



# PhD in CONSERVAZIONE DEI BENI ARCHITETTONICI / PRESERVATION OF THE ARCHITECTURAL HERITAGE - 37th cycle

**PON - GREEN Research Field: PRESERVING OUR HERITAGE USING A SUSTAINABLE AND GREENER APPROACH**

| Monthly net income of PhDscholarship (max 36 months)                                                 |
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| <b>€ 1180.0</b>                                                                                      |
| In case of a change of the welfare rates during the three-year period, the amount could be modified. |

| Context of the research activity                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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| <b>Motivation and objectives of the research in this field</b> | <p>The research takes place under the framework of New European Bauhaus to shape a greener and fairer way of life in creative and inclusive societies. The overall objective is to define sustainable and resource-efficient solutions for an open, accessible, inclusive, resilient, and low-emission cultural heritage. Materials and methods for the preservation of cultural heritage are often energy consuming, not environmentally friendly, or harmful for the health of operators and curators. Many of these materials and methods also prove to be not durable nor sustainable, leading often to the need of repetitive and costly restoration of artefacts, monuments, and heritage sites. Research has already addressed this challenge to a certain extent, and several international research programs nowadays pay increasing attention to this topic. Most of the restorations today include actions aimed at improving the Energy Efficiency of Historic Buildings. Currently, about 35% of the buildings in the EU are over 50 years old and most of them are energy inefficient. The EEHB represents a field where the preservation of architectural heritage takes part to the global goal of sustainable development. Historic buildings play a crucial role in improving energy efficiency in cities and reducing the primary energy demand. Therefore, although they represent more than embodied energy and carbon but the spirit and identity of a community, historic buildings are</p> |



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|                                                                                                | <p>under significant pressure to reduce carbon emissions. The challenge is balancing energy efficiency with keeping the architectural and historical significance of such building stock. However, most systems currently in use for making old buildings more energy efficient are not environmentally sustainable because they do not rely on green-based techniques i.e., the materials currently in use for insulating. Therefore, improving the energy efficiency of historic buildings using scarcely green-based materials and techniques can result in a paradox because it increases the environmental impact of the construction sector instead of making the built heritage more sustainable. Similarly, many restorations today include actions aimed at protecting historic buildings from the consequences of climate change i.e., the methods for keeping the building walls dry or to get them dry after a flood. However, most systems are not environmentally sustainable nor durable and often lead to the need of costly repetitions of the same treatments. Such issues directly address the goals of EU Green Deal, since built heritage is responsible for approximately 40% of energy consumption and 36% of CO<sub>2</sub> emissions in the EU and consequently of the climate change that exposes many cities to increasing risks. A proper preservation and adaptation of the old buildings may otherwise lead to significant energy savings, reducing the EU's total energy consumption and lowering CO<sub>2</sub> emissions.</p> |
| <p><b>Methods and techniques that will be developed and used to carry out the research</b></p> | <p>The research program needs to adopt a holistic approach to conserving heritage buildings and materials through an interdisciplinary network of knowledge and skills from hard and soft sciences and engineering. Advanced methods and techniques for the survey, documentation, and monitoring of the built heritage at different scales (landscape, city, building) will have a significant role in the proper development of the research, including assessing and monitoring the preservation status of monuments and sites with non-intrusive green tech techniques. Therefore, an early task for the Ph.D. student will be to define a specific area/scale where to target the subsequent steps of the research. Thanks to specific agreements already in force, the Ph.D. student will be technically supported by</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |



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|                               | <p>DASTU's Laboratories System and other laboratories at Politecnico. The analysis of traditional methods and materials, also in a historical perspective, as well as digital and cutting-edge technologies to investigate this subject may coexist within an integrated program of investigation. Considering environmental, social, and economic impacts, the research will be able to bring together basic and applied research, social, cultural, and entrepreneurial innovation through the involvement of cultural and creative sectors to ensure sustainability. The participation of innovative industry and/or CCIs/SMEs, besides public entities, will be possible by means of a compulsory internship at ASSORESTAURO SERVIZI srl. During the internship, the Ph.D. student will have the opportunity to analyze the restoration sector in Italy from the privileged observation point of the main trade association at national level. Therefore the Ph.D. student will watch how restoration companies and professionals are going to face the challenge of green restoration, in response to the growing demand for green-oriented products and services, as a direct consequence of the sustainable development goals set by the EU Green Deal. The doctoral student will monitor how the restoration sector responds to these stimuli and document how some companies sustain a research activity primarily oriented to product and process innovation, He/she will also investigate what relation might be with outcomes obtained by universities research or other institutional research entities. By shaping a map of ongoing experiences, the doctoral student will select a shortlist of products or techniques for green-based conservation and restoration and, therefore, coherent with the aim of the research. He/she will then monitor their evolution and on-field application, possibly also by means of a specific pilot-site experience and will finally set a protocol to evaluate the sustainability of such green-based products and techniques for conservation.</p> |
| <b>Educational objectives</b> | <p>The research aims at exploring ways for quality conservation in a green and sustainable way. It will investigate the contemporary scenario of effective and sustainable strategies for the preservation and restoration</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |



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|                          | <p>of built heritage that are feasible, user friendly, affordable, durable and safe to the operators and the artefacts to ensure the long-term conservation and physical access to heritage buildings. They should also minimize their environmental footprint and contribute to energy efficiency and sustainability of monuments, historic buildings, and cultural institutions. More specifically, and thanks to the compulsory internship, the research will then investigate the impact the green transition will have on the historic built heritage and on the building restoration sector in Italy.</p> <p>The research program aims at forming a profile characterized by multidisciplinary skills and strongly oriented to contemporary conservation and architectural restoration. The research program stresses a direct approach to the themes of the 2030 Agenda for sustainable development. The Ph.D. student will have to immediately face these issues, demonstrating that he/she can draw from different disciplinary fields. The company internship will be crucial for the proper conduct of the research. It will allow the Ph.D. student to develop specific skills in information management at different scales (territorial, urban, single building). The ability to manage this information in a smart way and through advanced techniques and tools is one of the specific training objectives of this program. The precise nature of the research program, and the related educational objectives, will be integrated with the institutional goals and with the general courses of the doctoral program the doctoral student will fully attend. The achievement of the educational objectives will be periodically monitored and discussed by the Ph.D. board.</p> |
| <b>Job opportunities</b> | <p>Graduates of the PhD programme have often found 2 / 5 employment in public sector and conservation institutions, as well as in professional practices and in the business world, in specific specialized fields. PhD candidates from abroad find job in their native countries at University or in Cultural Heritage Institutions. As regards Italy, the relationship with Italian Ministry of Cultural Heritage (Mibact), has been definitely fruitful, especially when we consider that many among the best PhDs in Preservation</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |



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|                                          | of Architectural Heritage have been hired as officers and executives to the above ministry: recently (February 2018) twelve PhD from this Programme won the competitive exam to become public officers in the Ministry of Cultural Heritage and most of them are now responsible in prestigious seats. |
| <b>Composition of the research group</b> | 11 Full Professors<br>13 Associated Professors<br>0 Assistant Professors<br>38 PhD Students                                                                                                                                                                                                            |
| <b>Name of the research directors</b>    | Davide Del Curto                                                                                                                                                                                                                                                                                       |

| <b>Contacts</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
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| <p>Contact of the phd coordinator: Mariacristina Giambruno e-mail: mariacristina.giambruno@polimi.it; tel. +39 02.2399.5645</p> <p>Research director Davide Del Curto e-mail: davide.delcurto@polimi.it</p> <p>Contact in the PhD Office at DASTU:<br/>dr. Marina Bonaventura E-mail: marina.bonaventura@polimi.it; tel. +39/02/2399.5165<br/>Marilena Mastalli e-mail: marilena.mastalli@polimi.it; tel. +39/02/2399.9395</p> <p>Website: <a href="http://www.dastu.polimi.it/index.php?id=148">http://www.dastu.polimi.it/index.php?id=148</a></p> |

| <b>Additional support - Financial aid per PhD student per year (gross amount)</b> |    |
|-----------------------------------------------------------------------------------|----|
| <b>Housing - Foreign Students</b>                                                 | -- |
| <b>Housing - Out-of-town residents (more than 80Km out of Milano)</b>             | -- |

| <b>Scholarship Increase for a period abroad</b> |          |
|-------------------------------------------------|----------|
| <b>Amount monthly</b>                           | 566.36 € |
| <b>By number of months</b>                      | 0        |

| <b>National Operational Program for Research and Innovation</b>                                             |                          |
|-------------------------------------------------------------------------------------------------------------|--------------------------|
| <b>Company where the candidate will attend the stage (name and brief description)</b>                       | ASSORESTAURO SERVIZI srl |
| <b>By number of months at the company</b>                                                                   | 6                        |
| <b>Institution or company where the candidate will spend the period abroad (name and brief description)</b> |                          |
| <b>By number of months abroad</b>                                                                           | 0                        |



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

Educational activities (purchase of study books and material, funding for participation in courses, summer schools, workshops and conferences): financial aid per PhD student per year ("DOTE"):  
1st year: max 0 euros 2nd year: max 1.534,33 euro 3rd year: max 1.534,33 euro.

Teaching assistantship (availability of funding in recognition of supporting teaching activities by the PhD student) There are various forms of financial aid supporting the teaching practice. The PhD candidate is encouraged to take part in these activities, within the limits allowed by the regulations.

Computer availability: In the PhD candidates room are available workstations for shared use, connected with the printer . 4 / 5 All the PhD students can use their own laptop with the wireless connection. Workstations and other equipment are available in the various laboratories linked with the doctoral programme.