

Tsunami fragility functions for buildings and their applications in New Zealand

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The use of fragility functions for buildings to assess the risk to the built environment from tsunamis has become increasingly important over the last decade. Fragility functions express the conditional probability that a particular building structural damage state (e.g. low, moderate, complete damage) will be reached or exceeded for a given tsunami intensity parameter such as flow depth, velocity and/or debris strike. Results can then be used to estimate impacts and losses for various tsunami hazard scenarios in order to better inform hazard or risk planning and mitigation. In this poster, we report on the application of tsunami fragility functions for buildings to estimate tsunami impacts and losses in New Zealand using the RiskScape loss modelling tool. RiskScape is a multiple hazards loss modelling software tool that has the capability of correlating hazard models (e.g. tsunami inundation model) with asset inventories (e.g. buildings, lifelines) using fragility functions to determine risk exposures and potential losses. In the absence of major historical damaging tsunamis in New Zealand, estimating tsunami risks via RiskScape has traditionally been carried out using analogous flood depth-damage functions. However, we demonstrate here that the application of tsunami fragility functions for buildings developed in Japan following the recent 2011 Tohoku-oki tsunami provides a more realistic estimation of tsunami impacts to buildings via RiskScape. Furthermore, presenting the results as damage probabilities permits the identification of risk hotspots for a given tsunami inundation model, allowing for a more strategic approach to mitigation planning. Our findings suggest that global tsunami fragility functions can be used to improve tsunami risk assessment in other countries given the availability of country-specific tsunami hazard models and asset inventory data.

Keywords: Tsunami, Fragility functions, RiskScape, New Zealand