

Call for applications for admission to XXXVIII Cycle of Politecnico di Bari PhD Programmes

Attachment 4

PhD PROGRAMME IN

HERITAGE PLANNING: KNOWLEDGE, TRADITION AND INNOVATION

Project Identification Code (CUP): D93C22000540001; D93D22001350001

XXXVIII CYCLE DOCTORATE PROGRAMME PROFILE	
DEPARTMENT	Department of Civil Engineering and Architecture Sciences
COORDINATOR	Prof. Giuseppe Fallacara (giuseppe.fallacara@poliba.it)
PLACES AVAILABLE	12
	of which
Places with Politecnico di Bari grant	3
Places with Politecnico di Bari grant reserved for graduates from non-Italian universities	1
Places with grant funded by NRRP – as per Ministerial Decree 351/2022	3
<u>Refer to research topic list below</u>	of which: GRANT N. 1 - Area: Public Administration; Topic: “The 15 minute city as a model of urban transformation through NRRP projects”; GRANT N. 2 - Area: NRRP; Topic: “Fibre architecture: stereotomy and new fibre technologies for complex spaces”; GRANT N. 3 - Area: Cultural Heritage; Topic: “Archaeological areas in Mediterranean stratified cities”.
Places with grant funded by NRRP – as per Ministerial Decree 352/2022	2
<u>Refer to research topic list below</u>	of which: GRANT N. 4 - Co-funded by: Metallurgica Ledrense soc. Coop.; Topic: “Restoring shape to the land of historic landscapes: project techniques and innovative building systems for the critical refiguration of topography in ancient sites”; GRANT N. 5 - Co-funded by: Manzi Marmi s.r.l.; Topic: “Innovative forms and techniques for a project in raw earth and recomposed stone mortar: strategies for circular”.
Places without grant funding	3
ADMISSION REQUIREMENTS Applicants to the PhD programme in Heritage Planning: Knowledge, Tradition and Innovation must hold a second level (specialized) degree	<ul style="list-style-type: none"> ➤ Degree diploma in Architecture awarded prior to Ministerial Decree 509/99 ➤ LM-2 Archaeology ➤ LM-3 Landscape Architecture ➤ LM-4 Architecture and Building Engineering ➤ LM-4 Single Cycle 5-year degree in Architecture and Building Engineering ➤ LM-10 Architectural and Environmental Heritage Conservation ➤ LM-12 Design ➤ LM-23 Civil Engineering ➤ LM-24 Building Systems Engineering ➤ LM-35 Environmental and Land Engineering ➤ LM-48 Urban and Environmental Land Planning

	<ul style="list-style-type: none"> ➤ LM-89 History of Art ➤ 2/S Archaeology ➤ 3/S Landscape Architecture ➤ 4/S Architecture and Building Engineering ➤ 10/S Architectural and Environmental Heritage Conservation ➤ 28/S Civil Engineering ➤ 38/S Environmental and Land Engineering ➤ 54/S Urban and Environmental Land Planning ➤ 103/S Theories and Methods of Industrial Design ➤ 95/S Art History; ➤ Degree qualifications awarded by foreign universities officially recognised as equivalent to the above degrees¹.
<p>COURSE PROGRAMMES (successful candidates to select from this list at enrolment)</p>	<ul style="list-style-type: none"> ➤ Programme 1 – Historical Heritage: In line with UNESCO categories and proposals (Cultural Landscapes and Historic Urban Landscapes/HUL), the programme research focuses on forms of Italian and Mediterranean cultural landscapes (archaeological, architectural, urban and natural), their invariants and their processes of transformation. Studies address projects for the conservation, re-use, restoration and enhancement of architectural heritage geared towards a re-proposal of its numerous distinctive features. ➤ Programme 2 – City and Local Area: The fields of interest developed in this programme highlight the wide range of concerns within an architectural project; studies of local areas, landscapes and contemporary cities are organised into different lines of research which integrate their areas of knowledge. These include the following: the relationship between land and settlement patterns; open spaces and closed spaces in contemporary extended cities; settlement patterns in the renovation of areas and reconstruction following natural disasters; the role of infrastructural projects and land conservation projects within landscape configuration. ➤ Programme 3 - Construction: Programme research focuses on the relationship between architectural planning and structural concepts, both for new projects as well as those of existing structures. Initial research themes include the relationship between form and structure in 20th and 21st century architectural planning and the “invention” of structural form in building architecture. Subsequent research analyses the evaluation of structural safety with regard to environmental features and earthquakes and compliance, improvement and restoration measures through innovative materials and earthquake protection systems. ➤ Programme 4 – Computational Design and Digital Manufacturing: Programme research focuses on innovation in planning processes through the use of computational and parametrical design technology and digital manufacturing. These forms of technology are increasingly widespread and can be of great benefit for heritage purposes, above all in the field of conservation and restoration. For example, the digital reproduction of historical artefacts and their modifications uses digital manufacturing, while for traditional architecture, the evolution of stereotomy in the construction of vaulted spaces uses computational design and research into architectural 3D printing using natural materials. The aim here is to train doctorate students how to use this

¹ Where a qualification awarded by a foreign university has not yet been declared equivalent to an Italian university degree, subject to verification by the administration offices, the Selection Committee will decide upon the eligibility of the foreign qualification in line with current Italian regulations and those of the country of origin, as well as any international treaties or agreements on qualification recognition for further study.

technology in a critical and responsible way, where it is not so much an aim in itself as a means of planning and research.

APPLICATION PROCEDURES

Please note that the information provided below complements and does not substitute that contained in arts. 2 and 3 of the general Application Call.

REQUIRED DOCUMENTATION

Candidates must upload the following documentation to their online application.

Failure to do so will result in their exclusion from the selection procedure.

- **A CV** following the layout of the example provided by Politecnico di Bari at <https://www.poliba.it/it/dottorati-di-ricerca>.

(File to be named "01.CV").

- **Copy of a current identification document.** Only the following documents will be considered eligible:
 - ID cards issued by an EU member state;
 - driving licence issued by an EU member;
 - in all other cases, a full validity passport (also non-EU citizens).

(File to be named "02.Documento Riconoscimento").

- **Degree qualification certification for first (Bachelor's) degrees and second (specialization/Master's) degrees (or 5-year Single Cycle degrees).**

Candidates with qualifications awarded in Italy must attach the Politecnico form available at <https://www.poliba.it/it/dottorati-di-ricerca>, specifying:

- final degree mark;
- a list of all exams taken with their relative marks in both degree courses (or the Single Cycle course);
- results of exams taken.

(File to be named "03.Titoli di Laurea").

Candidates with a degree qualification awarded by a non-Italian university must attach the following documents to their application, as issued by the awarding body. This supersedes any form of self-declaration ²:

- Degree certificate or diploma showing relative final mark;
- Official transcript of exams taken during all university study programmes, showing relative results;
- Any other type of document which demonstrates the equivalence of qualifications with those required in this application call (Supplementary Diploma, *Dichiarazione di Valore* (statement of value) issued locally.

(File to be named "03.Titoli di Laurea").

² **N.B.:** These documents must be in Italian, French or English or translated into Italian or English and verified by an official Italian diplomatic or consular representative under the responsibility of the candidate. These should follow the guidelines set out in the document "PROCEDURES FOR ENTRY, RESIDENCY AND ENROLMENT OF INTERNATIONAL STUDENTS AND THE RESPECTIVE RECOGNITION OF QUALIFICATIONS, FOR HIGHER EDUCATION COURSES IN ITALY FOR THE ACADEMIC YEAR 2022/23" available at the Ministry link <https://www.studiare-in-italia.it/studentistranieri/>.

	<ul style="list-style-type: none">➤ An abstract of the thesis topic for specialist/Master's degree (or five-year Single Cycle degree), stating the title and name of thesis supervisor(s) (max 3,000 characters). <i>(File to be named "04.Abstract Tesi").</i> ➤ Candidate thesis for specialist/Master's degree (or five-year Single Cycle degree) For graduating students whose thesis is not yet complete (see art.2), a draft version of the thesis which has been completed up to the time of application; (N.B. "draft version" implies a version of the thesis text as completed by the graduating candidate up to the date of application, which, in terms of chapters and pages, allows the Selection Committee to evaluate its relative content and subject area. The abstract is uploaded as a separate file and is not considered as a draft version of the thesis under any circumstances. <i>(File to be named "05.Tesi")..</i> ➤ PhD research proposal which the candidate intends to develop during the programme, stating the scientific basis of the proposal, its research objectives and the methods to be used. Research proposals and projects are assessed purely for the purposes of admission and are not necessarily those which the candidate will follow during the programme Research proposals must use the format available at the following link (title "ALLEGATO D_FORMAT PROPOSTA DI RICERCA_CTI.doc"): https://www.poliba.it/sites/default/files/dottorati/alllegato_d_format_proposta_di_ricerca_cti_english.docx N.B: Candidates who intend to propose a research project based on the topics set out in Ministerial Decrees 351/2022 and 352/2022 must prepare a proposal in line with one or more of the topics listed below. <i>(File to be named "06.Proposta di Ricerca")</i> ➤ A letter of motivation (maximum 3.000 characters) outlining the candidate's areas of research interest and justification for their choice of programme and, where possible, the research project proposed for the PhD programme. <i>(File to be named "07.Lettere di Motivazione").</i>
OPTIONAL DOCUMENTATION	<ul style="list-style-type: none">➤ A self-certification declaration for any other qualifications deemed suitable for evaluation which must be signed and dated (following the layout of the example provided at https://www.poliba.it/it/dottorati-di-ricerca), as per arts.46 and 47 of Presidential Decree n. 445/2000. <i>(File to be named "08.Dichiarazione altri titoli").</i>

	<ul style="list-style-type: none"> ➤ Either one or two letters of reference from teaching staff who have supervised the candidate throughout their university-level studies. <i>(Files to be named "09.Lettera presentazione 1", "09. Lettera presentazione 2").</i> ➤ Language certification demonstrating a knowledge of English which corresponds to at least B2 level. Only those candidates who are non-Italian citizens may attach certification which demonstrates knowledge of the Italian language. <i>(File to be named "10.Certificazione linguistica 1"; etc).</i> ➤ Any publications related to activity carried out and shown on the candidate's CV. These must be in either Italian or English or translated into Italian or English on behalf of and under the responsibility of the candidate. In cases of large publications unavailable in electronic format or which exceed the number of MB permitted for documents, applicants may submit these separately (in paper format or as a CD or DVD-ROM), together with a detailed explanatory list, by 2 p.m. on the deadline date for applications. All publications submitted on paper or on electronic media must be sent in a sealed envelope, signed along the flap, to the following address: Magnifico Rettore del Politecnico di Bari – Direzione Gestione Risorse e Servizi Istituzionali - Settore Ricerca, Relazioni Internazionali e Post-Lauream - Ufficio Protocollo – Via Amendola 126/B, 70126 BARI (Italy). Envelopes must show the name and surname of the candidate together with the following text: <i>"Concorso di Ammissione al Corso di Dottorato in... (name of the PhD programme)"</i>. The delivery of the envelope containing publications to Politecnico di Bari – by postal service, private courier or shipping agency – is wholly at the candidate's risk. <i>(File to be named "11.Pubblicazione 1"; etc).</i>
<p>DOCUMENT CHECKLIST</p>	<p>Required Documentation:</p> <ul style="list-style-type: none"> ➤ CV (to be named "01.CV"); ➤ Copy of a current identification document (to be named "02.Documento Riconoscimento"); ➤ Degree qualification certification for first (Bachelor's) degrees and second (specialization/Master's) degrees (or 5-year Single Cycle degrees) (to be named "03.Titoli di Laurea"); ➤ Abstract of the thesis topic for specialist/Master's degree (or five-year Single Cycle degree) (to be named "04.Abstract Tesi");

	<ul style="list-style-type: none"> ➤ Candidate thesis for specialist/Master's degree (or five-year Single Cycle degree) (to be named "05.Tesi"); ➤ PhD research proposal (to be named "06.Proposta di Ricerca"). ➤ Letter of motivation (to be named "07.Lettera di motivazione"). <p><u>Optional documentation:</u></p> <ul style="list-style-type: none"> ➤ Self-certification declaration for any other qualifications (to be named "08.Dichiarazione altri titoli"); ➤ Either one or two letters of reference from teaching staff (to be named "09.Lettera presentazione 1", "09. Lettera presentazione 2"); ➤ Language certification (to be named "10.Certificazione linguistica 1"; etc); ➤ Any publications (to be named "11.Pubblicazione 1"; etc).
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ADMISSION EXAMINATION	
1.ASSESSMENT OF QUALIFICATIONS HELD	Assessment of qualifications held (average exam scores, final degree mark, theses, Master's degrees, post-graduate courses, language certification, publications, etc.).
2. INTERVIEW	The interview provides an opportunity for a complete evaluation of the candidate and a verification of the applicant's aptitude for research and willingness to undertake experience abroad, as well as areas of research interest.
DATES OF INTERVIEWS	Monday 12 Sept 2022; Tuesday 13 Sept 2022.
<p>The Examination Board will assess candidates' qualifications and interview with a mark out of 100 (maximum mark for qualifications 40 and interview 60). Candidates awarded less than 10 marks for the qualification evaluation will not be admitted to the interview phase of the selection process.</p> <p>The minimum pass mark for the interview is 15.</p> <p>The minimum overall pass mark for the selection procedure is 25.</p> <p>The results of the Board's assessment for qualifications and research proposals will be published on the Esse3 portal in the private area of each candidate. No other direct notification will be sent to the candidates.</p> <p>At the end of the examination procedure, the Board will carry out an overall assessment and draw up an admission rankings list on the basis of the marks obtained by candidates in each part of the examination.</p> <p>The assessment criteria for qualifications will be established by each Examination Board.</p>	

LIST OF RESEARCH TOPICS FOLLOWS

GRANT N. 1

CTI

D.M. 351/2022

Area: Public Administration

Topic: "The 15 minute city as a model of urban transformation through NRRP projects"

Research proposal:

Intro:

The National Plan for Recovery and Resilience (PNRR) represents a historic opportunity that will radically transform Italy. The city will be the main field of application of the projects financed by the Plan, which will have to deal with urban policies, planning tools and the project. Will it be possible, starting from the urban form of each context and declining urban planning tools, to generate cities that put the citizen and the relationships of proximity at the center?

The digital and ecological transition goals envisaged, alongside and trying to hinge on the tools in the hands of the Public Administration, provide the framework within which to rethink urban settlements capable of generating quality of living and urban quality, within a clear urban model. So that the interventions foreseen in the NRPV do not remain punctual and episodic but are part of an overall process of urban transformation, it is necessary to rethink the way in which the urban project can strengthen the spaces of proximity of our cities by implementing interventions of "pedestrianization", re-functionalization of the ground floors of urban blocks with social services and public interest, experimenting with new housing models, implementing public mobility to eliminate the use of private cars.

The model of city to aspire, therefore, is polycentric and citizen-friendly. A model that focuses on the body and everyday spaces, as the pandemic has forced to learn, in which proximity services are the key to generating quality of living, still too linked to parameters linked exclusively to housing and its characteristics, and in which a public and sustainable mobility is able to ensure local accessibility to the great urban polarities, thus making the city sustainable and less energy-intensive. A model that seeks to overcome the limits arising from the dispersion of the built-up on the territory and urban expansions indifferent to public space that have reduced the city a set of solitary architectures connected by roads whose only function is that infrastructural.

The European context shows us how cities, even those of a metropolitan character, already have their own and specific model of proximity that can be read in the current subdivision into neighborhoods and that emerges from an idea of urban form planning already present in urban theories for more than two centuries. If we think of the Italian context, the legislation in force in the field of services at the local scale, with the DM 1444/68, already defines the minimum mandatory ratios of spaces for services at the urban and local scale. We must start from this "milestone" that has sanctioned the birth of the "right to the city" and that has strongly affected the form and growth of new urban settlements to try, on the one hand, to overcome the limits and rigidities inherent in this legislation, on the other hand, to innovate the types of services and equipment needed in the most recent and formless urban areas, adapting them to technological infrastructures, the digital transition, current ways of living times and workplaces, new urban economies.

On a local scale, the instruments used by the Municipal Administrations (AC) in the field of urban planning are often obsolete and outdated. In the Apulian context, there are many municipalities whose current planning refers to Manufacturing Programs and General Plans, obsolete even before the challenges launched by the PNRR. They will therefore not be able to support the planned interventions, nor is it plausible to think that the ACs could be able to update them in time with the tight timeframes foreseen by the PNRR.

In such a complex framework, in which the AC will be the main actuators of the interventions in the field of Urban Regeneration, the responsibility within these bodies seems relevant to the success of the interventions and the achievement of the transition objectives that the PNRR sets itself. The ACs are therefore the most suitable place to monitor and test new planning and design methods for the implementation of the neighbourhood model.

In the light of the above, it is good to ask whether the "proximity city", not hinged on models exclusively based on factors related to travel times, overcoming the concept of "city of fifteen minutes" and becoming a city that leaves no one behind, will be generated through NRPV-funded projects.

Objects

The aim of the research is to study the model of proximity cities: the origins and applications in urban history and contemporary experimentation, understand the logic and mechanisms in function of the urban models to which it is applied. In addition, the aim is to analyse the project applications implemented by the administrations, linking the implementation of projects with urban planning tools to understand their limits and opportunities, so that they are a common heritage and shared with the actors involved in the interventions of government and urban project.

Methodology

The modalities of the research project are as follows::

1. 1. A first phase of analysis and study of the literature on the historical and urban origins of the model of the proximity city to define a clear picture of what are the main characteristics underlying the historical applications.
2. 2. A second phase of rebuilding the regulatory framework for Integrated Urban Programmes that can generate models of Neighbourhood Cities.
3. 3. A third phase of deepening of case studies and of contemporary applications of the model of city of proximity is regarding the planning solutions that to those in within of instruments in order to understand and to define which are the criticalities and the opportunities that this model provides respect to the contemporary economic context, social, working and urban.
4. 4. A fourth phase of monitoring of urban projects being implemented by the AC, deepening the regulatory framework, as well as project to begin to collect the salient issues to be analyzed during the research.
5. 5. A fifth phase of support and work within a local CA, engaged in the implementation of projects financed by the PNRR, to study in the field characteristics, limits and possibilities of the instruments available to the PA in the implementation of models of proximity cities
6. A sixth phase of research to be carried out abroad in a European city, which can be defined following the first phase of analysis, which has in the course of experimentation and implementation of Urban Regeneration interventions aimed at achieving a model of proximity.
7. 7. A seventh and final phase of analysis of the collected data, cartographic and textual elaborations and drafting of the final product, which, making synthesis of the study work, Monitoring and support of the PA can define new tools and good practices to generate settlements that have as a reference model that the proximity city.

EXPECTED RESULTS

The aim of the research is to define the characteristics with which new "flexible" and "adaptable" tools can support and enhance the control of urban transformations, which will be implemented with the funding of the NRPV taking into account the peculiarities that characterize the urban models of our cities. In addition, alongside local ACs, it will be possible to quantitatively and qualitatively monitor the process of using PNRR funds for urban interventions to define their limits and opportunities so that they can create "learning in action" with the possibility of transfer to other local authorities and anyone who will interface with this theme. The expected result of the international experience, in contexts where the experimentation of transition to the city of proximity has already been started, is to study and analyze good practices, design solutions and urban tools that can, with the necessary adaptations to the context, be a starting point to innovate local tools.

**GRANT N. 2
CTI**

**D.M. 351/2022
Area: NRRP**

Topic: "*Fibre architecture: stereotomy and new fibre technologies for complex spaces*"

Research proposal:

This line of research aims at the use of new computational technologies, through robotic programming, parametric modeling and finally the creation of algorithms, for the design of discrete elements that can compose complex stereotomic spaces. A first experiment was conducted at the Fablab Poliba, digital manufacturing center of the Polytechnic of Bari, through the design of an arc in carbon fiber and fiberglass with epoxy resins; It was the subject of a ten-day workshop in collaboration with the ICD and the ITKE in Stuttgart. The workshop was attended by students, postgraduates, and PhD students of the Polytechnic of Bari, who contributed to the realization of the various blocks - built with the technique of Robotic Coreless filament winding - of the prototype, exposed at the end of the workshop at the House of Technologies of Matera.

This was only a first approach to the theme, which gave rise to many ideas, ideas and possible advances of this research, even compared to the current state of the art on the subject. It is fundamental to describe first of all the philosophy of the ICD, pioneer of this line of research, then the digital fabrication methods, the design approach and co-design, themes at the base of the research carried out by the University of Stuttgart; Below are some examples of projects carried out, including the results of the various annual research masters exhibited in the large garden.

One of the most important projects realized by the ICD is La Maison Fibre, exhibited at the XVII International Architecture Exhibition - La Biennale di Venezia 2020, which explores an alternative approach to the design and construction of future living spaces, presenting a full-size, habitable installation made entirely of robotically produced fibrous construction elements, constituting the first multi-storey structure of its kind, going to sow a first idea of light housing. The weight of the Maison Fibre is reduced fifty times compared to traditional reinforced concrete architecture and aims at a "new architecture" on multiple points of view, for the optimization of material, energy, economy, digital technologies, robotics and sociocultural impacts. The consumption of building material, nowadays, for the only load-bearing structures, which represent more than half of the materials used in buildings, has multiplied compared to the last century, That is why we must give priority to simple construction processes, saving materials and resources. And it is nature that helps us by providing a paradigmatic alternative: almost all the supporting structures in biology are fibrous systems, in which the organization, directionality and density of the fibers are calibrated according to the efforts to which they are subjected. One of the ICD research that inspired the workshop dates back to 2019: the Buga Fibre Pavilion. The pavilion demonstrates how the combination of state-of-the-art computational technologies with naturally occurring construction principles allows the development of truly new construction systems based on digitalization. The supporting structure of the pavilion is produced robotically only with fiber composites.

This unique structure in the world is not only highly effective and exceptionally light but provides a starting point for the union of the principles of fiber construction and stereotomic design, just like a dome space. The performance and efficiency of the fibrous structures come from the optimization of their distribution using a specific algorithm. Their organization, directionality and density are managed and varied at the local level to ensure that the material is placed only where it is needed, according to the principles adopted even in nature. The BUGA Fiber Pavilion aims to transfer this biological principle of fiber composite systems adapted to the load and therefore highly efficient. Artificial composites, such as fiberglass or carbon fiber used for this architecture, are ideal for such an approach because they share their fundamental characteristics with natural composites. While the Buga Wood Pavilion celebrates a new approach to the digital fabrication of "stereotomic" vaulted spaces different from the techniques using a more traditional material, wood. A robotic asset for the automated assembly and milling of the wooden components of the pavilion was developed for manufacturing. This manufacturing process ensures that all parts combine precisely like a large three-dimensional puzzle.

This technique, developed by the laboratory in Stuttgart, allows to realize complex structures using a woven fabric of glass fibers and reinforced carbon fibers in epoxy resin baths with consequent drying of the construction components. It also allows you to design and build large architectures through lightweight components but at the same time of great strength and refined aesthetic quality.

With a view to launching a new PhD, in accordance with the themes of knowledge development in the scientific-technological field, which is one of the fields of the NRRP, it seemed appropriate to propose this line of research on such an innovative theme, which can boast, given the first workshops and ongoing projects, the collaboration with the ICD in Stuttgart, an institute now an expert in the field, so as to create networking between new PhD candidates even outside the Italian academic boundaries; the PhD candidates will enjoy, such as, of international experiences with universities and businesses, very important focus nowadays for specialization and postgraduate education.

The theme of the stereotomic design of complex spaces in fiber is just one of the many facets that can be grasped; you can broaden the architectural vision also in the ecological and environmental, aiming at a sustainable design using new technologies and materials that can cope with climate change, generating resilient future cities; or even in the extraterrestrial sphere for the new spatial assets of the future or even for the new settlements, object by now more and more current and coveted in the "space race".

But even before, you can take advantage of this research and these technologies in the building sector by designing light spaces that evoke the heaviness of the stone of complex cupulated spaces; or even in the field of design by going to design furniture or fiber complements.

The result of the research, in addition to expanding new scientific/ technological knowledge in the architectural field, will be aimed at the creation of prototypes and practical demonstrators suitable for the concrete demonstration of the applicability of the building system in different areas.

**GRANT N. 3
CTI**

**D.M. 351/2022
Area: Cultural Heritage**

Topic: "Archaeological areas in Mediterranean stratified cities"

Research proposal:

The following research proposal aims to offer a theoretical and methodological contribution aimed at rethinking the ways of conservation, use and valorization of the archaeological and architectural heritage of Mediterranean cities.

These cities, including those of southern Italy, have remote origins, and their shape is the result of a secular stratification or even millenary. Thanks to the more and more archaeological research carried out within them - so much so as to attribute to the so-called archaeology of the city its own disciplinary identity -, in recent decades there has been a remarkable progress in the knowledge of their history. All this, however, has rarely given positive results from the point of view of form and urban space. As a result of the way in which such research is carried out, which finds its most frequent opportunity in emergency excavations, we often find ourselves faced with urban projects interrupted or never started for problems of various kinds that highlight the complexity of the situations and the great distance between the level of knowledge reached and the actual quality.

For this reason, too often the archaeological traces reach us inside these cities in the form of 'strange fragments', confined in fences that introduce real cracks in the urban form. It is not by chance that the same archaeologists have often defined "wounds" the excavations precisely because with them the traces of the past reappear through a solution of temporal continuity and define morphological interruptions in territorial realities of which we know a continuous development instead.

More specifically, the condition of the places where the ruin occurs is attributable, almost everywhere, to that of the *palimpsest*: a place that has had an interpretation fixed in an ancient form and that has seen other interpretations follow, in different times, which have changed relationships, appearance and forms. It is difficult to recognize for these places a defined condition within a single formal paradigm. With respect to the same place, different interpretations of the same theme have occurred over time or different formal themes have overlapped, sometimes even in a conflictual or contradictory way.

Faced with the complexity that the archaeological theme assumes, when investigating the presence of the ancient in an urban context, the current practices of musealization cannot be considered a satisfactory answer: "The ruins removed from their original reason risk losing the horizon of meaning for which they were designed and built - the life of men - and in this sense be destined for a disappearance that, if not physical, concerns, however, formal relations and the meaning of things and between things" (Ferlenga, 2010).

Starting from this panorama and from the difficulties that are traditionally found in this geographical area, although rich in places of fundamental archaeological importance, we intend to address the problem of the historical city-archaeological with a new interpretation of the space of the city, which would allow first of all to abandon the traditional idea of archaeological park as a delimited and autonomous place, instead considering the urban space in its complete articulation.

The line of architectural research that is proposed is related to the archaeological, according to an articulated discourse that places the emphasis on the cognitive aspect, without turning exclusively to the ancient, thus preserving the entire urban context. In many cases, in fact, the ancient structures have been superimposed, intertwined, approached successive settlements of various periods, resulting in very articulate and extremely interesting urban situations (Franciosini, 2002). The coexistence of different architectures in the same site confirms, increasingly, the need for the archaeological discipline to be open to other contributions, able to offer new points of view and keys to different readings. Among these, the settings that are not only configured as reconstructions of the ancient, but as knowledge and interpretation of urban territories, marked by the archaeological presence, up to the highlighting of hidden plots (Ricci, 2006), take on particular importance.

In this direction are inserted the theoretical positions of R. Panella, A. Ricci, M.M. Segarra Lagunes, and application and design lines of F. Cellini, L. Franciosini, R. Moneo, which reflect on the question of reuse, understood in a broader sense than the simple reuse of architecture, which therefore extends to the understanding of the complexity of historical topography "not only as an archaeological value but also as an urban value, which ensures a relationship between transtorical realities" (Tsiomis, 2002).

From a more empirical point of view, the presence of archaeological sites in cities poses recurrent conditions and design needs: the reconquest of the link between ancient and current soil, the definition of the limits of the areas, the view, the protection, the crossing.

In the light of these considerations, there arises the need to define a theory and a method for contemporary design that takes on the stratified condition of the places under consideration as an additional value for the project, to establish a new order between the urban parts, led to a renewed dialectical unity.

To this end, the exemplary study of good practices, realized in the modern and in the contemporary, is addressed, which already characterizes other European cities of medium dimension (Merida, Malaga, Marseille, Split) where it is possible to recognize the overcoming of the traditional concept of the 'archaeological enclosure' and the definition of the 'margins' of these places as an important transitional system consisting of finds, walls, paths, accesses, public spaces, once again directly related to the ruins but also to the city, in a completely different perspective of urban usability.

The ancient in this way will be brought into play through compositions of planes/ layers that mark the presence and temporal succession of the remains, aiming to build places of connection between public spaces and archaeological spaces that outside the enclosures become urban reference in the contemporary.

The purpose of this proposal is also to deepen the practices, uses, functions and management methods that such spaces could take, with a view to a contemporary idea of a city that is on the one hand adequate and respectful of the historical heritage but on the other hand aware of the current flows, characteristics and modes of urban life, especially in the light of new technologies and increasingly significant tourism in the cities of the Mediterranean and southern Italy.

Within the research, the knowledge of architecture, ancient history and archaeology, today in the best of cases acting in parallel, can find, in the process of construction of the method through experimentation, ability to interaction, useful and perhaps necessary to the planning action of our time by expanding the field of action of all the disciplines involved and opening fields of intervention and comparison unpublished and relevant in a country like Italy, so rich in history. In this sense, the location of the project within the South line acquires an even deeper meaning, because the south of the country is not simply the place where the institutions represented in the Research Units act, but the place par excellence of an inevitable relationship between archaeology and the city.

The aim of the research, in summary, is therefore to define a theory that, in the stratified condition of the Italian city, establishes an Order corresponding, at the same time, to our love for the Past and the greatness of our Time.

**GRANT N. 4
CTI**

D.M. 352/2022

Co-funded by: Metallurgica Ledrense soc. Coop.

Topic: "*Restoring shape to the land of historic landscapes: project techniques and innovative building systems for the critical refiguration of topography in ancient sites*"

Research Proposal:

The proposed research intercepts the needs of protection and enhancement of archaeological, architectural and landscape heritage, with the aim of reversing the processes of abandonment and degradation of the ancient places.

This objective is pursued in the belief that a better perception of the archaeological site, in the different components, environmental, architectural, historical and landscape, can contribute in a decisive way to the enhancement of the site itself.

The communicability and understanding of the site that become the vectors through which to achieve a mature sense of belonging to the places, reactivating interests and economies of development, linked to cultural tourism and new models of heritage management.

Such strategies are indispensable especially in contexts where the precariousness of the conditions of conservation and the lack of an adequate program of valorization place the "historical" landscapes in degraded conditions. Think of the Internal Areas (as defined in 2015 by the Decree of the then Minister F.Barca) characterized by phenomena of marginality or areas subject to instability due to hydrogeological and seismic instability.

The theme of soil reconfiguration, through actions aimed at the prevention of instability and the protection of archaeological areas, allows to integrate the safety aspects with the possibility to intervene directly on the latent form of the traces of archaeology. Through these interventions also comes to materialize the opportunity to completely redesign the site, including the improvement of accessibility and routes.

The research is placed in the thematic area related to the "management of the historical-artistic-architectural heritage: activities related to the conservation, use and valorization of the cultural heritage, both in its tangible dimensions (museums, libraries, archives, etc.) that in intangible ones (management of historical places, buildings or monuments)". Convinced that a work aimed at an awareness of the urban places of archaeology can only improve the quality of life of citizens by triggering processes of re-appropriation of the ancient places.

The research fully meets the interests and current lines of research within the PhD Course in Knowledge and Innovation in the Heritage Project of the DICAR department.

GRANT N. 5 CTI

D.M. 352/2022

Co-financed by: Manzi Marmi s.r.l.

Topic: "Innovative forms and techniques for a project in raw earth and recomposed stone mortar: strategies for circular"

Research proposal:

State of the art: additive manufacturing in architecture:

The last few years have witnessed an ardent search by the construction industry for a more rapid production process characterized by an increasing complexity of forms. Architects and engineers are migrating towards a digital production process that can offer increasingly efficient solutions that meet the demands of contemporary society.

Digital fabrication has been introduced in the construction industry since the 1980s. However, the rate of adoption of these technologies has seen an intense increase over the last decade. Digital fabrication techniques in the field of construction are basically based on four main methods: subtractive, additive, formative and constructive.

The field of additive manufacturing (AM), like 3D printing (3DP), has been the most widely applied. In fact, a well-developed automated digital process can provide substantial benefits for the construction industry, such as greater design freedom and increased productivity in general. In an effort to exploit these qualities, the construction industry has studied and developed digital production methods for large-scale structures and building components. Until now, several institutions around the world have digitally built a wide range of prototypes of structural components, furniture, and full-scale buildings. Many universities and companies have tried to enhance the process in general, among them we have Apis Cor®, CyBe®, WASP®, COBUD® and PERI®. Many experiments, as well as most research

published, concern the use of cement-based materials. This raises concerns about possible environmental implications, considering that the construction sector is already responsible for almost 40% of global energy consumption and greenhouse gas emissions. In addition, around 50% of the world's raw materials are used for construction, while 5-8% of CO₂ emissions are generated by cement production.

These observations stimulate the study and use of more sustainable building materials. Among these there is the raw earth that - unlike cement - is a pure product consisting of variable mixtures of earth and water, with any addition of fibers to improve its mechanical performance. Raw earth is energy efficient and has very good transmittance values. It is also a very economical material compared to other building materials because the land is available on site.

The first ever approach to additive manufacturing in the architectural field with the use of earth materials dates back to 2011, when Kayser experimented with small-scale additive manufacturing using the local sand of Egypt and Morocco solar energy to power the printing system. Between 2012 and 2017, experimentation has increased and, in particular, 2018 has been a key year for the advancement of research in this field. In 2018, the company WASP located in Massa Lombarda printed the first real large-scale structure in raw earth, Gaia, using the extrusive process of Liquid Deposition Modelling (LDM). As a result of this experience, we have seen a significant increase in experimentation in this area and about ten projects have now been completed.

Ambito d'azione

Most of the architecture in the world is made of raw earth, but nowadays the use of this material has become rare because concrete offers better mechanical performance and faster and less laborious construction processes.

While many building materials (such as wood and cement) are undergoing a phase of renewal thanks to the use of digital manufacturing processes, raw earth remains one of the least studied materials in this field. The question arises: can digital fabrication be the key to promoting a renewed use of this material in a contemporary context?

Despite the growing interest, the current experiments, applications, and publications are in their initial stages of advancement and the notions are fragmented. Most of the experiments do not focus on actual constructibility aspects or performance aspects. This lack of information also inevitably slows down the process of regulating and approving the use of constructive strategy.

Moreover, most of the experiments known up to now have technological limitations regarding the construction of roofs and, therefore, these applications are characterized using different technologies and materials in roofing. This approach compromises, in some cases, the structural behavior of the raw earth, which is characterized by worse performance characteristics if related to materials of a different nature and in the presence of points of discontinuity and inhomogeneity. However, the printing of structures – including roofing - full-scale with viscous materials involves the use of permanent supports. Such supports are extremely expensive and assembly can be difficult and dangerous for workers. Over the course of history, many masonry structures have been developed - such as vaulted or domed structures - that, using the "pushing" system, solve the problem of coverage and the presence of permanent supports. Considering the structural and compositional similarities between 3D printing with viscous materials and load-bearing masonry, an aspect that needs more research concerns the transfer of the building principles of ancient masonry techniques to additive manufacturing.

There is also to consider that in Puglia the mining of stones has always been present as an increasingly developed sector and that the same is changing in the consideration of renewed directions. whereas mining and related activities produce a significant amount of waste material and whereas the simultaneous construction activity aimed at the replacement and regeneration of existing buildings also produces residual stone material, you can also imagine the use of stone powders in the construction experimentation using 3d printers to Liquid Deposition Modelling.

Research directions

All the foregoing and analyzed allows us to imagine research that can take into account within the macro-field of automation of the civil construction site the theme of construction by additive manufacturing considering in an ambivalent way is the use of viscous materials of natural origin such as those with clayey components, both mortar mixtures that include other materials that can be combined with the use of stone powders.

This research may take different directions depending on the candidate's predisposition. Consider the possibility of:

- Construction applications in LDM 3d printing with wide experimentation on mixing mixtures involving the use of diversified materials compatible with technology.
- Research for practical demonstrators for the construction of formal prototypes compatible with the intended technology.