path to save ourrself and her/his own children from direct and indirect violence through the support of the institutions. The mural depicts some iconic places of the city such as Vesuvius and Piazza Plebiscito illuminated by colored stars representing the 'Scugnizzi' of Naples.



Multifunctional Center in the Soccavo district, Naples

In April 2021, two murals were created and donated by Ciambrone to the City of Naples for the Soccavo Multifunctional Center. The first of 70 square meters that represents the historic center, Spaccanapoli, to create an ideal link between the ancient center and its suburbs. The second of 30 square meters dedicated to Diego Armando Maradona entitled 'Diego and his scugnizzi'. In sacred and profane symbolism, the triangle and the circle refer to a superior, divine entity. The body-10 and the pelota-head are intertwined with the luminescent explosion of Vesuvius, aligned with the Pibe and at the center of the scenic representation. Around and suspended ten illuminated ‘scugnizzi’, the Champion Team, which are reflected in the seawater field and in the sky, among a thousand colored and kaleidoscopic beams of light. The stadium is an amphitheater made up of pieces of the city, with its most significant monuments and the most popular neighborhoods. The stadium-city overlooks the sea in a game of sailing houses on the waves that have made immortal the bond between Naples and the sea. Everything is expressive power and dynamic joy in the fraternal gaze of San Gennaro and in the stadium-city of Diego Armando Maradona.


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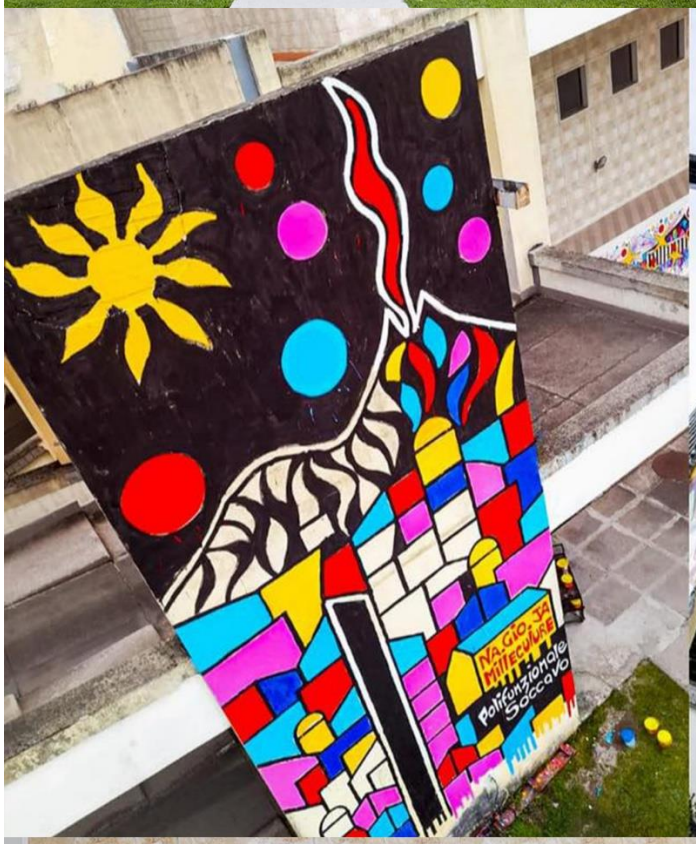
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NapolIDEA in the Naples Parthenope University

The 'NapolIDEA' mural wins the DISAQ Excellence 2020 competition organized by the Department of Business and Quantitative Studies of Parthenope University. Naples, one of the most important port cities in the Mediterranean, was included in the UNESCO World Heritage List because the urban layout, the ancient center, the architectures, the intangible traditions are the result of countless cultural contaminations that have helped to outline its Outstanding Universal Value. Founded by the Greeks in 470 BC, the city receives Roman, Byzantine, Norman, Swabian, Angevin, Aragonese and Bourbon influences that make it one of the most significant cultural and economic centers in the world. Architectures and historic buildings become pages of colored books that, like kites, take flight in search of new perspectives. The Greek letters remind us that there is no future without memory and enhancement of one's history. The egg of the tradition of Publio Virgilio Marone, the 'magician' poet, is a symbol of eternal life and rebirth. The egg is also a lamp, an icon of ideas and innovation, positioned in the water because in the sea the people of Campania have found the strength to broaden horizons, develop visions, create economic value and global economies. Through different types of boats, it is remembered the Maritime Republic of Amalfi, the Real Marina of the Two Sicilies Kingdom, the owners and the shipping companies. Knowledge is the ability to understand socio-economic context, scientific innovation, moral wealth, sustainable development.

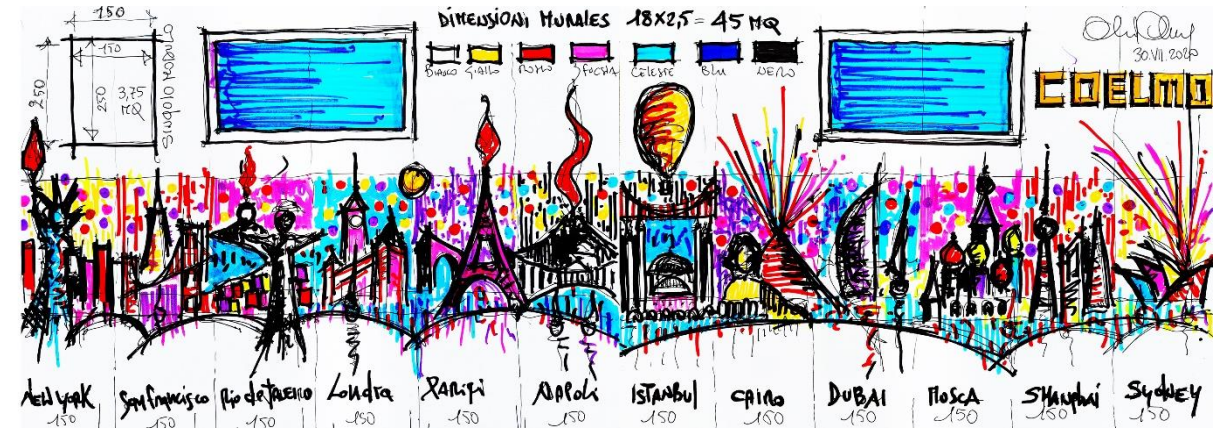




The COELMO industrial and marine generators in Acerra, Naples

In 2020 an entire wall of the factory was transformed into a ‘fresco’. A 50-meter artwork titled ‘A World of Opportunities, inspired by 12 iconic cities worldwide with which Coelmo in Acerra, in the Naples province, has its main cultural and commercial networks: Sydney, Shanghai, New York, Rio de Janeiro, London, Paris, Naples, Istanbul, Cairo, Riyadh, Dubai, Moscow. The mural by Ciambrone is located in the new third Coelmo production plant, in which are designed and manufactured industrial and marine generators since 1947. The idea to represent the most significant icons of 12 cities that have the greatest number of economic relations with the company is in line with the mission, suported by Coelmo, of promoting beauty and optimism even in a place typically voted to the rationality: because beauty creates the conditions to improve the quality of work and, hopefully, company results and assets. Additionally, murals were realized in the workers' mess hall and a 2021 calendar was realized, which represents the 12 cities of the mural. The limited number of calendars were donated to the Coelmo's main customers and supporters around the world.



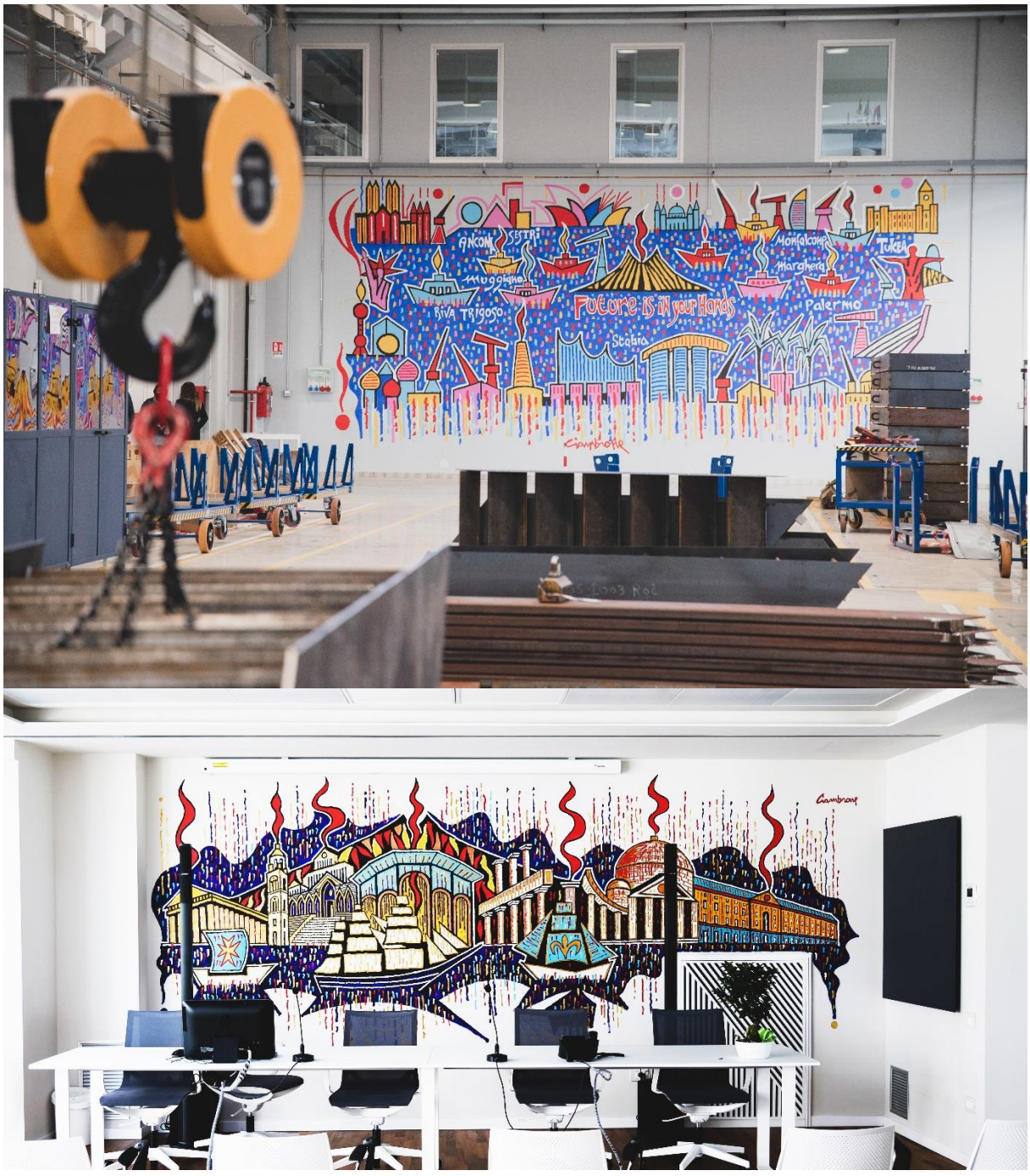




A World of Opportunities: murals and sketch / 2021 COELMO calendar

The IDAL Group factory for metal carpentry and naval industrial fornitures in Salerno

The new IDAL Group headquarters in Salerno focuses on architecture and art. Five murals for a total of 100 square meters characterize the reception and processing spaces in a kaleidoscopic explosion of colors. The pictorial cycle tells the passion of the founders of the company for their identity roots, for the sea, for an always open relationship with the Workers who are the driving force behind excellent products. The five murals are positioned: in the conference area 'Sala Campania d'Oro'; in the lounge bar, resturant, and co-working area 'Sala Mediterraneo'; in the Workers' relax area 'Sala Pibes de Oro'; and in the processing area 'Sala IDAL Group'. 'Future is in your Hand' is the slogan of the 50 square meter mural in the processing room. The company is represented by Vesuvius and its explosive flame, a symbol of innovation. Vesuvius is an island connected to the main international locations with which the Group has economic and cultural relations, and cultural is the idea of connecting the nine ships, which represent the main production poles in Italy and Romania, with the IDAL production poles in the world. The first are Monfalcone, Marghera, Tulcea, Sestri Ponente, Riva Trigoso, Muggiano, Stabia, Ancona, Palermo. The main international locations, represented through their icons, are Barcelona, Montreal, Sydney, Istanbul, Dubai, London, Rio de Janeiro, Rotterdam, Valletta, Miami, Singapore, Hamburg, Marseille, St. Petersburg, Shanghai and New York.



The Global Logistic System office in Ferrante Imparato street, Naples

The idea of the Global Logistic System mural in Via Ferrante Imparato in Naples, created in 2021, stems from the desire to connect the architectural structure to the artistic realization. A wooden suspended bridge connects two bodies of technical and administrative services in the same factory. Ciambrone creates an ideal bridge, in continuity with the wooden bridge, which overlooks the sea and is characterized by some icons of the Neapolitan cultural landscape: the Castel dell'Ovo, the Church of Santa Chiara, Piazza del Gesù, Vesuvius, Piazza Plebiscito, Royal Palace, the Cerosa di San Martino and Castel Sant'Elmo. At the end of the city-bridge, a colored explosion frames the GLS company logo. Other murals are planned in the same architectural structure and in particular in the cafeteria area and in the conference room, with the idea of enhancing the places of the Campania heritage (Cilento, the Amalfi-Serrentina coast, the islands of Capri, Ischia and Procida) and some European heritage sites, to emphasize the GLS cultural and commercial network on the Continent.

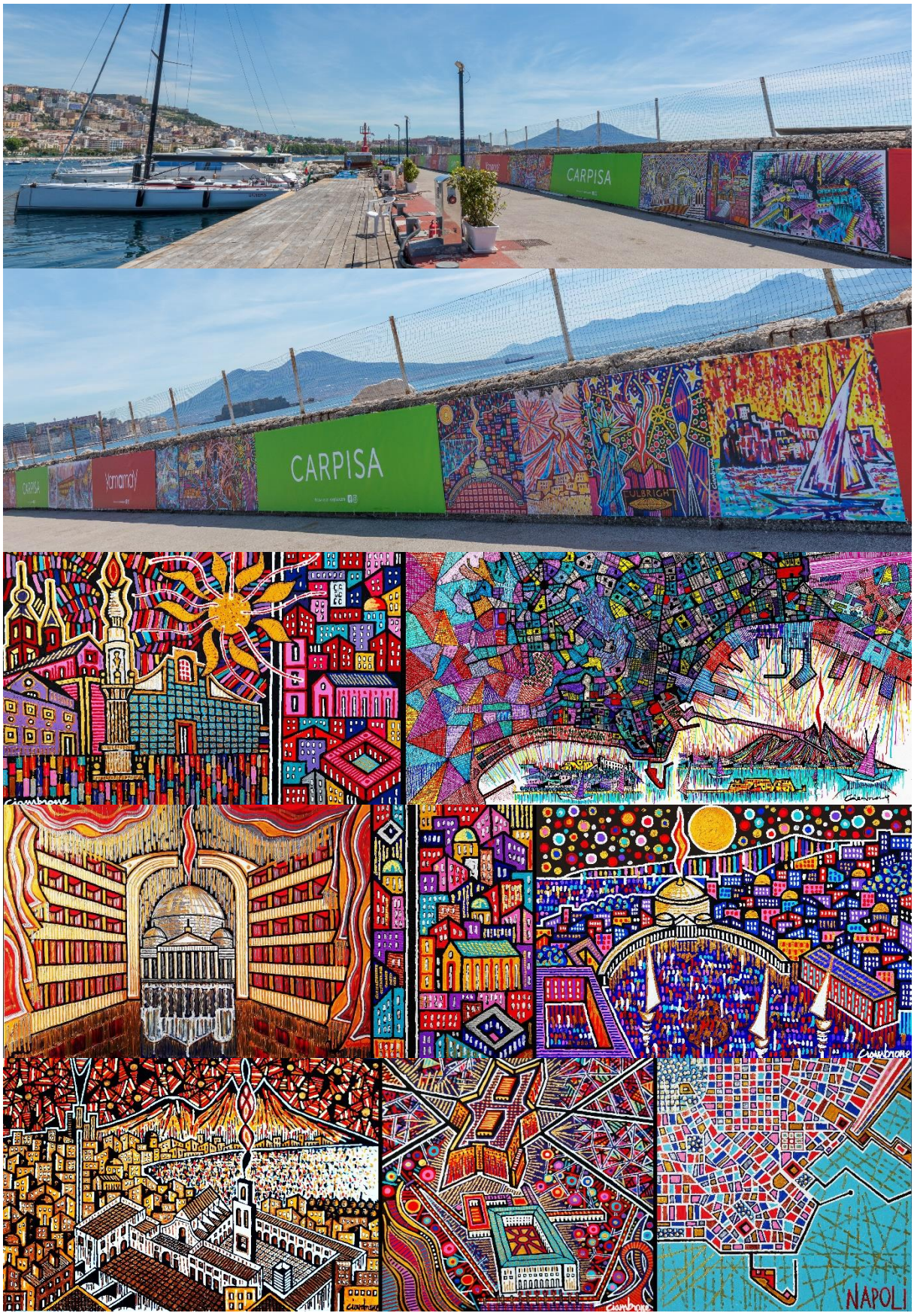




The Luise Pier in Naples with installations for the Carpisa and Yamamay brands

The realization of a 200 square meter installation on the Luise Pier in Naples is in 2021 and aims to promote the landscape, cultural, tangible and intangible, heritage in Campania by the Carpisa and Yamamay brands, which financed the initiative. The location is certainly strategic for the frequentation of the pier by citizens, tourists and many people who arrive in the city with their boats and yachts. Ciambrone chooses his most representative works of Campania heritage, including icons of intangible heritage such as San Gennaro and Diego Armando Maradona. All the World Heritage Properties in Campania are represented (Naples, Caserta, Amalfi, Pompeii, Cilento, Benevento in the Italia

Langobardorum serial network), the islands of the gulf, the two UNESCO Man and Biospheres National Parks of Vesuvius and Cilento. Ciambrone collaborates with Pianoforte Holding (Carpisa, Yamamay, Jaked) and has created murals and pictorial panels for two stores in Milan, and some important international Solidarity campaigns such as 'Love has a weight' and the donation to the Santobono Pausilipon Foundation of Naples.



Conclusions

The artworks created by Ciambrone are linked to the design and representation of cultural heritage Drawing as a circumstantial paradigm is inspired by the lesson of Giovanni Klaus Koenig who believed that the boundary between survey, project drawing and pictorial work is much more evanescent than one might believe. The scientific and artistic work describes research, inspections and projects developed in World Heritage Properties of excellence in Italy and abroad with critical annotations and study drawings relating to the representation of architecture and landscapes through the codes and criteria for reading cultural heritage, material and intangible, defined by the UNESCO criteria. Ciambrone, in his works, illustrates the cultural, academic and professional experiences, matured in the last twenty years, in the scientific disciplinary sector of design and complex representation in which he participated, as a Researcher at the Benecon University Consortium (Research Center on Cultural Heritage, Ecology, Economy, Service Design), headquarters of the UNESCO Chair on Landscape, Cultural Heritage and Territorial Governance. The works are characterized by the texture of the drawing, which structures them, and by the colors that in his canvases and murals, even before the images, impress the whole soul of the places through the graphic structure. The artworks are an explosion of layered colors, to form a dense pictorial material that enhances the idea, of architectures chosen from among the wonders of the Campania heritage; the symbolic essence is sought out of them, so that the large audience to whom it is addressed can make a personal evocative interpretation. The details give way to the dream of swirls and soft lines, circles and rain of gold, silver and copper. Even the night skies always shine with radiant light. There are no human figures, but only because the essence of man is recognized in the beauty of what one has produced. In fact, this is the poetic message: man was born to live in Beauty, and he must vote his life to it, only in this way he will be happy (Ciambrone, 2021).

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