



# 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: WATER DISTRIBUTION NETWORK  
TRANSFORMATION. DIGITALIZATION, ENERGY RECOVERY, PRESSURE MANAGEMENT  
AND RESILIENCE**

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

**€ 1200.0**

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

#### **ECS-MUSA: ECOSISTEMA DELL'INNOVAZIONE MUSA - MULTILAYERED URBAN SUSTAINABILITY ACTION**

CUP D43C22001410007 – Decreto di concessione D.D. 1055 del 23/06/2022 D.D. 3277 del 30/12/2021

Avviso pubblico per la presentazione di Proposte di intervento per la creazione di 12 Ecosistemi dell'innovazione sul territorio nazionale da finanziare nell'ambito del Piano Nazionale di Ripresa e Resilienza, Missione 4 Componente 2 Investimento 1.5 - Creazione e rafforzamento di "ecosistemi dell'innovazione", costruzione di "leader territoriali di R&S" - finanziato dall'Unione europea - NextGenerationEU.

(National Plan for Recovery and Resilience) M2C4 - I 4.2

Water distribution networks are strategic structures whose operativity is of primary importance for population well-being. In a global context of fast transformation due to social and environmental actions, water systems are heavily solicited up to the achievement of their functional



	<p>limits. The introduction of innovative devices for the improvement of network performances can represent a valid opportunity to overcome service limitations and improve network resilience.</p> <p>Some objectives of the research are:</p> <ul style="list-style-type: none"> <li>-The programmatic evaluation of innovative devices able to improve the operability of the network. The technological solutions will be investigated under several points of view: the energetic efficiency, the digitalization and monitoring capacity and the potential for operations improvement.</li> <li>-The modeling of real network conditions where the technologies potentialities will be tested, and their functional reliability verified.</li> <li>-Development of experimental equipment for performance evaluation of industrial devices and innovative prototypes.</li> <li>-The goals should be the implementation of a supporting methodology for water system management based on optimization of monitoring systems and the development of new IOT devices in order to implement the digital transition in WDS management.</li> </ul> <p>The project promoting rationale use of water resources and enhancing efficiency of water distribution networks (energy saving, water loss reduction, improved level of service etc.) is in line with Research Priority 4.a of the PNRR.</p>
<p><b>Methods and techniques that will be developed and used to carry out the research</b></p>	<p>The research method follows several steps beginning from a wide technical review of the state of the art about water distribution network enhancement. The steps regard the use of several approaches, specifically:</p> <ul style="list-style-type: none"> <li>-the implementation and use of network modelling methodologies to reproduce real environments and analyse the actual performance of the network;</li> <li>-the modelling of hydraulic devices behaviour in real conditions and their implementation in network modelling software;</li> <li>-the execution of laboratory performance tests on hydraulic devices, like pumps, PAT, turbines, valves and</li> </ul>



	<p>innovative devices to be applied in networks.</p> <p>A phase of project review is foreseen to account for differences between achieved and expected results and to eventually adjust planning to improve benefits for underperforming activities.</p> <p>The context of the project implies the consideration of several national and international regulations with particular attention to the indicators and key performance parameters defined by the International Water Association (IWA).</p>
<b>Educational objectives</b>	<p>Learn about best practices and innovative technologies.</p> <p>Learn how to experimentally evaluate the performances of hydraulic devices dedicated to pressure control and energy recovery. Gain experience in all aspects related to efficiency of water distribution networks</p> <p>Prepare highly qualified professionals to efficiently tackle engineering scenarios linked to water network management, leakage control and climate changes. Close collaboration between PoliMI and the industrial partner yields a unique opportunity for the PhD to be trained in diverse aspects contributing to shape their future careers, including economic-management and goals oriented to sustainable use of water and energy resources.</p>
<b>Job opportunities</b>	<p>Expert in water distribution network efficiency, asset management and optimization of operations. Energy manager.</p>
<b>Composition of the research group</b>	<p>1 Full Professors 1 Associated Professors 2 Assistant Professors 6 PhD Students</p>
<b>Name of the research directors</b>	<p>Stefano Malavasi</p>

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

Scholarship Increase for a period abroad	
Amount monthly	600.0 €
By number of months	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> <ul style="list-style-type: none"> <li>•Politecnico di Bari</li> <li>•Università degli studi della Basilicata</li> <li>•PIDE srl</li> <li>•PBVS srl</li> <li>•IDRAGEST srl</li> </ul> <p><u>Educational activities</u> (purchase of study books and material, funding for participation to courses, summer schools, workshops and conferences): approximately 1630,00 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>