POLITECNICO DI MILANO

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

Research Area n. 2 - Transport Infrastructures and Geosciences

PNRR_351_PUBBL_AMMIN Research Field: TOOLS FOR PUBLIC ADMINISTRATIONS AIMED AT MANAGING HYDROGEOLOGICAL RISK

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	The public administration is being called upon to face a radical and decisive change and to prove that it is capable of reacting to the transformations of recent years with a new organisational strategy, capable of revitalising public work and signing a new deal with citizens. All this, however, comes up against resources that are always rather limited, and an administrative system characterised by an ageing personnel. What is needed, therefore is a highly-qualified generational change in Public Administration (even PhDs) to cope with the emergence of new areas of expertise capable of responding in a very short time to all the urgencies that gradually arise. Some of the challenges that the Public Administrations have to face are particularly related to emergencies. As an example, one can mention the environmental policies that municipalities, provinces, regions, local communities, etc. must pursue in order to manage problems related to climate change. This will increasingly alter the existing equilibrium by heavily affecting the fragility of a territory that is already very marked by natural hazards (landslides, floods, etc.). Public Administrations must therefore be able to adequately face these issues by means of proper management and decision-making

	systems. Only in 2020, the worldwide losses related to geohazard were quantified as 210 billion dollars and 8,200 victims. Among the natural disasters, the events linked to hydrogeological phenomena, such as floods and landslides, certainly play a significant part. In Italy, a total area of 50,117 km2, which corresponds to 16.6% of the national territory is affected by high or very high landslide hazard and/or by a medium hydraulic hazard. In 2020, the victims from landslide and flood events were twelve and the evacuated people were over 3,000. Northern Italy has the highest mortality rate caused by landslides and floods. In this context, the aim of the present research is to find solutions for mitigation measures and for hydrogeological risk reduction. Moreover, the final achievement is to reduce the impacts by means of the improvement of territories resilience. These solutions bring the necessity of a mutual dialogue between the political and technical aspect. Therefore, the Ph.D. program will be concerned in fostering this dialogue by embedding it according to the governance processes. This one should be able to enforce the intervention implementation in accordance with a compliant and effective spatial planning. One aspect that will be addressed by this program is the development of low-cost technologies for landslide monitoring to help governments with this problem that has a great impact both in terms of economic losses and casualties. These new landslide monitoring techniques can lead to the development of more adequate early warning systems, able to influence the decision-making procedures that can result in alarms to be rapidly transmitted to the population involved.
Methods and techniques that will be developed and used to carry out the research	The research group that will be involved in the present project offers a wide range of expertise on hydrogeological instability and on the monitoring techniques commonly used for both rockfalls and landslides. Overall, the methodologies and tools developed during this research activity will allow to: (i) reconstruct the geological model to understand the collapse mechanisms of unstable slopes,

	(ii) define the most suitable low-cost monitoring techniques for the various types of landslides (e.g. fibre optics for soil slips, seismic noise for rockfalls, etc.), (iii) carrying out numerical modelling using the monitoring data derived from low-cost techniques, also taking into account climate change scenarios,(iv) define early warning systems for public administrations and development of decision-making procedures. All the actions previously mentioned will be developed in close contact with the Public Administration that will be involved in all the aspects of the decision making chain.
Educational objectives	Prepare highly qualified personnel able to efficiently deal with issues related to landslide management and protection, also taking into account climate change.Close collaboration between PoliMI and Public Administrations offers a unique opportunity for the PhD to be trained in engineering and management aspects.
Job opportunities	Public Administrations.
Composition of the research group	1 Full Professors 1 Associated Professors 1 Assistant Professors 4 PhD Students
Name of the research directors	Monica Papini, Laura Longoni

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

National Operational Program for Research and Innovation

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Company where the candidate will attend the stage (name and brief description)	Provincia di Lecco (www.provincia.lecco.it) - Comune di Lecco (www.comune.lecco.it)
By number of months at the company	6
Institution or company where the candidate will spend the period abroad (name and brief description)	to be defined
By number of months abroad	6

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

Universities, Companies, Agencies and/or National or International Institutions that are cooperating in the research:

- Comune di Lecco
- Protezione Civile
- Vigili del Fuoco
- Provincia di Lecco
- Arpa Lombardia

Educational activities (purchase of study books and material, funding for participation in courses, summer schools, workshops and conferences): approximately 1624,30 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: PhDs have their own computer for individual use. They will also have access to CFDHub (www.cfdhub.polimi.it), an Interdepartmental laboratory of PoliMi, with a stateof- the-art infrastructure and scientific computing system.

Desk availability: individual assignment for the entire career.