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Tsunami risk assessment with GIS methods: cost from building damage and evacuation mapping

Triantafyllou, I.¹, Fokaefs, A.¹, Novikova, T.¹, Papadopoulos, G.A.¹, Vaitis, M.²

¹Institute of Geodynamics, National Observatory of Athens, 11810 Athens, Greece;
rioannatriantafyllou@yahoo.com

²Department of Geography, University of Aegean, Mytilene, 81100 Athens, Greece

Tsunamis are disastrous phenomena causing loss of life and heavy damage in the built environment. Heraklion, Crete, Greece has significant risk of tsunami and was hit by a very strong tsunami after the collapse of the volcanic caldera in Thera Isl. The coastal population is increasingly contributing human activities and urban development. After a tsunami the coastline with its diverse activities is exposed to a variety of impacts both towards humans and to buildings. Geographic Information Systems analysis with datasets of terrain and population provides a possible model of the extent of the damage that may affect the coastal community. In order to reduce the loss life from the inundation it is critical to evacuate the population which is exposed to tsunami hazard. The time which is required in order for someone to move from one point to another as well as the distance which must be crossed must be calculated. The probabilistic building damage was evaluating using the SCHEMA Tool. Results show that there is an important percentage of the population at possible risk; especially in the high zone of inundation. The evaluation of tsunami risk included calculations and mapping with QGIS of (1) cost for repairing or rebuilding buildings suffering tsunami damage or collapse, (2) population exposed to tsunami attack, (3) optimum routes and times for human evacuation. To calculate the cost for building reparation or rebuilding after a tsunami attack we have determined the tsunami inundation zone in the study area after numerical simulations for extreme tsunami scenarios and calculated the expected damage level from empirical fragility curves. The official cost recognized by the Greek state after strong earthquakes occurring in 2014 was used as a basis to calculate the cost to buildings after the tsunami of the extreme scenario. This research is a contribution to the EU-FP7 tsunami research project ASTARTE (Assessment, Strategy And Risk Reduction for Tsunamis in Europe), grant agreement no: 603839, 2013-10-30.

