



## **Exploring probabilistic tools for the development of a platform for Quantitative Risk Assessment (QRA) of hydro-meteorological hazards in Europe**

V. Zumpano (1), H.Y. Hussin (2), and K. Breinl (3)

(1) Institute of Geography, Romanian Academy, Dimitrie Racovita Street 12, Sect.2, Bucharest, Romania (veronicazumpano07@yahoo.it), (2) CNR-IRPI, via Madonna Alta 126, 06128 Perugia, Italy (haydar.hussin@irpi.cnr.it), (3) Centre for Geoinformatics Z\_GIS, University of Salzburg, Schillerstrasse 30, 5020 Salzburg, Austria (Korbinian.Breinl@sbg.ac.at)

Mass-movements and floods are hydro-meteorological hazards that can have catastrophic effects on communities living in mountainous areas prone to these disastrous events. Environmental, climate and socio-economic changes are expected to affect the tempo-spatial patterns of hydro-meteorological hazards and associated risks in Europe. These changes and their effects on the occurrence of future hazards need to be analyzed and modeled using probabilistic hazard and risk assessment methods in order to assist stakeholders in disaster management strategies and policy making. Quantitative Risk Assessment (QRA) using probabilistic methods can further calculate damage and losses to multi-hazards and determine the uncertainties related to all the probabilistic components of the hazards and the vulnerability of the elements at risk. Therefore, in order to develop an effective platform that can quantitatively calculate the risk of mass-movements and floods to elements at risk in several European test sites, an extensive inventory and analysis has been carried out of the available tools and software related to the probabilistic risk assessment of single and multi-hazards. The tools have been reviewed based on whether they are open source and freely available, their required input data, availability and type of hazard and vulnerability modules, transparency of methods, validation and calibration techniques, the inclusion of uncertainties and the state of the art of the tool. The analysis specially focused on the applicability of the tools to European study areas. The finding showed that assumptions and simplifications are made when assessing and quantifying the hazards. The interaction between multiple hazards, like cascading effects are not assessed in most tools and some consider the hazard and vulnerability as qualitative components, rather than quantitative ones. This analysis of hazard and risk assessments tools and software will give future developers and experts a better overview of current open source software and their applicability, flexibility and usefulness. It further indicates what components can be implemented in the future development of probabilistic risk assessment software for hydro-metrological hazards in Europe. This abstract is part of the ongoing 7th Framework Programme "CHANGES" (2011-2014, Grant Agreement No. 263953) of the European Commission.