



Development of Visualisations for Multi-Hazard Environments in Guatemala

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Here we present an adaptation of global interacting hazard matrices for the purpose of improving disaster risk reduction in multi-hazard environments of Guatemala. Guatemala is associated with multiple natural hazards, including volcanic eruptions, earthquakes, mass movements and floods. These processes are often not independent and it is therefore important to consider and understand the ways by which they interact to generate cascades or networks of natural hazard events. We first present a review of such hazard interactions and hazard chains in Guatemala, focusing on the volcanic environments around Pacaya, Fuego and Santiaguito. Interactions discussed are those where a primary hazard triggers or increases the probability of secondary hazards. Consideration is also given to interactions where two hazards combine to trigger a third hazard, or two concurring hazards result in impacts greater than the sum of components. Second, we utilise and adapt global interacting hazard matrices designed to understand and communicate information about interactions. We explore the use of this hazard visualisation framework within the more regional Guatemalan context. Twenty-one semi-structured interviews, and a workshop with 16 participants, were held with hazard and civil protection professionals in Guatemala to solicit feedback on: (i) how visualisations with a global focus can be modified for use in Guatemala, (ii) possible end users for such visualisations, and (iii) participants' understanding of hazard interactions and their opinion of community understanding of these themes. Core ideas that emerged from these interviews were (i) the importance of such tools in rapid response, preparedness and community education, (ii) the appropriate scales for visualisation development, in order to have maximum impact, and (iii) the need to integrate anthropic factors to fully understand hazard cascades. It is hoped that the development of improved tools to understand natural hazard interactions and networks of interactions can support multi-hazard approaches to monitoring and responding to hazard events.