



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: NATURE BASED SOLUTIONS AND SUBSURFACE
ENVIRONMENT IN URBAN AREAS**

Monthly net income of PhDscholarship (max 36 months)

€ 1195.5

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**

**CN-Biodiversità: CENTRO NAZIONALE PER LA
BIODIVERSITA'**

CUP D43C22001250001 – Decreto di concessione D.D.
1034 del 17/06/2022

Bando D. D. 3138 del 12/16/2021 rettificato con D.D.
3175 del 18/12/2021 "Avviso pubblico per presentazione
Proposte di intervento per il Potenziamento di strutture di
ricerca e creazione di "campioni nazionali" di R&S su
alcune Key Enabling Technologies da finanziare
nell'ambito del Piano Nazionale di Ripresa e Resilienza,
Missione 4 Componente 2 Investimento 1.4
"Potenziamento strutture di ricerca e creazione di
"campioni nazionali di R&S" su alcune Key Enabling
Technologies" finanziato dall'Unione europea -
NextGenerationEU".

Urban areas cover about 3% of the global surface (7% in
Italy). Green and permeable areas occupy less than 10%
of the urban territory, on average. In recent years, Nature
Based Solutions (NBS) have been introduced to restore
and/or enhance the functional urban biodiversity and the
natural resources, generate resilient ecosystems and



	<p>natural resources, generate resilient ecosystems and promote human wellbeing and quality of life in urban contexts. One of the functions of soil, which is of great importance for the conservation of groundwater quality in urban environments, is its ability to mitigate the leaching of pollutants of natural or anthropogenic origin into groundwater. Quantification of flux and mass exchanges between the surface and subsurface system is affected by high uncertainty due to subsurface heterogeneous and complexity, while available information is generally limited. In this context, the research program is in line with the National PNRR (with particular relevance to M2C4- Protection of the territory and water resources) and will provide technical and scientific expertise in: (i) integrated modeling of surface-subsurface water environment; (ii) impact of NBS on surface/subsurface flow and contaminant transport, including multiple uncertainty sources within a probabilistic framework; (iii) surface water-soil-groundwater interaction, aimed at water quality control; (iv) development of probabilistic risk assessment strategies, to increase certainty through quantification of risk and to allow establishing decision-making tools able to include and quantify acceptable (or otherwise unacceptable) risk levels.</p> <p>Objectives of the research</p> <p>Development of robust methodologies and tools that can be used to study the impact of NBS on the surface-subsurface environment. Several contaminants affecting urban areas (e.g., heavy metals from roof shingles, motor vehicles; Viruses, bacteria and nutrients from pet waste and failing septic systems) and their movement from the surface to the subsurface environment will be investigated.</p>
<p>Methods and techniques that will be developed and used to carry out the research</p>	<p>The team involved in the project (see below) offers a variety of competences on surface-subsurface flow/transport modeling, uncertainty quantification and probabilistic risk assessment. Methodologies and tools developed during the research activity will enable one to (i) model surface environment – NBS – Groundwater interaction using available data; (ii) accurately simulate transport of pollutants across various scales and forcing</p>



	conditions, and (iii) provide model predictions in a probabilistic framework, accounting for uncertainties related to our knowledge of the surface/underground environment and climate conditions.
Educational objectives	Prepare highly qualified professionals to efficiently tackle engineering scenarios linked to groundwater management and protection.
Job opportunities	Industrial companies, professionals in watermanagement and groundwater protection.
Composition of the research group	2 Full Professors 2 Associated Professors 1 Assistant Professors 8 PhD Students
Name of the research directors	Monica Riva

Contacts
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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	597.76 €
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"> •Université de Strasbourg, France •Universitat Politècnica De Catalunya, Barcelona, Spain •University of Southern California, USC, USA



- Università degli studi Milano-Bicocca
- ERSAF - Ente di Ricerca Scientifica ed Alta Formazione

Educational activities (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.

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. PhDs will have access to CFDHub (www.cfdhub.polimi.it), an Interdepartmental laboratory of PoliMi, with a state-of-the-art infrastructure and scientific computing system.