



Development and application of indices using large volcanic databases for a global hazard and risk assessment

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The Global Volcano Model (GVM) and IAVCEI were commissioned by the United Nations Office for Disaster Risk Reduction to produce a global assessment of volcanic hazard and risk for the Global Assessment Report 2015 (GAR15). This involved presenting both an introduction to volcanology and developing indices to assess hazard and risk on a global scale. To this end two open-access databases were of utmost importance: the Global Volcanism Program's Volcanoes of the World (<http://www.volcano.si.edu>) and the Large Magnitude Explosive Volcanic Eruptions database (LaMEVE; <http://www.bgs.ac.uk/vogripa/>). Indices were developed to enable a relative global assessment cognisant of data uncertainty and availability to broadly identify how hazard and risk varies around the world, the extent of monitoring and strengths and limitations in knowledge. The accessibility of both physical (e.g. volcano, eruption) and social data is crucial to our understanding of past behaviour, forecasting probable future behaviour and the potential impacts on communities. Such data is regionally highly variable and the eruption record worsens back in time. The Volcanic Hazard Index (VHI) was designed to quantify hazard levels globally, based on the Holocene eruption record. Vulnerability to eruptions was measured using the Population Exposure Index, which weights the population within 100 km of volcanoes by area and historical fatalities. The combination of these indices provides an indicator of population risk at individual volcanoes. The VHI was also combined with the total populations living within 30 km of volcanoes in each country to develop an understanding of the global distribution of volcano threat, and to rank countries by this measure. About half of the historically active volcanoes have insufficient information to adequately calculate VHI and these are highlighted as requiring future research. A database currently in development, GLOVOREMID, collates monitoring data to understand monitoring levels around the world; this is designed to be complementary to WOVODat (the World Organisation of Volcano Observatories: Database of Volcanic Unrest). An index developed from this has been adapted and applied to a global dataset showing that approximately one third of historically active volcanoes have levels of ground-based monitoring that may permit analysis of magma movements and activity forecasts. Some unmonitored volcanoes score highly for both hazard and population risk. The development and application of such indices is dependent on the availability and accessibility of large, systematic, sustainable and compatible databases. These indices help to harmonise approaches and allows first order assessments, highlighting gaps in knowledge and areas where research and investment is recommended.