



## **Hydrogeological risks: hazard and vulnerability assessment for economic evaluation of consequences and real-time management of emergency situations**

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A methodology targeted to manage critical hydrogeological events is presented, taking advantage of GIS tools, decision support systems (DSS), and mobile technology. The methodology is settled and tested in a local Mountain Consortium of Municipalities (Lombardy Region, Italy), an area characterized by a high level of hydrogeological hazards and risks in a complex social and economic context.

Initially, hydrogeological (landslide and flood) susceptibility and hazard assessment was performed to geographically define and map specific hazard scenarios, on the base of statistical and deterministic models, historical records, expert knowledge, and the set of laws in force, at a national, regional, and local level. This step is followed by detailed analysis (1:2,000) focused to spatially identify and to characterise vulnerable elements in the study area (people, infrastructures, activities, public and private services, etc.), and to provide an understanding of the possible physical effects on exposed elements caused by the impact of a potentially destructive event.

Then a detailed characterization of the social and economic features of the area is

performed. Finally, potential risk scenarios are derived as areas characterised by high values of susceptibility/hazard and by the presence of vulnerable elements of different social, economic and strategic importance. For each specific risk scenario an estimation of the potential social and economic damage (direct and indirect) is carried out. At the same time, contingency plans to manage interventions in the aftermath of disasters are also defined. In that case, a workflow based on decisional processes and rules is set up and uploaded in a Decision Support System (implemented in a GIS) for a real-time management of prospective emergency situations.

The approach proposed in this study may assist local decision makers in determining the nature and magnitude of the expected losses due to a dangerous event. Besides, a preventive knowledge of the prospective physical effects and economic consequences may help to properly allocate financial resources for prevention and mitigation measures and to decide how to manage assets during the aftermath of critical hydrogeological events.