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'Understanding volcanoes and society: the key for risk mitigation'



Vulnerability assessment of critical infrastructures to volcanic eruptions: the example of Vulcano Island, Italy.

Dehrick Guobadia¹, S. Menoni¹, C. Bonadonna², C. Frischknecht²

¹Politecnico di Milano, Italy

²Department of Earth Sciences, University of Geneva, Switzerland

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Road network, ports, heliports, power stations, telecommunication, and water systems have a strategic role both in ordinary times and during an emergency. In order to assess the vulnerability of such systems, one cannot consider only physical aspects, but also what has been defined as systemic vulnerability. The latter reflects the fragility of systems, due to the interconnection and dependence of each systems' component on others and the interlinkages among systems. Vulcano Island in Italy is the case study area where concepts and methodologies to assess the systemic vulnerability of critical infrastructures to explosive volcanic risk are applied. To have a clear overview of the critical infrastructures, a preliminary phase of mapping has been performed and then an assessment in terms of systems' interconnection, redundancy, transferability, interdependence and durability was carried out. Taking into account the emergency and the recovery phases, both needs and priorities among infrastructures were indicated, by developing a hierarchical ranking among systems and components of critical infrastructures based on indicators. The physical vulnerability of critical infrastructures was combined with volcanic hazards that are likely to occur in Vulcano so as to obtain a physical damage map. Then this map was combined with the systemic vulnerability assessment to characterize the potential degrees of malfunctions and failures that may occur to each infrastructure. As an island is a closed system, in case of emergency, the external support becomes fundamental. So the systemic vulnerability cannot be considered only at the island scale, but the larger area from where help and support may arrive and to where evacuees may have to be transported needs to be considered. Both systemic and organizational vulnerabilities related to external accessibility have also been assessed as accessibility is a key component of any emergency plan for the island.