



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, TECHNOLOGIES AND DATA SCIENCE FOR
NETWORK MANAGEMENT**

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 limits. The introduction of innovative devices and



	<p>strategies for the improvement of network performances can represent a valid opportunity to overcome service limitations and improve network resilience. Some objectives of the research are:</p> <ul style="list-style-type: none"> •The evaluation development and verification of technological solutions to improve the energetic efficiency, the digitalization level and plant management. •The modelling of real network conditions to test technologies and methodologies effectiveness. •Development of experimental equipment for performance evaluation of industrial devices and innovative prototypes. •Implementation of a supporting methodology for water system management based on new IOT devices enhancing the digital transition in WDS. •The evaluation, design and implementation of Artificial Intelligence (AI) tools and related technologies, specifically in the domain of Deep Learning, to optimize device positioning, setting and operation. <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>Methods and techniques that will be developed and used to carry out the research</p>	<ul style="list-style-type: none"> •Implementation and use of network modelling methodologies to reproduce real environments and analyse the actual performance of networks like Demand Driven and Pressure Driven analysis; •Modelling of hydraulic devices behaviour using matlab or other modelling tools. Application of the model to real conditions and implementation in network modelling software; •Experimental analysis on hydraulic devices, like pumps, PAT, turbines, valves and innovative devices to be applied in networks. •The application of AI tools to improve the management of devices.



	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).
Educational objectives	<p>Learn about best practices and innovative technologies in water distribution activities. Learn how to experimentally evaluate the performances of hydraulic devices dedicated to pressure control and energy recovery. Gain experience in the application of state of the art methodologies and AI in all the aspects related to the 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>
Job opportunities	Expert in water distribution network efficiency, asset management and optimization of operations. Energy manager.
Composition of the research group	1 Full Professors 1 Associated Professors 1 Assistant Professors 4 PhD Students
Name of the research directors	Stefano Malavasi

Contacts	
Stefano.malavasi@polimi.it; +39 02 2399 6261; www.fluidlab.polimi.it	

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	600.0 €
By number of months	6

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

Universities, Companies, Agencies and/or National or International Institutions that are cooperating in the research:

- Università degli Studi di Milano
- Università degli Studi del Sannio

Educational activities (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.

Teaching assistantship (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.

Computer availability and desk availability: individual assignment for the entire career.