



## **A multi-risk analysis for Lombardia Region, Italy**

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Multi-risk assessment is a promising tool for territorial planning, emergency management and mitigation strategies development. The Multi-Risk maps should combine all available information about hazard and vulnerability related to different dangerous phenomena, and they could provide a more sound scientific basis for complex decision making. Within the framework of the Regional Program on Major Risk Mitigation, we analysed and integrated with an indicator-based approach seven major territorial risks in the Lombardia Region (Northern Italy, 25.000 sqkm), namely: hydrogeological, wildfire, seismic, and industrial risks; social insecurity, car accidents, and industrial injury. For each of these, we evaluated the physical risk, taking into account hazard, vulnerability and value of the exposed elements (e.g., residential and industrial area, population, lifelines, sensitive elements as schools, hospitals). We also considered an integrated indicator of indirect impact that depends on the performance in risk management, in terms of coping capacity (medical resources, fire brigades, emergency and contingency plans, infrastructural network connectivity) and system resilience (sensitive population, social disparity index, population density). We performed the analyses at the regional scale with a high spatial resolution, using 1km x 1km vector square cells as terrain units. The main difficulties encountered in the analysis are related to the disparity of detail of the available data and to the need of a sound strategy for weighting the different risk indicators. We tackled the first problem by implementing a top-down multi-level approach. With this approach, it is possible to integrate risks calculated at different level of detail, consistently with the quality of input data. For the second, we applied different approaches using the Analytic Hierarchy Process (AHP) technique and the Budgetary Allocation involving a panel of different experts. In order to ac-

count for the point of views and needs of different potential users we experimented three different weighting strategies: expert, socio-economical, and political. The results appear to be strongly sensitive to the adopted weighting strategy, with variation of the weights up to 100 % for the different risks. This highlights the critical importance of weighting for the development of multi-risk approaches. The integrated multi-risk in Lombardia Region results to be higher in big urban areas, mainly due to the large value of exposed elements, whereas natural risks dominate in rural and mountain areas.