



# PhD in ARCHITETTURA, INGEGNERIA DELLE COSTRUZIONI E AMBIENTE COSTRUITO / ARCHITECTURE, BUILT ENVIRONMENT AND CONSTRUCTION ENGINEERING - 41st cycle

**INTERDISCIPLINARY Research Field: GIS-BASED TECHNOLOGIES FOR ASSESSING ENVIRONMENTAL RISKS TO PUBLIC HEALTH IN URBAN ENVIRONMENTS**

**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

#### Interdisciplinary PhD Grant

The PhD research will be carried out in collaboration with research groups of the PhD programme in "**DATA ANALYTICS AND DECISION SCIENCES**".

The current global urbanization trend foresees a significant increase in the population living in densely built urban areas, from the current 50% to an estimated 74% by 2050. This shift is largely driven by the strong appeal of cities, which offer a concentration of opportunities in education, economy, culture, and access to services. However, urban contest also present many risk factors—environmental, social, and behavioral—with direct and indirect consequences on the physical, mental, and social health of citizens. To effectively promote and protect public health from a "One Health" perspective, it is both urgent and strategic to develop urban planning approaches grounded in scientific risk assessment tools.

In this context, Geographic Information System (GIS) technologies provide advanced spatial analysis tools, enabling the integration and visualization of environmental, epidemiological, and sociodemographic data in a georeferenced and comprehensive manner.



	<p>GIS-based methodologies make it possible to identify critical areas, quantify population exposure to specific risk factors, and support evidence-based decision-making for public health protection. This research aims to develop and test scalable and replicable GIS-based methodologies for assessing environmental risks and their impacts on public health in urban areas.</p> <p>The analysis draws on both proprietary big data provided by institutional partners and publicly available open-source datasets (demographic, environmental, and social data accessible through municipal and regional geoportals). The goal is to provide operational tools for monitoring and prevention. The strategic objective is to conduct risk assessments through the development of ad hoc models to generate thematic maps using a multi-weighted value system. These maps will cover various “environmental stressors” (e.g., heatwaves, floods, accidents, air pollution, noise); systemic vulnerabilities (e.g., demographic, health, and building data, lack of green areas, soil permeability, mobility infrastructure); and health impact/exposure indicators (e.g., epidemiological data or emergency call records categorized by symptom or cause linked to specific environmental risks).</p>
<p><b>Methods and techniques that will be developed and used to carry out the research</b></p>	<p>The project is grounded in the theories and methods of <i>environmental epidemiology</i>, which uses observational and statistical approaches (typical of biomedical engineering) to identify associations between environmental exposures and health outcomes, contributing to prevention and the development of public health policies. This type of analysis relies on geospatial data- referenced through geographic coordinates - and requires the use of dedicated software (GIS, Geographic Information Systems) and spatially explicit modeling approaches (mathematical or computational models that directly incorporate spatial information such as location or distance to represent geographically distributed phenomena), which are common in urban planning. Methodologically, the research will follow several phases - further detailed into milestones and operational tasks - including:</p>



	<ul style="list-style-type: none"> <li>•<b>PRELIMINARY ANALYSIS</b></li> <li>•<b>DEVELOPMENT AND MODELING:</b> creation of GIS-based analysis methods for the assessment of multidimensional territorial risks, with the potential implementation of a continuous risk monitoring system;</li> <li>•<b>TESTING PHASE:</b> pilot case study: City of Milan</li> <li>•<b>VALIDATION</b></li> <li>•<b>DISSEMINATION</b></li> </ul>
<b>Educational objectives</b>	The project aims to develop interdisciplinary competencies in environmental health, spatial analysis, and data-driven decision-making. It promotes critical thinking through the integration of public health, urban planning, and modeling.
<b>Job opportunities</b>	This research program offers career opportunities in urban health planning, and GIS-based risk assessment. Participants will gain experience in spatial data analysis, XAI modeling, and interdisciplinary collaboration. The project fosters skills valuable for roles in public health agencies, urban planning institutions, and environmental consultancies. Direct engagement with stakeholders enhances practical policy impact. It also supports scientific growth through publications and conferences.
<b>Composition of the research group</b>	1 Full Professors 3 Associated Professors 1 Assistant Professors 0 PhD Students
<b>Name of the research directors</b>	Maddalena Buffoli, Enrico Gianluca Caiani

<b>Contacts</b>
maddalena.buffoli@polimi.it

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



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

Stage and period abroad	
Institution or company where the candidate will spend the period abroad (name and brief description)	
By number of months abroad	0

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

**Additional support:**

**Budget for the research activity (only for positions supported by scholarship):** total amount Euro 5.707,20 per student.

In detail:

- 1<sup>st</sup> year Euro 1.902,40
- 2<sup>nd</sup> year Euro 1.902,40
- 3<sup>rd</sup> year Euro 1.902,40.

**Additional information about the organization and regulations of ABC-PhD programme can be found in the Regulations for the 41<sup>st</sup> Cycle of ABC-PhD:** download is available at link: <https://www.dottorato.polimi.it/en/phd-programmes>

**Additional information about ABC department and ABC-PhD programme:** available at link: <https://www.dabc.polimi.it/>

**Desk availability:** The ABC department provides non-permanent desks to be temporarily booked in common PhD rooms.