POLITECNICO DI MILANO

PhD in ARCHITETTURA, INGEGNERIA DELLE COSTRUZIONI E AMBIENTE COSTRUITO / ARCHITECTURE, BUILT ENVIRONMENT AND CONSTRUCTION ENGINEERING - 41st cycle

Number of scholarship offered	12
Department	DIPARTIMENTO DI ARCHITETTURA, INGEGNERIA DELLE COSTRUZIONI E AMBIENTE COSTRUITO

Description of the PhD Programme

The Doctoral Program in Architecture, Built Environment and Construction Engineering (ABC-PhD) was established in 2013, as the result of merging five prior programs active since the creation of the Dottorato di Ricerca in Italy; the goal of this program was to represent a national point of reference for training researchers and experts in our fields.

Our vision is to form PhDs so that they become self-sufficient, independent researchers, capable of reaching outstanding positions at an international level as scientists, intellectuals, professionals, or entrepreneurs. ABC-PhD is one of the most multidisciplinary PhD programs in Italy, as testified by the 20 different scientific sectors involved, and trains about 120 PhD Candidates (around 1/3 of which joins each year).

Our Candidates are trained to reply complex questions, to develop in-depth analyses and reliable models of complex physical, economic, environmental or social systems, and to innovate.

Their natural passion and their attitude toward innovation works as an active transmission system and activate a two-way knowledge transfer between the Academy and its stakeholders.

After their training, ABC-PhD Doctors are expected to be endowed not only with a high-level scientific knowledge and a significant experience in Research and Development (R&D) activities, but also with proven communication and management skills, and to become self-sufficient, independent researchers.
For the sake of simplicity, we have organized possible research topics in five interacting and reciprocally empowering Strategic Research Lines:

- Sustainability: decarbonised, resilient, adaptative and regenerative Built Environment

- Twin transition: competitive, digitalised and circular value chain for construction industry and built environment
- Well-being: safe, secure, inclusive and healthy Built Environment
- Advanced products: Advanced materials and components, clean tech, and innovative manufacturing and construction technologies/processes
- Conservation: Science and management of cultural heritage

More details about the specific research projects to be developed can be found at https://www.dabc.polimi.it/en/education/phd-programme/

POLITECNICO DI MILANO

PhD in ARCHITETTURA, INGEGNERIA DELLE COSTRUZIONI E AMBIENTE COSTRUITO / ARCHITECTURE, BUILT ENVIRONMENT AND CONSTRUCTION ENGINEERING - 41st cycle

THEMATIC Research Field: A COMPARISON OF CONTEMPORARY GARDEN DESIGN THEORY IN ITALY AND INDIA.

Monthly net income of PhDscholarship (max 36 months)
€ 1400.0 In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity	
Motivation and objectives of the research in this field	Introduction: Garden design is a profound reflection of a nation's cultural traditions, climatic conditions and aesthetic philosophies. Italy, with its rich history of Renaissance and Baroque gardens, has influenced landscape design across the world. India, on the other hand, has a thousand-year-old tradition of Mughal gardens and sacred green spaces. This research project aims to compare contemporary garden design theories in Italy and India, analyzing how historical traditions influence modern practices and how current challenges, such as urbanization and climate change, are addressed in both contexts. Objectives: To analyze historical influences on contemporary garden design in Italy and India. To identify the main current theories and philosophies in garden design in both countries.To compare design methodologies adopted in Italy and India, highlighting similarities and differences. Examine how modern challenges, such as urbanization and environmental sustainability, are integrated into contemporary design practices.

Methods and techniques that will be developed and used to carry out the research	Methodology: Literature Review: Analysis of academic texts, articles and specialist publications on garden design in Italy and India. Case Studies: Selection and analysis of representative contemporary projects in both countries. Interviews: Interviews with Italian and Indian landscape architects (and possibly in neighbouring countries) and garden designers to gain first-hand perspectives on current practices. Field Visits: Direct observation of contemporary gardens in Italy and India to understand the practical application of design theories. Expected Results: An in-depth understanding of the historical and cultural influences on contemporary garden design in Italy and India.Identification of key trends and philosophies in garden design in both contexts.A detailed comparison of design methodologies, highlighting unique approaches and common practices. Recommendations on how best practices from each country can be integrated to address global challenges in garden design. Timeline: •Literature review and case study selection. •Conduct interviews and data collection. •Field visits and analysis of collected data. •Processing of findings and writing of final report. Conclusion: This research project will provide a comparative overview of contemporary garden design theories in Italy and India, offering insights into how historical traditions and modern challenges influence design practices. The findings may contribute to greater cross-cultural understanding and the adoption of sustainable practices in garden design globally. By studying different forms, methods and expressions of landscape architectural research, the candidate will

	develop a personal approach that takes into account the specificities, goals and expected outcomes of the topic. The program considers design as an essential component of any research. With the help of the School and the supervisors, the candidate is able to find a specific niche in research, design, theory and practice.
Educational objectives	The training aims to provide candidates with a good orientation in the field of landscape architecture, allowing them to participate in the selection and elaboration of a chosen topic, develop appropriate methods of investigation and dissemination, and produce texts, drawings and artifacts that meet the requirements of scientific research. The main training objective is to encourage the candidate to carry out structured research work through a comprehensive investigation of a chosen problem, leading to original methods and results.
Job opportunities	The PhD program trains highly qualified researchers and professionals in the fields of landscape architecture, and design and management of landscape projects and policy, urban studies, and urban governance. Researchers with such profile may be employed by academic institutions including universities, public bodies, cultural foundations and research centres, public and private development agencies, and private firms. Freelance professionals qualified to manage highly complex design processes. – Designers who play key roles in institutional and professional structures and leading landscape design active and professional institutions, cultural institutions (museums, libraries, universities, schools, cultural centres), public and private service sectors, business networks.
Composition of the research group	0 Full Professors 1 Associated Professors 1 Assistant Professors 1 PhD Students
Name of the research directors	Nerantzia Tzortzi

Contacts
julia.georgi@polimi.it

Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents	--

Scholarship Increase for a period abroad	
Amount monthly	700.0 €
By number of months	6

Stage and period abroad	
Institution or company where the candidate will spend the period abroad (name and brief description)	
By number of months abroad	0

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

Additional support:
Budget for the research activity (only for positions supported by scholarship):total amount Euro 5.707,20 per student.
In detail:
-1st year Euro 1.902,40
-2nd year Euro 1.902,40
-3rd year Euro 1.902,40

Additional information about the organization and regultions of ABC-PhD programme can be found in the Regulations for the 41st Cycle of ABC-PhD:download is available at link: https://www.dottorato.polimi.it/en/phd-programmes

Additional information about ABC department and ABC-PhD programme:available at link: https://www.dabc.polimi.it/

Desk availability: The ABC department provides non-permanent desks to be temporarily booked in common PhD rooms.

POLITECNICO DI MILANO

PhD in ARCHITETTURA, INGEGNERIA DELLE COSTRUZIONI E AMBIENTE COSTRUITO / ARCHITECTURE, BUILT ENVIRONMENT AND CONSTRUCTION ENGINEERING - 41st cycle

THEMATIC Research Field: AI FOR THE CLASSIFICATION/SEGMENTATION/OBJECT RECOGNITION OF CH DIGITAL DATA INTEGRATING IMAGES, 3D POINTS CLOUDS AND MULTISPECTRAL/HYPERSPECTRAL IMAGING

Monthly net income of PhDscholarship (max 36 months)
€ 1400.0 In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity	
Motivation and objectives of the research in this field	The research is positioned within the domain of Cultural Heritage (CH), with a focus on reality-based surveying and data interpretation supported by Artificial Intelligence (AI) methodologies. The increasing availability of high-resolution 3D data and advanced diagnostic information in the field of architectural heritage presents both a major opportunity and a significant challenge: how to effectively interpret, classify, and manage vast volumes of spatial data to support informed conservation strategies. Within this context, the proposed research addresses the urgent need for intelligent and scalable methodologies capable of transforming raw 3D survey data into actionable knowledge. The motivation stems from the inherent complexity of monumental heritage, where traditional approaches to data management and analysis are no longer sufficient to meet contemporary demands for precision, scalability, and long-term monitoring. The primary objective is to develop a workflow that integrates multiple sources of digital data—including 3D point clouds derived from laser scanning and photogrammetry, digital

	imagery, and diagnostic (multispectral and or hyperspectral) and material analysis datasets—within a unified framework. This integrated dataset will serve as the foundation for implementing AI-based techniques for multiscale object recognition, specifically designed to address the intricacies of complex architectural environments. The research aims to achieve the semantic classification of a complete 3D dataset of a monumental structure, from large-scale point cloud segmentation down to individual element decomposition and micro-surface feature detection. While the Milan Cathedral will serve as the main case study, additional heritage sites will be considered to test and validate the proposed methodologies. Using advanced computer vision and machine learning algorithms, the research will explore automated techniques for identifying, classifying, and spatially locating architectural elements based on both geometric (2D and 3D) and physical characteristics. A key goal is to support structural interpretation by integrating external survey data with theoretical principles and historical construction logic. The AI system will be capable of hypothesizing internal structural layouts based on external measurements and multimodal inputs. Special attention will be given to the detection of anomalies and degradation features, enabling a data-driven approach to condition assessment. This will involve building a dedicated training dataset for anomalies, linking deterioration patterns to specific geometric, environmental, and material conditions. In summary, the project aims to advance the field of digital heritage by combining artificial intelligence, high-resolution spatial data, and diagnostic insight into a coherent and replicable framework.
Methods and techniques that will be developed and used to carry out the research	The research will adopt a multidisciplinary methodology combining spatial data processing, artificial intelligence, and digital heritage practices. Core techniques will include the acquisition and preprocessing of 3D point clouds from

	laser scanning and photogrammetry, followed by alignment and optimization for large-scale architectural environments. Advanced methods for semantic segmentation and object recognition will be developed using machine learning and deep learning algorithms, trained on annotated datasets representing both architectural components and material degradation. A key innovation will be the use of semantic photogrammetry, integrating AI-based classification and segmentation workflows directly within photogrammetric processing environments.The project will also emphasize the integration of heterogeneous data sourcesâ€”such as 2D diagnostic maps, historical documentation, and material analyses (multispectral or hyperspectral)â€”within a unified semantic framework. This will involve the creation of customized pipelines for multimodal data fusion, enabling the joint processing of geometric, physical, and historical information.To manage and explore complex spatial datasets, the research will develop interactive tools for point cloud manipulation, allowing users to select, annotate, and segment data within immersive environments, such as Mixed Reality (MR). These tools will also support user-in-the-loop validation of AI outputs, combining automated processing with expert input. This activity will be conducted in close collaboration with researchers specializing in MR applications in the cultural heritage field.In the domain of anomaly detection, both supervised and unsupervised learning techniques will be employed to identify surface irregularities, weathering, and deformations. A domain-specific training dataset will be compiled to correlate degradation types with material, geometric, and environmental parameters. Finally, rule-based reasoning and knowledge-driven inference systems will be explored to support hypothetical reconstruction of internal structural components, using external geometry and known construction logics. All techniques will be tested and validated through iterative prototyping and cross-case comparisons, ensuring robustness, scalability, and adaptability.
Educational objectives	

	The project will train the PhD candidate in 3D spatial data processing, semantic photogrammetry, and real-time analysis of spatial and diagnostic datasets. Key skills include the application of AI and deep learning techniques for object classification, segmentation, and anomaly detection. The candidate will also learn to integrate heterogeneous data sources and develop interactive tools for immersive analysis.
Job opportunities	The research will open up career opportunities in the fields of digital heritage, architectural conservation, and applied AI for cultural assets. The candidate will acquire highly transferable skills relevant to research institutions, heritage authorities, tech companies, and design studios. Expertise in 3D spatial data, semantic processing, and immersive technologies is increasingly in demand. The project also prepares for roles in innovation-driven public or private sectors. Researchers completing this PhD will be well-positioned to lead digital innovation in the field of cultural heritage.
Composition of the research group	0 Full Professors 2 Associated Professors 0 Assistant Professors 4 PhD Students
Name of the research directors	Prof. Francesco Fassi, Prof. Cristiana Achille

Contacts
francesco.fassi@polimi.it *office: +390223996532*

Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents	--

Scholarship Increase for a period abroad	
Amount monthly	700.0 €
By number of months	6

Stage and period abroad

Institution or company where the candidate will spend the period abroad (name and brief description)	
By number of months abroad	0

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

Additional support:
Budget for the research activity (only for positions supported by scholarship):total amount Euro 5.707,20 per student.
In detail:
-1st year Euro 1.902,40
-2nd year Euro 1.902,40
-3rd year Euro 1.902,40

Additional information about the organization and regultions of ABC-PhD programme can be found in the Regulations for the 41st Cycle of ABC-PhD:download is available at link: https://www.dottorato.polimi.it/en/phd-programmes

Additional information about ABC department and ABC-PhD programme:available at link: https://www.dabc.polimi.it/

Desk availability: The ABC department provides non-permanent desks to be temporarily booked in common PhD rooms.

POLITECNICO DI MILANO

PhD in ARCHITETTURA, INGEGNERIA DELLE COSTRUZIONI E AMBIENTE COSTRUITO / ARCHITECTURE, BUILT ENVIRONMENT AND CONSTRUCTION ENGINEERING - 41st cycle

INTERDISCIPLINARY Research Field: DATA-DRIVEN DECISION METHOD FOR ENERGY EFFICIENCY AND ENVIRONMENTAL QUALITY OPTIMIZATION IN SCHOOL BUILDINGS

Monthly net income of PhDscholarship (max 36 months)
€ 1400.0 In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity	
Motivation and objectives of the research in this field	Interdisciplinary PhD Grant The PhD research will be carried out in collaboration with research groups of the PhD programme in "**MATHEMATICAL MODELS AND METHODS IN ENGINEERING**". The research aims to develop a data analysis methodology based on “statistical learning” and “Machine Learning” (ML) techniques for reducing energy consumption and increasing the indoor environmental quality in school buildings including universities. In detail, the research intends to develop a robust and scalable methodology that integrates field-measured data (indoor and outdoor), statistical models, ML algorithms in a digital tools to predict and optimize energy uses, indoor comfort and building maintenance. The research methodology involves four different phases: i) identification of advanced mathematical techniques and models for the interpretation, analysis and management of large datasets; ii) implementation of digital building models that integrates real-time measured data; iii) implementation of a multi-parameter sensor network capable of analyzing both energy flows and the indoor condition perceived by the user; iv) design of a dedicated digital platform for data

	collection, interpretation and management of the collected and elaborated data.
Methods and techniques that will be developed and used to carry out the research	The research activity will be developed around three main activities: Activity 1 - Theoretical basis of large data sets analysis and methods for indoor data collection and fault detection. During this phase the student will review the scientific literature regarding digital building modelling, statistical models and unsupervised ML algorithms for data analysis and interpretation. Activity 2 - Data collection and data management platform development. This phase will deal with case studies selection, monitoring system development, set up and digital repository development. The student will structure a specific database for real-time data collection making links with the digital model. The activity consist also in the application of algorithms for digital model calibration. Activity 3 – Data evaluation and results exploitation. The validated models will be integrated into a digital platform, working as a decision making tool for supporting technicians/building owners in energy management and maintenance actions. The results will be in form of guidelines in order to facilitate the implementation of the approach in other building contexts. These guidelines will provide practical instructions for data gathering, data interpretation, maintenance prediction and in general for scaling up the digitization of the public built environment.
Educational objectives	The thesis will provide an original and comprehensive study on the energy-efficient management process of existing educational buildings. The study will contribute in developing a new concept and tool for supporting public authorities in maintaining efficient and safe the built environment. The specific learning objectives of the program allow the student to: •Develop high level knowledge in their area of specialization; •Master the analytical and methodological skills required

	to conduct research in their area of specialization and related areas; •Design and conduct original research in the specific area of research; •Demonstrate the ability to communicate the results of their research in a clear and effective manner •Demonstrate an ability to work effectively in team with other people from various, educational, and work experience backgrounds.
Job opportunities	PhD in this research area will be very competitive at both national and international level working as: •Researcher in academic institutions as well as in research centers; •Engineer in the research and development departments of SMEs, public institutions or large companies. •Create a business around their own innovations.
Composition of the research group	3 Full Professors 1 Associated Professors 0 Assistant Professors 4 PhD Students
Name of the research directors	Graziano Salvalai, Manuela Grecchi, Monica Conti

Contacts
graziano.salvalai@polimi.it

Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents	--

Scholarship Increase for a period abroad	
Amount monthly	700.0 €
By number of months	6

Stage and period abroad

Institution or company where the candidate will spend the period abroad (name and brief description)	
By number of months abroad	0

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

Additional support:
Budget for the research activity (only for positions supported by scholarship): total amount Euro 5.707,20 per student.
In detail:
-1st year Euro 1.902,40
-2nd year Euro 1.902,40
-3rd year Euro 1.902,40**.**

Additional information about the organization and regultions of ABC-PhD programme can be found in the Regulations for the 41stCycle of ABC-PhD: download is available at link: https://www.dottorato.polimi.it/en/phd-programmes

Additional information about ABC department and ABC-PhD programme: available at link: https://www.dabc.polimi.it/

Desk availability: The ABC department provides non-permanent desks to be temporarily booked in common PhD rooms.

POLITECNICO DI MILANO

PhD in ARCHITETTURA, INGEGNERIA DELLE COSTRUZIONI E AMBIENTE COSTRUITO / ARCHITECTURE, BUILT ENVIRONMENT AND CONSTRUCTION ENGINEERING - 41st cycle

THEMATIC Research Field: DESIGN FOR CIRCULARITY AND ADAPTABILITY IN THE CONSTRUCTION SECTOR

Monthly net income of PhDscholarship (max 36 months)
€ 1400.0 In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity	
Motivation and objectives of the research in this field	The limitations of the contemporary linear economic system necessitate a fundamental shift in resource utilization, promoting solutions aligned with the principles of the circular economy, which are essential for sustainability in architectural technology. However, given the current reality, which remains distant from this ideal model of production and consumption, there is an urgent need to emphasize structural change in this direction. The transition from a linear to a circular model presents a significant challenge that requires concrete actions, including a redesign of conventional technological systems, with the explicit aim of configuring a new framework capable of maximizing resource value. Consequently, the shift from the prevailing "take-produce-dispose" paradigm to one centred on circularity is driven by project-based innovation.This research aims to explore methods, tools, and approaches for steering architectural design towards circularity objectives, adopting a techno-typological approach that enables integrated control over both spatial and constructional solutions, thereby ensuring the adaptability and transformability of buildings.
Methods and techniques that will be developed and used to carry out the	The research is based on a first phase of basic *curiosity*

developed and used to carry out the research	*driven* exploration, which can then develop towards an applicative and experimental research. The research is carried out by developing knowledge aimed at establishing cultural awareness and technical competence aimed at governing the complexity of the transformation processes of the built environment, considering both the intangible level (information and data management) and the material level (materials and construction solutions). Research and innovation activities must respond and give active support to the development of an evolutive framework that is shaped by societal challenges, by policy and regulatory drivers and by technology and industry trends, that might either be considered as challenges or opportunities. Specifically, the research activity aims to develop guidelines and evaluation tools designed to guide and "measure" the adaptability and reversibility of architectural design. **SDGs related to this research**: Goal 9 "industry, innovation and infrastructure""Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation" Goal 11 “Sustainable cities and communities”“Make cities and human settlements inclusive, safe, resilient and sustainable” Goal 12 “Responsible Production and Consumption”“Ensure sustainable consumption and production patterns”
Educational objectives	ABC-PhD Candidates are expected to produce knowledge advancements in their scientific field. Moreover, they are raised to be resilient, not frightened by the uncertainty and failure risks of innovations, trained in communication, management, networking and other transferrable skills, that are fundamental for doing research in this complex world. They are taught to cooperate in a competitive environment and to exploit their creativity to reach their goal, going beyond the limits of one scientific discipline, interacting and learning from other researchers and colleagues. Eventually, they are pushed to find out (and to

	network with) the possible stakeholders of their work. We purport that the best value for the Candidate and for the Program itself is the reward given by the chance of a practical application of the knowledge advancements realized.With this experience, ABC-PhD Doctors are expected to acquire the capacity to shoulder the responsibilities of R&D activities, to plan and to manage control tasks, to help the development and the critical optimization of policies and projects, to innovate: in particular about the PhD thesis topic, in general about the many sectors of Architecture, Built Environment and Construction Engineering and in all the most critical subjects related to the sustainable transformation and management of the Built Environment (environmental, economic, social and cultural sustainability).
Job opportunities	The ABC-PhD program offers advanced scientific knowledge, R&D management skills, and global communication proficiency in English. Graduates are highly qualified for roles in top international universities, research centers, architectural and engineering firms, and public institutions. They excel as problem-setters and solvers, adept at modeling complex environments and applying critical thinking to deliver reliable solutions. The program aligns strategically with the ECTP and EU's research and innovation goals, focusing on industry 4.0 and digital transition impacts.
Composition of the research group	1 Full Professors 1 Associated Professors 1 Assistant Professors 1 PhD Students
Name of the research directors	Elisabetta Ginelli, Laura Daglio

Contacts
laura.daglio@polimi.it

Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents	--

Scholarship Increase for a period abroad	
Amount monthly	700.0 €
By number of months	6

Stage and period abroad	
Institution or company where the candidate will spend the period abroad (name and brief description)	
By number of months abroad	0

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

Additional support

Budget for the research activity (only for position supported by scholarship):total amount Euro 5.707,20 per student
In detail:
- 1st year Euro 1.902,40
- 2nd year Euro 1.902,40
- 3rd year Euro 1.902,40

Additional information about the organization and regultions of ABC-PhD programme can be found in the Regulations for the 41st Cycle of ABC-PhD:download is available at link:https://www.dottorato.polimi.it/en/phd-programmes

Additional information about ABC department and ABC-PhD programme:available at link: https://www.dabc.polimi.it/
Desk availability: The ABC department provides non-permanent desks to be temporarily booked in common PhD rooms.

POLITECNICO DI MILANO

PhD in ARCHITETTURA, INGEGNERIA DELLE COSTRUZIONI E AMBIENTE COSTRUITO / ARCHITECTURE, BUILT ENVIRONMENT AND CONSTRUCTION ENGINEERING - 41st cycle

THEMATIC Research Field: DEVELOPMENT OF RETROFITTING DEVICES TO REDUCE THE SEISMIC VULNERABILITY OF STEEL STORAGE PALLET RACKS

Monthly net income of PhDscholarship (max 36 months)
€ 1400.0 In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity	
Motivation and objectives of the research in this field	A sustainable strategy to reduce the seismic vulnerability of steel storage pallet racks is to increase the life cycle and the lifetime of the existing frames. This will aid in reducing economic and environmental impact of new constructions but also avoiding downtime in logistics, which may cause high direct and indirect economic loss (e.g. cost of dismantling and replacement ordowntime/business interruption along with issues for workers). The project responds to this need by delivering innovative retrofitting strategies that will be used to enhance the seismic performance of existing racks. Different approaches and devices, aimed at improving the strength and ductility of the connections (longitudinal direction) and of the upright frame (cross-aisle direction) will be developed and investigated. The proof-of-concept for such devices will start with the selection of case-study rack configurations, after which several prototypes of the devices will be developed and characterised to define their behaviour and performance. The next phase of the project will foresee the integration of the different developed devices in the racks themselves. At the same time, an extensive numerical modelling campaign of the dynamic behaviour of the selected racks, with and without

	thedifferent devices will assure the extension of the experimental outcomes to additional configurations.
Methods and techniques that will be developed and used to carry out the research	The project will develop new seismic devices to reduce the seismic risk of steel storage pallet racks, both existing and newly built ones. In order to validate the proposed technologies, the project foresees an extensive experimental campaign aimed to first characterise the selected racks, then to develop and characterise the new devices, and finally to verify the efficiency of the improvements with an authentic simulation of earthquake sequence through shake-table tests. To do so, the project needs to follow a well-thought methodology and should be based on clear concepts. To achieve such requirements, three main phases can be identified: i. characterisation of materials, racks and devices; ii. numerical modelling and seismic design and analyses; iii. validation of the developed devices through full-scale tests. The project offers hence a proper mix between experimental and numerical activities.
Educational objectives	The Candidate who will participate to the project will develop new skills on: i) advanced numerical modelling of complex structures; ii) design of complex steel structures made by thin-walled cold-formed profiles; iii) seismic analysis of structures equipped with seismic dissipation devices; iv) understanding of the laboratory work to perform experimental testing on complex structures.
Job opportunities	At the end of the PhD the Candidate can be directly inserted inside one of the companies involved in the research project.
Composition of the research group	1 Full Professors 0 Associated Professors 1 Assistant Professors

	0 PhD Students
Name of the research directors	Marco Simoncelli

Contacts
Email address: marco.simoncelli@polimi.it *Office phone number: +39 02 2399 4285*

Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents	--

Scholarship Increase for a period abroad	
Amount monthly	700.0 €
By number of months	6

Stage and period abroad	
Institution or company where the candidate will spend the period abroad (name and brief description)	
By number of months abroad	0

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

Additional support:
Budget for the research activity (only for positions supported by scholarship):total amount Euro 5.707,20 per student.
In detail:
-1styear Euro 1.902,40
-2ndyear Euro 1.902,40
-3rdyear Euro 1.902,40**.**

Additional information about the organization and regultions of ABC-PhD programme can be found in the Regulations for the 41stCycle of ABC-PhD:download is available at link:
https://www.dottorato.polimi.it/en/phd-programmes

Additional information about ABC department and ABC-PhD programme:available at link:
https://www.dabc.polimi.it/

Desk availability: The ABC department provides non-permanent desks to be temporarily booked in common PhD rooms.

POLITECNICO DI MILANO

PhD in ARCHITETTURA, INGEGNERIA DELLE COSTRUZIONI E AMBIENTE COSTRUITO / ARCHITECTURE, BUILT ENVIRONMENT AND CONSTRUCTION ENGINEERING - 41st cycle

THEMATIC Research Field: ENVIRONMENTAL IMPACT MITIGATION, RESILIENCE AND LIFE CYCLE APPROACH

Monthly net income of PhDscholarship (max 36 months)
€ 1400.0 In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity	
Motivation and objectives of the research in this field	The environmental issue and sustainable development (Sustainable Development Goals SDGs) require the identification of transformation processes of the built environment characterized by resilience, adaptation and mitigation of environmental impacts, adopting a life cycle thinking approach. The research area is aimed at defining organizational models, environmental design strategies, process and product solutions that direct the built towards the reduction of environmental impacts, in line with the objectives of decarbonisation, circular economy, bio-economy, green economy, seeking ever greater efficacy in pursuing environmental performance requirements, in their inseparable relationship with social and economic ones. This area can be defined by technologies, strategies, innovative process and design models and evaluation methods for the efficient use of resources (materials and water), at different scales (region, neighborhood, building, building product) and reduction of environmental impact, in particular: *Resilience, mitigation of climate change and decarbonisation* Development of technologies and design/testing of technical solutions (e.g. *bio-based* and

	nature-based solutions) enabling speed up the reduction in GHG emission in line with the 2020 goals and for mitigation of the effects of climate change (European Green Deal). *Life cycle approach, sustainability metrics and environmental footprints* Development of methods and tools for the design and evaluation of the environmental sustainability, with a holistic view along the whole life cycle of construction materials and along the whole value chain of the building process.
Methods and techniques that will be developed and used to carry out the research	The research is based on a first phase of basic *curiosity driven* exploration, which can then develop towards an applicative and experimental research. The research is carried out by developing knowledge aimed at establishing cultural awareness and technical competence aimed at governing the complexity of the transformation processes of the built environment, considering both the intangible level (information and data management) and the material level (materials and construction solutions). Research and innovation activities must respond and give active support to the development of an evolutive framework that is shaped by societal challenges, by policy and regulatory drivers and by technology and industry trends, that might either be considered as challenges or opportunities. **SDGs related to this research**: Goal 9 "industry, innovation and infrastructure""Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation" Goal 11 “Sustainable cities and communities”“Make cities and human settlements inclusive, safe, resilient and sustainable” Goal 12 “Responsible Production and Consumption”“Ensure sustainable consumption and production patterns”
Educational objectives	ABC-PhD Candidates are expected to produce knowledge

	advancements in their scientific field, trained in communication, management, networking and other transferrable skills, that are fundamental for doing research in this complex world. They are taught to cooperate, going beyond the limits of one scientific discipline.
Job opportunities	The environmental expertise in AEC sector will offer the best occupational opportunities for employments in architectural and engineering design enterprises, in public bodies (as technical support for policy makers), in research institutions, at national and international level.
Composition of the research group	1 Full Professors 1 Associated Professors 2 Assistant Professors 5 PhD Students
Name of the research directors	Andrea Campioli, Monica Lavagna

Contacts
Prof.ssa Monica Lavagna *Email monica.lavagna@polimi.it*

Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents	--

Scholarship Increase for a period abroad	
Amount monthly	700.0 €
By number of months	6

Stage and period abroad	
Institution or company where the candidate will spend the period abroad (name and brief description)	
By number of months abroad	0

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
Additional support: **Budget for the research activity (only for position supported by scholarship):** total amount Euro 5.707,20 per student

In detail:
- 1st year Euro 1.902,40
- 2nd year Euro 1.902,40
- 3rd year Euro 1.902,40

Additional information about the organization and regultions of ABC-PhD programme can be found in the Regulations for the 41stCycle of ABC-PhD: download is available at link: https://www.dottorato.polimi.it/en/phd-programmes

Additional information about ABC department and ABC-PhD programme: available at link: https://www.dabc.polimi.it/

Desk availability: The ABC department provides non-permanent desks to be temporarily booked in common PhD rooms.

POLITECNICO DI MILANO

PhD in ARCHITETTURA, INGEGNERIA DELLE COSTRUZIONI E AMBIENTE COSTRUITO / ARCHITECTURE, BUILT ENVIRONMENT AND CONSTRUCTION ENGINEERING - 41st cycle

INTERDISCIPLINARY Research Field: GIS-BASED TECHNOLOGIES FOR ASSESSING ENVIRONMENTAL RISKS TO PUBLIC HEALTH IN URBAN ENVIRONMENTS

Monthly net income of PhDscholarship (max 36 months)
€ 1400.0 In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity	
Motivation and objectives of the research in this field	Interdisciplinary PhD Grant The PhD research will be carried out in collaboration with research groups of the PhD programme in "**DATA ANALYTICS AND DECISION SCIENCES**". The current global urbanization trend foresees a significant increase in the population living in densely built urban areas, from the current 50% to an estimated 74% by 2050. This shift is largely driven by the strong appeal of cities, which offer a concentration of opportunities in education, economy, culture, and access to services. However, urban contest also present many risk factors—environmental, social, and behavioral—with direct and indirect consequences on the physical, mental, and social health of citizens. To effectively promote and protect public health from a "One Health" perspective, it is both urgent and strategic to develop urban planning approaches grounded in scientific risk assessment tools. In this context, Geographic Information System (GIS) technologies provide advanced spatial analysis tools, enabling the integration and visualization of environmental, epidemiological, and sociodemographic data in a georeferenced and comprehensive manner.

	GIS-based methodologies make it possible to identify critical areas, quantify population exposure to specific risk factors, and support evidence-based decision-making for public health protection. This research aims to develop and test scalable and replicable GIS-based methodologies for assessing environmental risks and their impacts on public health in urban areas. The analysis draws on both proprietary big data provided by institutional partners and publicly available open-source datasets (demographic, environmental, and social data accessible through municipal and regional geoportals). The goal is to provide operational tools for monitoring and prevention. The strategic objective is to conduct risk assessments through the development of ad hoc models to generate thematic maps using a multi-weighted value system. These maps will cover various “environmental stressors” (e.g., heatwaves, floods, accidents, air pollution, noise); systemic vulnerabilities (e.g., demographic, health, and building data, lack of green areas, soil permeability, mobility infrastructure); and health impact/exposure indicators (e.g., epidemiological data or emergency call records categorized by symptom or cause linked to specific environmental risks).
Methods and techniques that will be developed and used to carry out the research	The project is grounded in the theories and methods of *environmental epidemiology*, which uses observational and statistical approaches (typical of biomedical engineering) to identify associations between environmental exposures and health outcomes, contributing to prevention and the development of public health policies. This type of analysis relies on geospatial data- referenced through geographic coordinates - and requires the use of dedicated software (GIS, Geographic Information Systems) and spatially explicit modeling approaches (mathematical or computational models that directly incorporate spatial information such as location or distance to represent geographically distributed phenomena), which are common in urban planning. Methodologically, the research will follow several phases - further detailed into milestones and operational tasks - including:

	•**PRELIMINARY ANALYSIS** •**DEVELOPMENT AND MODELING**: creation of GIS-based analysis methods for the assessment of multidimensional territorial risks, with the potential implementation of a continuous risk monitoring system; •**TESTING PHASE**: pilot case study: City of Milan •**VALIDATION** •**DISSEMINATION**
Educational objectives	The project aims to develop interdisciplinary competencies in environmental health, spatial analysis, and data-driven decision-making. It promotes critical thinking through the integration of public health, urban planning, and modeling.
Job opportunities	This research program offers career opportunities in urban health planning, and GIS-based risk assessment. Participants will gain experience in spatial data analysis, XAI modeling, and interdisciplinary collaboration. The project fosters skills valuable for roles in public health agencies, urban planning institutions, and environmental consultancies. Direct engagement with stakeholders enhances practical policy impact. It also supports scientific growth through publications and conferences.
Composition of the research group	1 Full Professors 3 Associated Professors 1 Assistant Professors 0 PhD Students
Name of the research directors	Maddalena Buffoli, Enrico Gianluca Caiani

Contacts
maddalena.buffoli@polimi.it

Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents	--

Scholarship Increase for a period abroad	
Amount monthly	700.0 €
By number of months	6

Stage and period abroad	
Institution or company where the candidate will spend the period abroad (name and brief description)	
By number of months abroad	0

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

Additional support:

Budget for the research activity (only for positions supported by scholarship): total amount Euro 5.707,20 per student.

In detail:

-1st year Euro 1.902,40

-2nd year Euro 1.902,40

-3rd year Euro 1.902,40**.**

Additional information about the organization and regultions of ABC-PhD programme can be found in the Regulations for the 41stCycle of ABC-PhD: download is available at link: https://www.dottorato.polimi.it/en/phd-programmes

Additional information about ABC department and ABC-PhD programme: available at link: https://www.dabc.polimi.it/

Desk availability: The ABC department provides non-permanent desks to be temporarily booked in common PhD rooms.

POLITECNICO DI MILANO

PhD in ARCHITETTURA, INGEGNERIA DELLE COSTRUZIONI E AMBIENTE COSTRUITO / ARCHITECTURE, BUILT ENVIRONMENT AND CONSTRUCTION ENGINEERING - 41st cycle

THEMATIC Research Field: MR HOLOGRAPHIC APPLICATION TO SUPPORT THE CH CONSERVATION ACTIVITY

Monthly net income of PhDscholarship (max 36 months)
€ 1400.0 In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity	
Motivation and objectives of the research in this field	This research falls within the field of Cultural Heritage (CH), emphasizing reality-based surveying and the integration of 3D data into Mixed Reality (MR) applications to enhance conservation and maintenance processes. After three years of research, development, and field experimentation, the MR prototype for heritage maintenance—successfully tested at the Milan Cathedral—now serves as a solid foundation for a second research phase focused on scalability, interoperability, and wider operational deployment. The proposed work aims to transform the current solution into an extensible and modular platform, adaptable to various architectural and territorial heritage contexts, while prioritizing the on-site user experience.While the Milan Cathedral remains the main case study, other heritage sites may be integrated. The first research task is to optimize the current MR interface for next-generation devices, identifying and preparing suitable hardware solutions. The second step involves updating and testing the localization system for holographic sensors in large, complex physical environments, expanding on earlier prototypes. Next, the

	project will focus on the integration of advanced point cloud manipulation tools and 2D metric data overlays within the MR environment. These tools will allow users to isolate, annotate, and edit 3D spatial data in real time, enabling precise analyses and targeted interventions even in highly stratified contexts.A crucial development axis will involve connecting the MR system to the Cathedral's emerging Information System and to diverse databases (historical, diagnostic, photographic, maintenance, BIM/GIS), starting with the Milan Cathedral archive. Using dedicated APIs and middleware, the system will access, update, and correlate multi-source data in real time, creating a dynamic and interconnected knowledge ecosystem.The final component foresees close collaboration with fellow researchers to integrate AI capabilities into the MR application. These will support real-time detection of objects and surface characteristics, facilitating spatial localization of deterioration and data-driven maintenance insights.This research seeks to evolve a functional prototype into a scalable, intelligent, and open digital platform, capable of supporting effective, long-term conservation strategies across diverse heritage contexts. By leveraging MR, AI, and integrated data systems, the platform will promote sustainable preservation practices and unlock new potential for informed, spatially aware heritage management.
Methods and techniques that will be developed and used to carry out the research	The study will utilize a multidisciplinary approach to improve the technological, operational, and cognitive performance of the current Mixed Reality system. This phase will introduce new functionalities and integration strategies, emphasizing broader applicability, enhanced data interaction, and intelligent automation, rather than reiterating previous achievements. The investigation will start with the adoption and configuration of emerging MR hardware, focusing on devices that enhance spatial awareness, user comfort, and interaction fidelity. This study will investigate innovative interaction paradigms, such as multimodal input (gestures, voice, gaze), focusing on accessibility and intuitiveness in field conditions across

	various stakeholders. The project aims to enhance MR deployment in complex architectural settings by refining spatial anchoring and registration workflows. This will involve adapting existing positioning algorithms and implementing new localization protocols specifically designed for large-scale, non-uniform heritage spaces. These protocols will guarantee consistent content alignment, even in geometrically irregular or visually obstructed regions. An essential component involves enhancing the system's ability to visualize and analyse dense 3D point cloud data. Interactive point cloud editing tools will be embedded within the MR interface to achieve this goal. Users can extract significant spatial subsets, annotate features in situ, and correlate these with two-dimensional datasets, facilitating comprehensive multi-scale analysis on-site. The project will introduce a flexible data integration layer that can interface with various repositories, including historical archives, diagnostic reports, and existing digital models. The facilitation will occur through the design of interoperable middleware solutions and the establishment of standardized data exchange protocols, which will enhance communication between the MR application and external platforms. The integration of AI-driven visual analysis will facilitate real-time interpretation of surface conditions and object recognition, thereby advancing innovation. Computer vision techniques will facilitate the automated identification of degradation patterns, while advanced machine learning models may aid in predicting material deterioration, thereby enabling preventive conservation strategies. The topic has already been studied and is currently being developed by other PhD researchers. The objective is to modify methods and techniques for real-time holographic applications.
Educational objectives	The project aims to foster interdisciplinary skills at the intersection of architecture, digital technologies, and heritage conservation. It will enhance the ability to design and implement MR-based tools for complex cultural sites. The participant will develop critical thinking on data integration, user-centered design, and AI applications in

	the built environment.
Job opportunities	The project opens up career opportunities in digital heritage, architectural conservation, and immersive technology development. Experience in MR, 3D data processing, and AI-driven analysis is highly sought after in both academia and industry. The interdisciplinary profile developed through this research aligns with emerging roles in smart heritage management and the candidate will be well-positioned to lead innovation in the digital transformation of cultural assets.
Composition of the research group	0 Full Professors 2 Associated Professors 0 Assistant Professors 4 PhD Students
Name of the research directors	Prof. Francesco Fassi

Contacts
francesco.fassi@polimi.it *office: +390223996532*

Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents	--

Scholarship Increase for a period abroad	
Amount monthly	700.0 €
By number of months	6

Stage and period abroad	
Institution or company where the candidate will spend the period abroad (name and brief description)	
By number of months abroad	0

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
Additional support: **Budget for the research activity (only for positions supported by scholarship):**total amount

Euro 5.707,20 per student.
In detail:
-1st year Euro 1.902,40
-2nd year Euro 1.902,40
-3rd year Euro 1.902,40**.**

Additional information about the organization and regultions of ABC-PhD programme can be found in the Regulations for the 41st Cycle of ABC-PhD:download is available at link: https://www.dottorato.polimi.it/en/phd-programmes

Additional information about ABC department and ABC-PhD programme:available at link: https://www.dabc.polimi.it/

Desk availability: The ABC department provides non-permanent desks to be temporarily booked in common PhD rooms.

POLITECNICO DI MILANO

PhD in ARCHITETTURA, INGEGNERIA DELLE COSTRUZIONI E AMBIENTE COSTRUITO / ARCHITECTURE, BUILT ENVIRONMENT AND CONSTRUCTION ENGINEERING - 41st cycle

OPEN SUBJECT Research Field: PHD IN ARCHITECTURE, BUILT ENVIRONMENT AND CONSTRUCTION ENGINEERING

Monthly net income of PhDscholarship (max 36 months)
€ 1400.0 In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity	
Motivation and objectives of the research in this field	Our mission is to train PhD Holders able to reach outstanding positions at an international level not only as scientist or intellectuals but also as professionals or entrepreneurs in one of the quoted research fields. PhD Candidates are expected to refine their skills and to reach a cutting-edge level of knowledge about their research topics and to acquire a multidisciplinary character, to enhance their proficiency in scientific communication, research management and other transferable skills and to become active part of a scientific community. Moreover, they are expected to produce a significant, original contribution to their field, to organize this contribution it in a dissertation (the PhD Thesis) and to defend it 'viva voce' (publicly) in front of a committee of experts.
Methods and techniques that will be developed and used to carry out the research	Candidates without a pre-defined research topic shall plan their research and training activities and define the specific methodologies to be used to find the answer to their research question, immediately after the official start of their PhD Programme, in accordance with their Supervisors.The plan and the methodologies will be detailed it their PhD Agreement,giving evidence of their aims and of the global amount of time to be spent in each of them. The PhD Agreement will be endorsed by

	Candidate's Supervisor and approved by the Head of the Programme (or by a delegate).
Educational objectives	ABC-PhD Candidates are expected to produce knowledge advancements in their scientific field. Moreover, they are raised to be resilient,not frightened by the uncertainty and failure risks of innovations, trained in communication, management, networking and other transferrable skills, that are fundamental for doing research in this complex world. They are taught to cooperate in a competitive environment and to exploit their creativity to reach their goal, going beyond the limits of one scientific discipline, interacting and learning from other researchers and colleagues.Eventually,they are pushed to find out (and to network with) the possible stakeholders of their work. We purport that the best value for the Candidate and for the Program itself is the reward given by the chance of a practical application of the knowledge advancements realized.With this experience, ABC-PhD Doctors are expected to acquire the capacity to shoulder the responsibilities of R&D activities, to plan and to manage control tasks, to help the development and the critical optimization of policies and projects, to innovate: in particular about the PhD thesis topic, in general about the many sectors of Architecture, Built Environment and Construction Engineering and in all the most critical subjects related to the sustainable transformation and management of the Built Environment (environmental, economic, social and cultural sustainability).
Job opportunities	The holder of an ABC-PhD will gain high-level scientific knowledge, significant experience and proven R&D management skills, transferrable to other activities.This, together with the habit of communicating and working in English, acquired interacting with colleague at a global scale, during visits and stays abroad, and a deep knowledge of the academic world qualifies the Doctorate for positions offered by the best international universities and research centres. ABC-PhD experience, nevertheless, will offer the best occupational opportunities also for employments in architectural and engineering design companies,in public bodies and wherever highly

	qualified personnel (at an international level), specific competencies at the highest level, the attitudes and the network of a researcher is acknowledged. The more the Candidate, during the three PhD years, has taken the opportunities to stay in touch with the stakeholders of actual (or future!) societal needs and to operate real knowledge transfer, the more this comes true.ABC-PhD holders,infact,are problem-setters,trained to model complex environments, to understand complex questions and to apply critical thinking, and problem solvers, trained to turn uncertainty in methodology and doubts in reliable solutions.
Composition of the research group	48 Full Professors 89 Associated Professors 51 Assistant Professors 183 PhD Students
Name of the research directors	Andrea Caragliu

Contacts
head-phd-dabc@polimi.it phd-abc@polimi.it

Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents	--

Scholarship Increase for a period abroad	
Amount monthly	700.0 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

Additional support:

Budget for the research activity (only for positions supported by scholarship): total amount Euro 5.707,20 per student.

In detail:

- 1st year Euro 1.902,40
- 2nd year Euro 1.902,40
- 3rd year Euro 1.902,40

PhD students admitted without scholarship will have to negotiate the budget for research activities

with their Supervisors.
Additional information about the organization and regulations of ABC-PhD program can be found in the Regulations for the 41st Cycle of ABC-PhD: download is available at link: https://www.dottorato.polimi.it/en/phd-programmes
Additional information about ABC department and ABC-PhD program: available at link: https://www.dabc.polimi.it/
Desk availability: The ABC department provides non-permanent desks to be temporarily booked in common PhD rooms.

POLITECNICO DI MILANO

PhD in ARCHITETTURA, INGEGNERIA DELLE COSTRUZIONI E AMBIENTE COSTRUITO / ARCHITECTURE, BUILT ENVIRONMENT AND CONSTRUCTION ENGINEERING - 41st cycle

THEMATIC Research Field: RETROFITTING SYSTEMS FOR REINFORCED CONCRETE STRUCTURES

Monthly net income of PhDscholarship (max 36 months)
€ 1400.0 In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity	
Motivation and objectives of the research in this field	The main objective of the research is to study the efficiency of different retrofitting techniques applied to reinforced concrete structures. The ageing of reinforced concrete infrastructures and constructions requires retrofitting interventions to increase their safety level. The main objective is to select and optimize the most efficient and sustainable techniques considering different loading scenarios.Once the most efficient solutions have been selected, design methods will be developed and proposed for introduction into standard codes.
Methods and techniques that will be developed and used to carry out the research	The research will be developed following three different approaches: •Numerical analyses: at first, several simplified numerical analyses will be performed to optimize the retrofitting solutions and to select the configurations to be tested experimentally. In a second stage, detailed non-linear analyses will be performed on the tested configurations to develop parametric studies to limit the experimental effort. •Experimental investigations: the most efficient solutions will be tested to check the actual efficiency of the

	proposed retrofitting techniques. •Theoretical analysis: based on the numerical and experimental results, simplified theoretical design approaches will be developed and proposed.
Educational objectives	The Ph.D. student will improve/learn: •numerical skills •design and execution of laboratory tests •develop design models •work in an international research team
Job opportunities	The Ph.D. candidate will have the chance to get position both in University/Industry. In particular he/she will be able to get positions where high level numerical/design/experimental skills are required
Composition of the research group	1 Full Professors 0 Associated Professors 2 Assistant Professors 0 PhD Students
Name of the research directors	Sara Cattaneo

Contacts
sara.cattaneo@polimi.it

Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents	--

Scholarship Increase for a period abroad	
Amount monthly	700.0 €
By number of months	6

Stage and period abroad	
Institution or company where the candidate will spend the period abroad (name and brief description)	

By number of months abroad	0

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

Additional support:

Budget for the research activity (only for positions supported by scholarship):total amount Euro 5.707,20 per student.

In detail:

-1st year Euro 1.902,40

-2nd year Euro 1.902,40

-3rd year Euro 1.902,40

Additional information about the organization and regultions of ABC-PhD programme can be found in the Regulations for the 41st Cycle of ABC-PhD:download is available at link: https://www.dottorato.polimi.it/en/phd-programmes

Additional information about ABC department and ABC-PhD programme:available at link: https://www.dabc.polimi.it/

Desk availability: The ABC department provides non-permanent desks to be temporarily booked in common PhD rooms.

POLITECNICO DI MILANO

PhD in ARCHITETTURA, INGEGNERIA DELLE COSTRUZIONI E AMBIENTE COSTRUITO / ARCHITECTURE, BUILT ENVIRONMENT AND CONSTRUCTION ENGINEERING - 41st cycle

THEMATIC Research Field: URBAN PROXIMITY AND THE HERITAGE CITY. INNOVATIVE TOOLS FOR SOCIAL INCLUSION IN THE CLIMATE CHANGE SCENARIO

Monthly net income of PhDscholarship (max 36 months)
€ 1400.0 In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity	
Motivation and objectives of the research in this field	The intensification of climate change and recent urban challenges is generating significant impacts in cities, particularly in "heritage cities", which are becoming increasingly vulnerable from an economic, social, and cultural perspective, threatening their sustainable development and long term-resilience. In this context, it is essential to reflect on how to promote actions that make cities inclusive, safe, resilient, and sustainable, as defined by Goal 11 of the United Nations 2030 Agenda. Achieving this goal, along with others, requires integrated planning that attempts to experiment with the "proximity" strategy. The concept of proximity, studied by many researchers over the years, has become central to addressing the multiple urban challenges, made more evident by the Covid-19 pandemic. Proximity represents one of the strategies to guide the urban regeneration processes of heritage cities, such as Mantua, by promoting dynamic environments with diversified functions, residential areas, commercial activities, and a mix of green public spaces and areas accessible through slow mobility solutions. The proximity approach aims to reflect and reinterpret different urban themes, as outlined by the SDGs of the 2030 Agenda, translating these concepts into concrete actions to be experimented with, validated, and

	implemented in heritage cities. This requires innovative planning and territorial governance tools - progressive instruments that evolve over time, allowing flexible solutions that adapt to new needs. This also fosters territorial and social synergies among actors and places, aiming to develop new strategies for sustainable and integrated improvement that consider the needs of heritage cities and their inhabitants. Integrated planning for such urban transformation requires strong social integration to address climate change, encouraging shared responsibility for multidisciplinary and multisectoral projects. In this process, the collective and individual identity rooted in "heritage cities" is crucial to incorporate into proximity strategies, creating more livable, inclusive, resilient, and sustainable places based on historical and cultural characteristics. The opportunity lies in experimenting with new urban strategies and innovative tools that respond effectively to the proximity-heritage combination, enhancing the cities' resilience to climate challenges.
Methods and techniques that will be developed and used to carry out the research	The activity will aim to understand and develop knowledge for the integration of proximity strategies within planning tools, through the experimentation of innovative instruments designed to promote the resilient and sustainable development of “heritage cities”, with a specific focus on the goals of the 2030 AgendaThe candidate will be required to explore the phenomena that directly and indirectly impact the environment and cities, threatening their heritage and cultural values. Efforts should focus on addressing the ongoing challenges posed by climate change by adopting increasingly sustainable strategies and actions that are oriented towards urban proximity.The heritage city involved is Mantua, a city recognized for its historical, cultural, and architectural value, which contributes to a strong identity recognized both nationally and internationally. Indeed, Mantua, along with Sabbioneta, was designated as a single site in the UNESCO World Heritage list in 2008, in recognition of its exceptional contribution to urban, architectural, and artistic achievements of the Renaissance.The candidate

	must take this heritage into account when considering potential urban transformation, employing both multidisciplinary and interdisciplinary approaches. Additionally, the candidate will experiment with integrated, multi-scale planning capable of addressing urban design and planning at various levels, with the goal of developing solutions that are responsive to emerging needs and applicable at different scales of investigation. The candidate must build upon existing studies by providing a theoretical, analytical, and interpretive framework based on the distinctives features and peculiarities that define the identity of the heritage city, as well as experimenting with effective operational tools that can be integrated into current governmental urban planning instruments.In this applied phase, the candidate will explore how the proximity strategy, integrated with innovative tools, could represent an opportunity for urban planning. This experimentation will center on the city of Mantua as a case study, with the aim of understanding the specific needs of heritage cities in the context of climate change, thereby defining the potential and limitations of this new approach for future urban planning that increasingly aligns with sustainability objectives.
Educational objectives	The program aims to provide analytical tools and methodologies for research, analysis, and urban planning, fostering advancements in urban studies for the development of innovative tools for territorial governance. The goal is to promote integrated planning for “heritage cities”, such as Mantua, through a “proximity culture”, experimenting with actions and strategies aligned with the SDGs of Agenda 2030.
Job opportunities	The research aims to qualified professionals in the field of territorial planning, design and governance of urban projects. Specifically, in relation to this program call, PhD graduates with this qualification will be working in national and international organizations or academic Institutions in research, consultancy and planning for heritage cities with historical, cultural and architectural value.

Composition of the research group	1 Full Professors 1 Associated Professors 1 Assistant Professors 1 PhD Students
Name of the research directors	Piergiorgio Vitillo

Contacts
piergiorgio.vitillo@polimi.it

Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents	--

Scholarship Increase for a period abroad	
Amount monthly	700.0 €
By number of months	6

Stage and period abroad	
Institution or company where the candidate will spend the period abroad (name and brief description)	
By number of months abroad	0

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

Additional support:

Budget for the research activity (only for positions supported by scholarship):total amount Euro 5.707,20 per student.

In detail:

-1styear Euro 1.902,40

-2ndyear Euro 1.902,40

-3rdyear Euro 1.902,40**.**

Additional information about the organization and regultions of ABC-PhD programme can be found in the Regulations for the 41stCycle of ABC-PhD:download is available at link: https://www.dottorato.polimi.it/en/phd-programmes

Additional information about ABC department and ABC-PhD programme:available at link: https://www.dabc.polimi.it/

Desk availability: The ABC department provides non-permanent desks to be temporarily booked

in common PhD rooms.