A Review of Methodologies on Vulnerability Assessment of Buildings to Tsunami Damage

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The infrequency, suddenness and violence tsunamis has led to a lack of knowledge on tsunami and lack of data available for the calibration of numerical models particularly in relation to tsunami damage. Therefore, there are very few tsunami structural vulnerability studies available. Of the available literature, most of these started after the disastrous 2004 Indian Ocean event. Most of fragility curves have been developed in some areas struck by the 2004 tsunami, which are very different in architecture and engineering respect to the US, Japanese or European ones. This review aims to highlight the strengths and weaknesses of current knowledge on tsunami fragility by critically assessing several fragility curves based on post tsunami damage surveys in Chile, Japan (including initial findings of the March 2011 event), Samoa, Sri Lanka and Thailand.

It is observed that there is no consensus on how to derive tsunami fragility curves. Most of the examined relationships are seen to relate to residential buildings, and, due to the location of recent tsunami occurrences, they mostly represent non-engineered buildings (i.e. all use data from Thailand, Sri Lanka, Samoa, or Sumatra), which limits their usefulness. In the absence of a good understanding of tsunami actions on buildings most existing fragility relationships adopt inundation depth as the hazard parameter in the vulnerability function, which does not account for the other components of onshore flow contributing to tsunami loads on buildings, such as flow velocity.