



Conception of a method for the creation of volcanic risk index maps

P. Bion (1,2), B. Van Wyk de Vries (3), and G. Valentine (4)

(1) Laboratoire Magmas et Volcans, Université Blaise Pascal, Clermont-Ferrand, France (pascale.bion@gmail.com), (2) Department of Geology and Center for Geohazards Studies, University at Buffalo, The State University of New-York, Buffalo, USA (pascale.bion@gmail.com), (3) Laboratoire Magmas et Volcans, Université Blaise Pascal, Clermont-Ferrand, France (B.vanwyk@opgc.univ-bpclermont.fr), (4) Department of Geology and Center for Geohazards Studies, University at Buffalo, The State University of New-York, Buffalo, USA (gav4@buffalo.edu)

Risk index maps are a variant of risk maps, having the advantage of containing unique kinds of information - levels of risk spatially represented - and can therefore be a more effective communication tool than traditional risk maps.

Nevertheless, despite their apparent simplicity, their achievement is the result of a complex risk analysis, requiring the consideration of multidisciplinary indicators, expressing different parameters of the physical and human dimensions of the environment and their interactions. The risk index is obtained in three main stages: the definition of hazard and vulnerability indicators, the transformation of the indicators into subindices through mathematical processes (formulation, standardization, weighting), and the combination of the subindices into a final index.

As of now, only few attempts of risk quantification have been done, related to landslide, flood or seismic hazards, and those linked to volcanic hazards are very incomplete because of the specificities and complexities of these kinds of events and their effects. Volcanic hazards have the particularity of being of different types, moreover all events can combine together or be combined with other external events (e.g. meteorological), and they can reach and therefore affect extensive areas by different phenomena.

The methodology developed here assesses risk levels in regions potentially impacted by volcanic hazards. It incorporates volcanic hazard specificities and nuances of "vulnerability" by integrating the diversity of the environmental components. It analyses the natural and human strengths, weaknesses, opportunities and threats, which are located within the areas potentially "at risk". Consequently, it considers negative but also positive indicators (respectively aggravating and improving the potential consequences), which can be internal but also external to the volcanic hazards. The approach also considers a temporal variability of the events and their direct or indirect associated effects.

The developed approach tends to be especially aimed at urban planners, who would possess a new fundamental tool for organizing the territories located "nearby" volcanoes, in which population density is continually increasing. The volcanic risk index maps would give indications on the areas with the highest risk level, and the urban planners would also be able to determine the elements causing such level. This would lead them to the possibility of proposing recommendations and adequate measures to participate to the reduction of vulnerability, in particular in limiting the exposure and the impacts associated with the volcanic hazards, which would consequently reduce the volcanic risks.