



# PhD in INGEGNERIA AMBIENTALE E DELLE INFRASTRUTTURE / ENVIRONMENTAL AND INFRASTRUCTURE ENGINEERING - 38th cycle

Research Area n. 3 - Environmental and Hydraulic Engineering and Geomatics

**PARTENARIATO PNRR Research Field: FLOOD HAZARD MODELLING UNDER  
ENVIRONMENTAL AND CLIMATIC CHANGES**

**Monthly net income of PhDscholarship (max 36 months)**

**€ 1300.0**

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**

**RETURN: PARTENARIATO ESTESO MULTI-RISK  
SCIENCE FOR RESILIENT COMMUNITIES UNDER A  
CHANGING CLIMATE**

CUP D43C22003030002 - Decreto di concessione D.D.  
1552 del 11/10/2022 D.D. 341 del 15/03/2022

Avviso pubblico per la presentazione di Proposte di  
intervento per la creazione di "Partenariati estesi alle  
università, ai centri di ricerca, alle aziende per il  
finanziamento di progetti di ricerca di base" - nell'ambito  
del Piano Nazionale di Ripresa e Resilienza, Missione 4  
"Istruzione e ricerca" - Componente 2 "Dalla ricerca  
all'impresa" - Investimento 1.3, finanziato dall'Unione  
europea - NextGenerationEU.

Flood hazard is a long-standing problem; furthermore, the  
number of flood disasters is progressively increasing due  
to climate and environmental change. Therefore, it is  
imperative to develop a comprehensive framework for risk  
analysis and efficient and reliable predictive models.  
The present PhD scholarship is funded by the Extended  
Partnership (EP) RETURN - multi-Risk sciEnce for  
resilienT commUnities undeR a changiNg climate - that



	<p>resilient communities under a changing climate - that aims at enforcing the key competences, the technological and knowledge transfer, and to strengthen Italian governance in managing disaster risk.</p> <p>The specific objective of the PhD research is to develop a method to stochastically assess flood hazard in the presence of strongly interconnected discharge boundary conditions (rivers with tributary sub-basins, river networks), with the possibility to simplify the hydraulic treatment for the sake of manageable hydro-dynamic simulations. The activity falls within Spoke VS1 (Water), WP2 (Flood risk under environmental and climatic changes), Task 2.2 (Flood hazard modelling) of RETURN.</p>
<p><b>Methods and techniques that will be developed and used to carry out the research</b></p>	<p>The research will be carried out by setting up models for floods with variable probability, and paying attention to the composition of flood events in multiple sub-basins. Hydrological and hydraulic modelling will be employed to produce hazard scenarios. The possibility to use surrogate models for river hydro-dynamics will be considered to allow for multiple hydrological scenarios to be considered in a stochastic approach. The quantitative analyses will be performed for a case-study to be selected.</p> <p>The research shall proceed by subsequent steps:</p> <ul style="list-style-type: none"> <li>• Conceptual architecture of a modelling approach</li> <li>• Selection of a suitable case-study</li> <li>• Hydrological modelling for sub-catchments</li> <li>• Hydro-dynamic modelling of river streams</li> <li>• Development of a stochastic approach to location-wise probability of flooding.</li> </ul>
<p><b>Educational objectives</b></p>	<p>Advanced knowledge in:</p> <ul style="list-style-type: none"> <li>• Fluid mechanics</li> <li>• River hydraulics and hydrology</li> <li>• Hydro-dynamic and hydrological modelling.</li> </ul>



<b>Job opportunities</b>	<p>Job opportunities:</p> <ul style="list-style-type: none"> <li>•Employment in private consultancy firms or public agencies active in hydraulic modelling and engineering, water resources management, risk mitigation, spatial planning.</li> <li>•Freelance expert in the same sector as above.</li> </ul>
<b>Composition of the research group</b>	<p>1 Full Professors 1 Associated Professors 0 Assistant Professors 0 PhD Students</p>
<b>Name of the research directors</b>	Alessio Radice, Francesco Ballio

<b>Contacts</b>
<p>alessio.radice@polimi.it +39 02 2399 6251 <a href="https://radice.faculty.polimi.it/">https://radice.faculty.polimi.it/</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>	650.0 €
<b>By number of months</b>	6

<b>Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information</b>
<p><u>Educational activities</u> (purchase of study books and material, funding for participation to courses, summer schools, workshops and conferences): approximately 1620,00 euros per PhD candidate per year, on average.</p> <p><u>Teaching assistantship</u> (availability of funding in recognition of support to teaching activities by the PhD student): there are various forms of financial aid for activities of support to the teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations.</p> <p><u>Computer availability and desk availability</u>: individual assignment for the entire career.</p>