

PhD in Civil and Environmental Engineering

Research Title: Reservoirs and lakes operation for assessment and mitigation of flood risk at a regional scale

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Context of the research activity	<p><i>Main implications of this proposals reside in the role of large and small dams as fundamental systems for the production of hydropower and the provision of volumes for irrigation and civil or industrial uses. In developed and developing countries, dams can constitute valid barriers towards flooding, provided correct management is envisaged and good understanding of the flood peaks and volumes is achieved.</i></p> <p><i>In the Italian Civil Protection organization the n.100/2013 law acknowledges the importance of dam gates operation within the flood management plans at the regional level . These directions require consistent scientific effort to be devoted to whole topic of flood risk assessment in presence of dams.</i></p>
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Objectives	<p>The objectives of the research are multiple, as both hydrological knowledge and hydrosystem modeling require to be developed to provide advances to the topic. The hydrological advances expected are in a substantial increase of data justification of the statistical association of flood peaks and volumes for a given probability of occurrence. This increase is descends from the collaboration of ARPA Piemonte, which is involved in the development of reliable bivariate distributions of peaks and volumes required for building management scenarios. The hydrosystem advances are expected by the point of view of an effective conceptualization and modeling of</p>
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	<p>actual dams and of the corresponding downstream flood-prone areas. Both for the dams under control of the Ministry of Infrastructures and for a significant sample of smaller dams under control of the Regione Piemonte Department of Infrastructures, physical characteristics, hydraulic features of spillways and schematic –yet realistic– representation of the downstream valleys will be considered for a great part of north-western Italy. The goal is to proceed in a two-step approach: a first (robust but not physically detailed) step will allow us to select the areas downstream the dams which are most sensible to their operation; a second, more detailed series of analyses will be directed to the assessment of actual risks and to the development of prototype methodological and software-assisted tools for assistance to the dam management during floods.</p>
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Skills and competencies for the development of the activity	<p>The applicant is expected to easily manage probability and statistics of extremes and to be able to develop numerical software in R/Matlab intended to solve differential equations and some control system analysis. Proficiency in spoken and written English will be assumed as a remarkable prerequisite.</p>
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