



PhD in ARCHITETTURA, INGEGNERIA DELLE COSTRUZIONI E AMBIENTE COSTRUITO / ARCHITECTURE, BUILT ENVIRONMENT AND CONSTRUCTION ENGINEERING - 40th cycle

INTERDISCIPLINARY Research Field: THE ECONOMIC EVALUATION FOR FLOOD RISK MITIGATION DESIGNS IN PRESENCE OF CULTURAL HERITAGE ASSETS

Monthly net income of PhDscholarship (max 36 months)
€ 1350.0
In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity	
<p>Motivation and objectives of the research in this field</p>	<p>Interdisciplinary PhD Grant The PhD research will be carried out in collaboration with research groups of the PhD programme in "Environmental and Infrastructure Engineering". See https://www.dottorato.polimi.it/en/prospective-phd-candidates for further information.</p> <p>The climate change and an increasing demand of flood areas from anthropic activity has led to put natural hazard and, among them, flood risk management upfront on the international political agenda (Agenda 2030 Dg 11.4; 11.b). Cultural assets, identified by the Floods European Directive (60/2007) as one of the four macro-categories of risk-exposed elements, represent a relevant and characterizing element especially in Italian territorial and urban systems. The Italian Institute for Conservation and Restoration (VIR-ISCR, 2019) surveyed about 205,670 cultural assets on the Italian territory, of which 24.3 % are in flood-prone areas, accounting for 49,977 cultural assets. Among these, 16,025 assets are exposed to a high level of flood hazard. These assets are exposed to different levels of risk, which results in significant economic and social damages. The potential annual risk (Eu flood Directory, 2007/60, product of annual hazard</p>



	<p>and vulnerability of goods on the territory) are related not only to the loss of heritage assets' historical and cultural values, contributing to the construction of resilient cities, but also to the safety of visitors, workers, and local communities, without considering the relevance of their negative consequences for local economies. Thus, territorial planning can no longer dismiss considering the consequences of flood events also on architectural heritage and the potential loss of such an extra-ordinary and unique cultural, social, and economic resource. In this light, the research endeavors to define a spatial economic evaluation model, that can support investment choices and design selections about flood risk prevention and mitigation. Such a model can answer the need to assess, from the perspective of sustainably allocating financial sources, the most effective and efficient trade-off between prevention and maintenance actions on the territory and expected economic damage with a specific focus on architectural heritage in Italian areas at high hydrogeologic risk.</p>
<p>Methods and techniques that will be developed and used to carry out the research</p>	<p>Coherently with the European legislation (Directive 2007/60) and the Italian legislation (DL 49/2010), which consider flood risk as the function of</p> <ul style="list-style-type: none"> i) the probability of occurrence of the possible flood P, ii) the value of elements at risk (buildings and productive activities) present in the floodable area; iii) their degree of vulnerability, the research adopts an interdisciplinary approach to the flood risk mitigation issue. <p>More in detail, the research proposes integrating a spatial economic evaluation model with simulation models for hydrologic - hydraulic phenomena to compare different solutions based on financial and economic performance indicators.</p> <p>Nowadays, the approach to flood risk mitigation is conceived as combination of structural and nonstructural defenses, as recommended in UN/ISDR (2005) and in the EU Flood Directive (60/2007): in the specific, the EU directive requires the ex-ante evaluation of costs and benefits from mitigation measures in risk management</p>



	plans.
Educational objectives	The objective of the Phd program is to train a research figure that can develop autonomous research and become experts in the field of spatial economic evaluation to support selecting appropriate mitigation measures, that allow to preserve heritage values, reduce social and environmental risk, while ensuring their feasibility from a financial and economic perspective. In this light, the research proposes the development of a spatial model based on a Cost-Benefit Analysis (CBA) to support selecting appropriate mitigation measures, that allow to preserve heritage values, reduce social and environmental risk, while ensuring their feasibility from a financial and economic perspective. Furthermore, the model development in a GIS environment will allow to spatialize economic quantities (i.e. the expected damage with respect to different hydraulic hazard scenarios), thus providing a territorial visualization of the evaluation outputs.
Job opportunities	Main opportunities in the job market include Universities, Research Centers, Public-Sector, top-level management in Authorities involved in Environmental and Cultural Heritage Conservation policy, senior consultants for engineering companies.
Composition of the research group	1 Full Professors 1 Associated Professors 3 Assistant Professors 0 PhD Students
Name of the research directors	Francesca Torrieri, Marco Mancini

Contacts

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Additional support - Financial aid per PhD student per year (gross amount)



Housing - Foreign Students	--
Housing - Out-of-town residents (more than 80Km out of Milano)	--

Scholarship Increase for a period abroad	
Amount monthly	675.0 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
<p>Additional support:</p> <p>Budget for the research activity (only for positions supported by scholarship): total amount Euro 5503.35 per student In detail: - 1st year Euro 1834.45 - 2nd year Euro 1834.45 - 3rd year Euro 1834.45</p> <p>Additional information about the organization and regulations of ABC-PhD programme can be found in the Regulations for the 40th Cycle of ABC-PhD: download is available at link: https://www.dottorato.polimi.it/corsi-di-dottorato/architettura/architettura-ingegneria-delle-costruzioni-e-ambiente-costruito</p> <p>Additional information about ABC department and ABC-PhD programme: available at link: https://www.dabc.polimi.it/</p> <p>Desk availability: The ABC department provides non-permanent desks to be temporarily booked in common PhD rooms.</p>