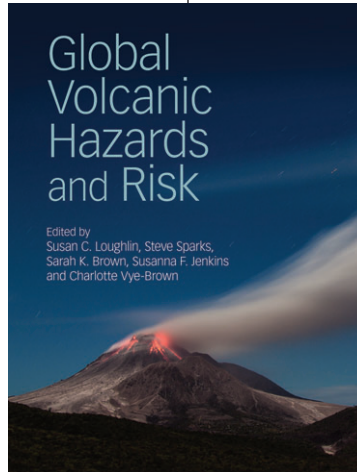


GLOBAL VOLCANIC HAZARDS AND RISK¹

Major environmental challenges affecting human communities require geoscientists who are not only scientifically and technically trained but who recognize their broader commitment to society. With 800 million people at risk from volcanic activity around the world, and populations ever increasing, volcanologists are embracing a more integrative applied approach, which is necessary to understand the human dimensions of volcanic activity. This now extends beyond the few volcano observatories and government agencies previously tasked with this charge to include the academic community. The edited volume *Global Volcanic Hazards and Risk* presents a state-of-the-art assessment of the preparedness of the global scientific community and government agencies to manage large-scale volcanic hazards and risks. The book also highlights the broad collaboration that exists in the volcanological and associated communities, with over 130 scientists from 86 institutions in nearly 50 countries worldwide contributing to this publication.

The book, conveniently available as open access via www.cambridge.org/volcano, consists of twenty-six chapters that cover a broad range of topics, including assessments of volcanic hazards and risk, case studies from several recent eruptions, reviews of the impacts of ash fall, the effects of eruptions on health and on aviation, assessments of monitoring and forecasting capacity, consideration of developing effective communication approaches, and a proposal for a new global volcanic hazard index (VHI). The first four chapters are from a report on global volcanic hazards and risk assessment capability for the United Nations Office for Disaster Reduction (UNISDR) Global Assessment Report for Risk Reduction 2015 (GAR15 Report). The rest of the book consists of case studies that illustrate the complex nature of volcanic risk assessment and management, due largely to the nature, variety, and availability of data that need to be analyzed. The quality of the data determines the evaluation of the volcanic risk, which is an essential part of risk-based decision-making in land-use planning and emergency management.

The reader will learn that the basis for evaluating volcanic risk is obtaining and organizing all pertinent data derived from geology, volcanology, geochemistry, petrology and geophysics, as well as from vulnerability and socio-economic data relating to what exactly (cities, rural communities, wildlife, etc.) might be at risk. It will also be clear to the reader that a key to evaluating risk is assessing if a volcanic eruption itself is imminent, and this is done through monitoring, which is described in several of the case studies. Seismic and geodetic networks are core to such monitoring, as is gas sampling and analysis. Modern remote sensing technologies and data are now also enhancing our abilities to assess unrest at volcanoes. However, all this is compromised if these data are in isolation of knowledge of the eruption history, the frequency and magnitude of eruptions, and the previous eruption styles of a volcano. Consequently, a major effort presented in this book is a database used as the basis for a new volcano hazard index (VHI) for each volcano for which there is adequate geological data. This important new index provides an overview of the range of possible hazards for a particular volcano, the likelihood of specific hazards occurring and the magnitude of such hazards, all based on the previous history of the volcano in question.



Another important initiative introduced in this book is the volcano population index (VPI). This provides an assessment of the magnitude of human populations living around a volcano and who are at risk from volcanic events of varying magnitudes. Significant statistics are that 800 million people live within 100 km of active volcanoes, 226 million live within 30 km, and 29 million live within 10 km. This highlights once again the importance of developing a better understanding of volcanic hazards and their impact.

Unfortunately, the clear message of *Global Volcanic Hazards and Risk* is that adequate information to make informed hazard and risk assessment exists for only 22% (or 349 out of 1,554) of the Earth's "active" volcanoes – defined as those known to have erupted during the Holocene (within the last 10,000 years). The situation is even more alarming when one considers that there are many more "dormant" volcanoes, any of which also have the potential to erupt. This situation clearly indicates that much more needs to be done by governments world-wide to improve both the monitoring efforts on all the known active volcanoes, and, as importantly, undertake detailed investigations of the geological histories of all known active and dormant volcanoes.

As important and comprehensive an assessment as this is, inevitably there are omissions. For instance, important issues around "big volcanological data" are not mentioned. How and where the data should be archived, in which format data should be made available, and how to facilitate data use and exchange are the pressing concerns. The need for appropriate, uniform data specifically adapted to evaluating and managing volcanic risk is now an area of vibrant effort, as are efforts to assimilate and integrate data in Bayesian and other multivariate frameworks. These and other issues with security implications, such as transparency and accessibility, need to be considered. However, rather than being a shortcoming of *Global Volcanic Hazards and Risk*, the fact that we can identify other areas of concern should be taken as a testament to the breadth of effort that is now being focused on volcanic hazards. It is a monumental task to cover all bases. Nonetheless, the insight gained from the assessment published here and from the framework it provides will surely be the launching pad for these efforts.

Global Volcanic Hazards and Risks is an excellent state-of-the-art summary of the knowledge and practice of volcanic risk. It is also a call to action: it clearly reminds us that there is still a huge amount of work to be done in understanding the hazards and risks of the world's active volcanoes. Major investments are required not only in acquiring and deploying more monitoring equipment on more volcanoes but also for undertaking geological mapping and fieldwork to improve our understanding of hazards and risks on all active volcanoes. The book is very accessibly written and could easily serve as a text for undergraduate and graduate classes in volcanology and volcanic hazards; the latter particularly benefiting from the compiled databases, the range of methods in the case studies and the cited literature.

This book is a key resource for those interested in volcanology and natural hazards as well as for the disaster risk reduction community, policy makers, and the generally interested reader.

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¹ Loughlin S, Brown S, Jenkins S, Vye-Brown C (eds) (2015) *Global Volcanic Hazards and Risk*. Cambridge University Press, 408 pp, ISBN 9781107111752, US\$ 120