



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

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

PNRR\_352 Research Field: HYDRAULIC CRITICALITIES OF RIVER BRIDGES

**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**

Hydraulic processes constitute the first cause of default of bridges, in Italy and all over the world. The interaction between the river and the bridge generates complex intercorrelated phenomena (flux obstruction, river bed and banks erosion, hydrodynamic loads, floating debris accumulation, ...); such processes are only partially documented in the technical-scientific literature. As a consequence, we presently face strong uncertainties in evaluating bridge safety with respect to hydraulic processes, both within the design of new structures and while assessing potential criticality of existing ones. Deeper phenomenological understanding, proper inspections procedures and monitoring set-ups can constitute useful tools to reduce such uncertainties.

**Objectives of the research**

Define operational procedures for the assessment of hydraulic criticalities of river bridges and for their structural safety. Among the PNRR strategic objectives, the project is mainly focused on "infrastructures and competition", but also has an impact on "improvement of people's quality of life and reduce inequalities", by supporting the lines:

- Speeding up and simplification of infrastructure investments



	<ul style="list-style-type: none"> <li>• Modernization and enhanced connection of transport systems</li> <li>• digitization for better logistics and road safety</li> <li>• Better connections for inland and mountain areas.</li> </ul>
<p><b>Methods and techniques that will be developed and used to carry out the research</b></p>	<p>The project will be developed within a wide network of research institutions (see below) offering a variety of competences, presently cooperating on the topic of river-bridge compatibility. Specific objectives (and, therefore, tools) of the research will depend on the level of co-funding provided by the industrial partner (TECNE). Possible approaches to the problem involve:</p> <ul style="list-style-type: none"> <li>• laboratory experiments at Politecnico di Milano</li> <li>• field monitoring</li> <li>• hydraulic modelling tools</li> <li>• analysis of field cases</li> <li>• analysis of satellite images.</li> </ul>
<p><b>Educational objectives</b></p>	<p>Educate an expert in (and/or):</p> <ul style="list-style-type: none"> <li>• evaluation of hydraulic vulnerability of existing bridges</li> <li>• hydraulic monitoring and inspection of bridges with special focus on critical thinking and analysing and assessing sustainable solution, for a larger set of stakeholders.</li> </ul>
<p><b>Job opportunities</b></p>	<p>Road and railway managers; private companies offering monitoring and inspection services for constructions; insurances.</p>
<p><b>Composition of the research group</b></p>	<p>1 Full Professors 1 Associated Professors 0 Assistant Professors 1 PhD Students</p>
<p><b>Name of the research directors</b></p>	<p>Francesco Ballio</p>

<b>Contacts</b>	
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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	700.0 €
By number of months	6

National Operational Program for Research and Innovation	
Company where the candidate will attend the stage (name and brief description)	TECNE Autostrade per l'Italia
By number of months at the company	6
Institution or company where the candidate will spend the period abroad (name and brief description)	to be defined
By number of months abroad	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
<p>Universities, Companies, Agencies and/or National or International Institutions that are cooperating in the research:</p> <p>see the web-page of the connected project (in Italian): <a href="https://sites.google.com/view/gii-ponti/home-page">https://sites.google.com/view/gii-ponti/home-page</a></p> <p><u>Educational activities</u> (purchase of study books and material, funding for participation in courses, summer schools, workshops and conferences): approximately 1902,38 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 candidate): there are various forms of financial aid for activities of support to the teaching practice. The PhD candidate 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>