

Towards Earthquake-Resilient Buildings: Exposure/Damage Database for the 2013 Bohol Philippines Earthquake

^a Muriel Naguit, ^{a,b} Phil Cummins, ^b Hadi Ghasemi, ^b Mark Edwards, ^b Hyeuk Ryu,
^c Bartolome Bautista and ^a Marcus Haynes

^a *Research School of Earth Sciences, Australian National University, muriel.naguit@anu.edu.au*

^b *Geoscience Australia, Canberra, Australia*

^c *Philippine Institute of Volcanology & Seismology, Quezon City, Philippines*

The devastating potential of earthquake impact was witnessed in the province of Bohol in the Philippines when a Mw7.1 inland earthquake occurred in the morning of 15 October 2013. The aftermath was dominated by strong ground shaking leading to the prominent collapse of several historic churches and damaging over 70,000 houses. This makes the Bohol earthquake an important opportunity to improve knowledge on building fragility. A post-event damage assessment was conducted leading to the compilation of an exposure/damage database covering 25,000 exposed structural systems in the island. Using an empirical approach, the seismic fragility and vulnerability functions for the typical building units in the database have been derived. An essential step in the process is the correlation of earthquake ground motion estimates with the actual building damage. For the ground motion estimation, a uniform slip model was constrained using SAR and aftershocks data. To generate the ground motion fields, two methods were used including stochastic modeling and an ensemble of ground motion prediction equations from which the intensity distribution has been extrapolated. On the other hand, the building population representing pre-defined damage states are aggregated and used as statistical inputs in the analysis. This allowed validation of building fragility models already in use in the Philippines. The assessment further corroborates the importance of assembling an empirical database in evaluating how fragile and vulnerable the building systems are under seismic excitations.