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Tsunami Vulnerability of Critical Infrastructure: Development and Application of Functions for Infrastructure Impact Assessment

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Abstract : Recent tsunami events, including the 2011 Tohoku Tsunami, Japan, and the 2015 Illapel Tsunami, Chile, have highlighted the potential for tsunami impacts on the built environment. International research in the tsunami impacts domain has been largely focused toward impacts on buildings and casualty estimations, while only limited attention has been placed on the impacts on infrastructure which is critical for the recovery of impacted communities. New Zealand, with 75% of the population within 10 km of the coast, has a large amount of coastal infrastructure exposed to local, regional and distant tsunami sources. To effectively manage tsunami risk for New Zealand critical infrastructure, including energy, transportation, and communications, the vulnerability of infrastructure networks and components must first be determined. This research develops infrastructure asset vulnerability, functionality and repair- cost functions based on international post-event tsunami impact assessment data from technologically similar countries, including Japan and Chile, and adapts these to New Zealand. These functions are then utilized within a New Zealand based impact framework, allowing for cost benefit analyses, effective tsunami risk management strategies and mitigation options for exposed critical infrastructure to be determined, which can also be applied internationally.

Keywords : impact assessment, infrastructure, tsunami impacts, vulnerability functions
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