POLITECNICO DI MILANO

PhD in INGEGNERIA AMBIENTALE E DELLE INFRASTRUTTURE / ENVIRONMENTAL AND INFRASTRUCTURE ENGINEERING - 37th cycle

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

THEMATIC Research Field: PROGETTO INNOVAZIONE POLIMI - REGIONE LOMBARDIA: OPEN DATA, SPATIAL ANALYSIS AND MODELLING INTEGRATION INCLUDING HYDROGEOLOGICAL RISK ASSESSMENT UNDER UNCERTAINTY

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	This research addresses the challenges that public administrations are facing in the digital era that was accelerated by the COVID-19 events. The PhD will contribute to renew competences and instruments with the final goal to improve public administration governance and management. Thanks to the INSPIRE directive, large archives of data are shared among public administrations. These data aim at supporting the decision making for the preservation of the environment and for the monitoring of phenomena which could lead to risks for people and assets. It is essential to envisage a direct application of these data and to build models that allow to link data and environmental applications. The PhD candidate will work in a multi-disciplinary team on geomatics, hydraulics and environmental sciences and in close collaboration with Regione Lombardia. The PhD candidate will explore the Regione Lombardia open data in order to select datasets that can be combined and processed in order to monitor risks for the environment, in particular with respect to hydrogeological risk. The applicability of Copernicus and Remote Sensing

	data will be considered as well. Having Regione Lombardia as a study case, the availability of input data for hydraulic risk modelling will be explored, taking into account different scales and levels of detail. In fact, it often happens that available data are not at the appropriate scale which is required by environmental models. Good practice guidelines will be provided in order to clarify which data could be used depending on the type of model or application of interest, suggesting also recommendations for new data collection. Spatial analysis will be applied to look for correlation of information coming from diverse data sources. The most critical datasets with respect to the impact of climate change over the area of interest will be considered. Available tools for data query and reporting will be explored in order to select the most suitable ones in view of their use for Regione Lombardia applications. The PhD candidate will make use of the analysed data to model Groundwater-Surface water flow and transport phenomena, including impacts of systems' heterogeneity, seasonable and future climate conditions and socio-economic changes, as well anthropogenic actions on fresh-water quality and availability. The project will make use of the latest development in surface-subsurface hydrological modelling. Emphasis will be placed on the development of a model-data-assimilation framework to integrate model simulations and observations for prediction of groundwater dynamics and model-predictive control of groundwater extraction.
Methods and techniques that will be developed and used to carry out the research	The research will be conducted in collaboration with the Regione Lombardia Directorate on Environment and Climate. GIS tools and coding libraries (e.g. Python libraries) will be exploited to query and explore available open data, as well as geo-statistitical tools for uncertainty quantification, and numerical methods to simulate flow and transport phenomena. Dashboards and business intelligence tools will be explored as well in order to suggest best practices and guidelines for data deployment. Spatial analyses will be performed to correlate data coming from multiple sources

	to support Regione Lombardia decision making regarding the environment, climate and risk.
Educational objectives	The project will provide the candidate with: knowledge of the sector in which they develop the research project; methodological competences at both the theoretical and applied level; capabilities to interact with people of diverse background; problem setting and solving capabilities.
Job opportunities	Main opportunities include Universities, Research Centers, top level management in Authorities involved in environmental policy, senior consultants for engineering companies, high level personnel for the industry, in particular with respect to geographic information and risk management.
Composition of the research group	2 Full Professors 2 Associated Professors 1 Assistant Professors 3 PhD Students
Name of the research directors	M. Riva, D. Carrion and a Regione Lombardia tutor

Contacts
Contact of Politecnico di Milano research director: monica.riva@polimi.it daniela.carrion@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	566.36 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
Educational activities (purchase of study books and material, funding for participation to courses, summer schools, workshops and conferences): financial aid per PhD student per 2nd and 3rd year: max 1534,33 euros per student 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. Increase in the scholarship for stays abroad: 566,36 euros per month, for up to 6 months.

Computer availability and desk availability: 1st year + 2nd year + 3rd year: individual use.