



PhD in INGEGNERIA AMBIENTALE E DELLE INFRASTRUTTURE / ENVIRONMENTAL AND INFRASTRUCTURE ENGINEERING - 38th cycle

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

PNRR_352 Research Field: DIGITAL TWIN CITIES

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**

MOTIVATIONS /

As part of the European Commission's initiative "Destination Earth", it is planned to build a digital Twin of Earth (DTE). DTE's goal is to create an interactive model of the Earth that results from the integration of individual models that accurately reflect different physical aspects of the Earth. In this way, we can obtain more and more reliable information about the past, present and future changes of the Earth system. This information can be used to tackle most of environmental, social, and economic challenges. The underlying model is based on measurements and observations and is complemented by state-of-the-art analytical techniques such as artificial intelligence (AI). DTE is a basic essential tool for at least two of the three strategic axes of the PNRR, namely: digitisation and innovation and ecological transition. There will be many DTEs and each application requires optimized data accessibility (via cloud solution), data connectivity (over the appropriate network), and data processing power (via scaled HPC usage). Simulations and predictions are based on improved science and geophysical modeling of our planet.

OBJECTIVE

The research aims at the designing and then prototype a



	<p>Digital Twin City (DTC). It will be done at several levels, ranging from the gathering, analysis and fusion / integration of Earth Observation and geospatial data with different spatial / temporal / spectral resolutions by means of traditional statistical techniques and machine learning. The output will be to the development of the DTC prototype of one Italian city, a product compliant with the international standards (ISO, OGC).</p> <p>Results are expected to tackle urgent challenges addressed by the European Green Deal and the Italian National Research Plan 2021-2027, under many topics, from digitization, to climate, energy, sustainable mobility and security for social systems. In parallel, results will help on reporting UN Sustainable Development Goals indicators connected to sustainable cities, health and well-being.</p>
<p>Methods and techniques that will be developed and used to carry out the research</p>	<p>The thesis is developed with funding and in strict collaboration with EBWorld. The grant recipient will make her/his research partially in Politecnico di Milano and partially in EBWorld premises.</p> <p>EBWorld research staff will provide guidance mainly on topics related to GIS and the geodata and tools used in their products and projects, while Politecnico di Milano researchers will guide the geomatics and geoinformatics aspects of the thesis, specifically in the newest related to Digital Twin Earth and Digital Twin Cities. EBWorld and Politecnico di Milano tutors will meet at least once every four months for discussing the advancement of the research activity.</p>
<p>Educational objectives</p>	<p>The student will acquire competencies related to:</p> <ol style="list-style-type: none"> 1) critical thinking and capabilities to design rigorous and sustainable solutions 2) geospatial web design and implementation 3) Earth observation and Geospatial Data 4) Machine learning and artificial intelligence applied to Earth observation and geospatial data 5) Digital Twin Earth/Digital Twin Cities.
<p>Job opportunities</p>	<p>Geoinformatics competences are nowadays highly requested. Students who finish the Ph.D. with a</p>



	geomatic/geo-informatic specialisation have many opportunities of professional carriers in: start-ups; GIS companies; companies which deal also with georeferenced information; research centres; universities.
Composition of the research group	1 Full Professors 2 Associated Professors 2 Assistant Professors 7 PhD Students
Name of the research directors	Maria Antonia Brovelli

Contacts	
maria.brovelli@polimi.it +39-02-23996242 https://www.gisgeolab.polimi.it/ (under "team")	

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	700.0 €
By number of months	6

National Operational Program for Research and Innovation	
Company where the candidate will attend the stage (name and brief description)	EBWorld https://www.ebw.it/
By number of months at the company	6
Institution or company where the candidate will spend the period abroad (name and brief description)	The PhD student will spend a period of at least 6 months abroad to interact with researchers and participate in joint activities potentially foreseen in the project, according to specific needs. Indeed, the project is highly interdisciplinary, and this favors the collaboration with foreign research centers where the candidate can acquire in-depth knowledge on sustainability and circularity assessment.
By number of months abroad	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
<p><u>Universities, Companies, Agencies and/or National or International Institutions that are cooperating in the research:</u></p> <ul style="list-style-type: none"> • University of Geneve - Switzerland • University of Lund - Sweden



- ESA - ESRIN PhiLab
- Università Roma La Sapienza - Italia
- Geosystems - Ellas

Educational activities (purchase of study books and material, funding for participation in courses, summer schools, workshops and conferences): approximately 1902,38 euros per PhD candidate per year, on average.

Teaching assistantship (availability of funding in recognition of support to teaching activities by the PhD candidate): there are various forms of financial aid for activities of support to the teaching practice. The PhD candidate 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.