POLITECNICO DI MILANO

PhD in INGEGNERIA AMBIENTALE E DELLE INFRASTRUTTURE / ENVIRONMENTAL AND INFRASTRUCTURE ENGINEERING - 39th cycle

Research Area n. 1 - Water Science and Engineering

Number of scholarship offered	1
Department	DIPARTIMENTO DI INGEGNERIA CIVILE E AMBIENTALE

Description of the Research Area

This research area includes 7 main topics:

Environmental fluid and pollutant dynamics. Focus is on theoretical and laboratory investigation on boundary layer interaction in channels and rivers. Specific topics are sediment deposition and control, erosion and nutrient fluxes for the aquatic biota. Experimental activities involve methods for shear stress measurement and skin friction assessment in complex channel geometry. Both field experiments and simulation studies are developed to understand pollutants transport and diffusion dynamics in artificial and natural streams, including the effect on the aquatic ecosystem.**Hydrogeological hazard.** Focus is on analysis, prediction and prevention from hydrogeological hazard and on actions for risk mitigation. Specific topics are: methods for process observation, data assimilation, fusion and scaling techniques based on remote sensing and ground telemetering, flood early warning, flood real-time forecasting and long-term prediction. Also field analysis and mathematical modeling of hydrogeological processes, including storms and flash floods, debris flows, firefloods, soil slips, woody debris and bulk flood transport, are addressed. **Integrated water resources management.** Focus is on modelling of water resources systems for planning and optimal management. Specific topics are: water resources assessment, stochastic calibration and long-term simulation of water resources systems, water footprint and water trade issues, exploration of medium and long range horizon of water safe supply and water security, minimum stream flows, droughts.**Snow, ice and glacier dynamics.** Focus is on in situ experiments to evaluate snow and glacier ablation and stream flow production, study of ice and snow cover variation, study of trends of climate and stream flows, assessment and development of downscaling schemes for GCM models, hydrological budgets of mountainous snow and ice fed areas and hydrological projections under climate change. **Land surface processes.** Focus is on hydrological modeling of soil-water balance and soil-vegetation-atmosphere transfer, and monitoring water and energetic fluxes between surface and atmosphere. Specific topics are:

integrate soil moisture dynamics, runoff assessment, surface water-groundwater interaction, hydrological control of biota. Field experiments on water and energetic fluxes between surface, vegetation and atmosphere, monitoring techniques by micrometeorological stations and satellites are also included.**Hydraulic structures and infrastructures.** Focus is on modelling and design of hydraulic structures as river dams, hydroelectric plants, water supply systems, urban drainage and river works. Specific topics are: impact of sewerage loads on rivers, real-time control of urban drainage systems, planning and management of urban water supply, safety of hydraulic structures, dam-break modelling, hydro-electrical plant design, assessment of environmental impact of flow regulation. A special research focus is on sustainable urban water management in smart cities. Field and laboratory analyses of river dams and diversions by physical models are included.. **Ocean and coastal engineering.** Focus is on sea waves dynamics and ocean convective circulation and their effects on sea bed and marine structures, including the assessment of wave-current field on structures (seawalls and breakwaters for harbour protection, offshore structures for deep sea exploitation) and the forecasts of long term effects of human activities on coastal dynamics, shore dynamics, coastal sediment transport, water quality.

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OPEN SUBJECT Research Field: WATER SCIENCES AND ENGINEERING

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	Water and its environmental and engineering links play a key role in a modern sustainable development of human activities. The school of Politecnico of Milano is deeply involved from long time in national and international research activities in this field.The main research topics deal with scientific issues in the following areas (www.diiar.polimi.it/cimi/) •Environmental fluid and pollutant dynamics; •Hydrogeological hazard; •Integrated water resources management; •Snow, ice and glacier dynamics; •Land surface processes; •Hydraulic structures and infrastructures; •Ocean and coastal engineering.
Methods and techniques that will be developed and used to carry out the research	Research activities are performed considering theoretical development, technological application, numerical computational activities, field and laboratory experiment. Cooperation in national and international team is performed in the framework of dedicated projects.
Educational objectives	The PhD program is oriented to improve the scientific

	background of each student, preparing the basis for a university researcher as professional specialist careers.
Job opportunities	Main opportunities in the job market include Universities, Research Centers, top level management in Authorities involved in environmental policy, and senior consultants for engineering companies.
Composition of the research group	2 Full Professors 6 Associated Professors 9 Assistant Professors 10 PhD Students
Name of the research directors	G. Becciu, M. Mancini, C. De Michele, C. Rulli

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	597.75 €
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 year: max 1620,00 euros per student on average. Teaching assistanship (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: 1st year +2nd year +3rd year: individual use.