POLITECNICO DI MILANO

# PhD in INGEGNERIA AMBIENTALE E DELLE INFRASTRUTTURE / ENVIRONMENTAL AND INFRASTRUCTURE ENGINEERING - 40th cycle

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

**THEMATIC Research Field: EARLY WARNING SYSTEMS FOR A RISK-BASED MANAGEMENT OF THE WATER SUPPLY SYSTEM**

| Monthly net income of PhDscholarship (max 36 months) |
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| **€ 1400.0**<br>In case of a change of the welfare rates during the three-year period, the amount could be modified. |

| Context of the research activity | |
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| **Motivation and objectives of the research in this field** | Ensuring chemically and microbiologically safe drinking water requires a sequence of treatments. This asks for a careful process control, especially in climate change scenarios. The revision of the European Union Drinking Water Directive (EU DWD) is based on the guarantee of safety for the consumers, which involves the analysis and management of the water system in terms of risk minimization. The project's objective is to leverage a paradigm shift, from an approach based on compliance with quality limits at a specific control point, to a precautionary approach that accompanies compliance with limits with monitoring and control actions that prevent the deterioration of the quality of drinking water. |
| **Methods and techniques that will be developed and used to carry out the research** | The water system must be schematized into three sequential compartments: (1) the supply source, (2) the treatment plant, (3) the distribution network, which can no longer be conceived as separate, but as a unicum. Furthermore, the distribution network can no longer be seen only as a transport infrastructure, therefore passive, but as an active infrastructure capable of modifying the quality of the drinking water.<br>The implementation of this new paradigm requires a |

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| | change in strategy in monitoring and controlling the quality of drinking water in each of the 3 compartments. Early warning systems, combined with new techniques for processing large amounts of data, are the basis of this strategy, allowing for the early detection of variations in water quality, supporting the manager in the proactive implementation of targeted mitigation actions.<br>In detail, we want to couple advanced monitoring techniques and advanced data elaboration methods to design an early warning system, dedicated to each of the above mentioned compartment.<br>In addition, we will develop risk assessment procedures to account for emerging contaminants, which originate from the source water, but can also be released by materials in contact with water.<br>The outcomes of the PhD research are expected to contribute to some of the Sustainable Development Goals (SDG), in details: SDG6 by providing tools to increase resilience of drinking water production and distribution systems, SDG3, SDG9, SDG11, and SDG12, related to the safety of distributed water and the more efficient use of resources.<br>It is requested to the PhD student: i) to be autonomous in transferring to the sites selected for the research by car (no public transportation available); ii) to have a basic knowledge of Italian in order to interact with plant technicians; iii) to be able to write technical reports in Italian. |
| **Educational objectives** | The main objective is the formation of professionals who can:<br>- develop autonomous research and become experts in environment-related topics<br>- plan and design interventions<br>- assess their implications on the environment and human health.<br>The PhD student will take advantage from internal know-how transfer and from the continuous exchange with the experienced senior members.<br>Moreover, the researcher will have the opportunity to combine expertise collaborating with experts of Acque Bresciane S.r.l., managing the integrated water system |

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| | from which case studies are selected, to synergistically exploit research and technical practice. |
| **Job opportunities** | Industrial sector (water and wastewater treatment and management, consulting), senior consultants for engineering companies, public bodies and authorities involved in environmental policies, research agencies and institutions. |
| **Composition of the research group** | 0 Full Professors<br>1 Associated Professors<br>1 Assistant Professors<br>3 PhD Students |
| **Name of the research directors** | Manuela Antonelli |

| **Contacts** |
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| Prof. Manuela Antonelli (https://orcid.org/0000-0003-1293-2019)<br>manuela.antonelli@polimi.it |

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

| **Scholarship Increase for a period abroad** | |
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| **Amount monthly** | 700.0 € |
| **By number of months** | 6 |

| **Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information** |
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| Educational activities (purchase of study books and material, funding for participation to courses, summer schools, workshops and conferences): the Ph.D. programme supports the educational activities of its Ph.D. students with an additional funding equal to 10% of the scholarship, starting from the first year.<br><br>Teaching assistanship (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.<br><br>Computer availability and desk availability: 1$^{st}$ year +2$^{nd}$ year +3$^{rd}$ year: individual use. |