Combined adverse effects of cascading events on systems' functionality: an insular case study, French West Indies

Nicolas Desramaut, Justin Wang, Pierre Gehl, José Marti, Audrey Bailles, Arnaud Réveillère

Geophysical Research Abstracts
Vol. 15, EGU2013-7352, 2013
EGU General Assembly 2013

Combined adverse effects of cascading events on systems' functionality: an insular case study, French West Indies

Nicolas Desramaut (1), Justin Wang (2), Pierre Gehl (1), Jose Marti (2), Audrey Baills (1), and Arnaud Reveillere (1)

(1) BRGM, Orléans, France, (2) UBC, Vancouver, Canada

In our modern societies, lifelines play a vital role, even in normal conditions. Therefore, during crises, the dependency to critical infrastructures is likely to be exacerbated. Indeed, in order to provide quick emergency services to the population, systems have to be functional. However, even if not directly damaged, in order to be functional, elements of the different systems have to receive enough resources but also to be able to supply their own services. In a multi-risk approach, this necessity to take into account systemic vulnerability to assess the real impact of natural hazards on society is even made more obvious. For example, impacts of one hazard, taken separately, might not significantly affect societies, but might reduce redundancy, and therefore could increase functional vulnerability to other hazards.
The present study aims at analyzing the effects of cascading events on the behaviour of interdependent systems and on the capacities of the health care system to treat the victims. In order to work on a close system, an insular context (Guadeloupe, French West Indies) has been selected. The hazard cascading scenario consists of a M6.3 earthquake striking Basse-Terre, and triggering landslides in the mountainous areas where antecedent precipitations have made the area prone to slide. Damages due to earthquakes have been estimated for the 5 considered systems (buildings, healthcare system, electrical network, water supply network and transportation). Due to their localization in mountainous areas, landslides would affect only transportation networks, with closure of roads. The inter- and intra-dependencies of systems have been modeled thanks to the I2Sim platform developed at UBC. The functionality of each element is therefore the consequence of the physical (direct damage) but also functional (indirect) damage. Analyses are performed for different strategies of resources allocations, and one of the final results is the impact of the induced landslides on the Health care treatment capacity.

The results have been achieved in the project MATRIX, co-funded by the European Commission in the Seventh Framework Programme (FP7/2007-2013), under Grant Agreement n° 265138