Local to global: a collaborative approach to volcanic risk assessment

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Volcanic risk assessments at all scales present challenges related to the multitude of volcanic hazards, data gaps (hazards and vulnerability in particular), model representation and resources. Volcanic hazards include lahars, pyroclastic density currents, lava flows, tephra fall, ballistics, gas dispersal and also earthquakes, debris avalanches, tsunamis and more ... they can occur in different combinations and interact in different ways throughout the unrest, eruption and post-eruption period. Volcanoes and volcanic hazards also interact with other natural hazards (e.g. intense rainfall).

Currently many hazards assessments consider the hazards from a single volcano but at national to regional scales the potential impacts of multiple volcanoes over time become important. The hazards that have the greatest tendency to affect large areas up to global scale are those transported in the atmosphere: volcanic particles and gases. Volcanic ash dispersal has the greatest potential to directly or indirectly affect the largest number of people worldwide, it is currently the only volcanic hazard for which a global assessment exists. The quantitative framework used (primarily at a regional scale) considers the hazard at a given location from any volcano. Flow hazards such as lahars and floods can have devastating impacts tens of kilometres from a source volcano and lahars can be devastating decades after an eruption has ended.

Quantitative assessment of impacts is increasingly undertaken after eruptions to identify thresholds for damage and reduced functionality. Some hazards such as lava flows could be considered binary (totally destructive) but others (e.g. ash fall) have varying degrees of impact. Such assessments are needed to enhance available impact and vulnerability data. Currently, most studies focus on physical vulnerability but there is a growing emphasis on social vulnerability showing that it is highly variable and dynamic with pre-eruption socio-economic conditions tending to influence longer term well-being and recovery.

The volcanological community includes almost 100 Volcano Observatories worldwide, the official institutions responsible for monitoring volcanoes. They may be dedicated institutions, or operate from national institutions (geological surveys, universities, met agencies). They have a key role in early warning, forecasting and long term hazard assessment (often in the form of volcanic hazards maps). The complexity of volcanic systems means that once unrest begins there are multiple potential eruptive outcomes and short term forecasts can change rapidly. This local knowledge of individual volcanoes underpins hazard and risk assessments developed at national, regional and global scales. Combining this local expertise with the knowledge of the international research community (including interdisciplinary perspectives) creates a powerful partnership. A collaborative approach is therefore needed to develop effective volcanic risk assessments at regional to global scale.

The World Organisation of Volcano Observatories is a Commission of IAVCEI, alongside other Commissions such as 'Hazard and Risk' (with an active working group on volcanic hazards maps) and the 'Cities and Volcanoes' Commission. The Global Volcano Model network is a collaborative initiative developing hazards and risk information at national to global scales, underpinned by local expertise. Partners include IAVCEI, Smithsonian Institution, International Volcanic Health Hazard Network, VHub and other initiatives and institutions.