

Scenario-Based Seismic Loss Estimation for San Diego County, California

Loren Wimmer
M.S. Candidate

Committee:

Steven Day, Kim Olsen, Peter Blomgren

Abstract:

A study was done to estimate seismic losses to San Diego County, California, and test the sensitivity of those loss estimates to the choice of ground motion model. The scenario chosen was a magnitude 7.1 earthquake on the Rose Canyon Fault Zone. A rupture surface for this scenario was defined following the 2002 National Seismic Hazard Mapping Program. Two types of ground motion forecasts are used as input to the loss analysis. The first type uses empirical attenuation relationships. Nine different attenuation relationships are employed and compared, three of which are from the recent Next Generation Attenuation (NGA) project. The second type of ground motion input is broadband numerical simulations. For the broadband simulation methodology three rupture directions are considered, north-to-south, south-to-north and a bilateral rupture. Using the nine attenuation relationships and three broadband simulations, 12 different ground motion estimates for the M7.1 scenario were computed. Loss estimates were made by importing each scenario into the FEMA program HAZUS-MH MR3. The analysis estimates total economic loss to be between \$9.1 and \$26 billion and 15 - 412 fatalities. This study shows the choice of ground motion model to have a large effect on both loss estimates and the spatial distribution of those losses. In general, using the NGA attenuation relationships reduces loss estimates by 40 – 50% when compared with the loss estimates generated using pre-NGA attenuation relationships. Broadband numerical simulations on the other hand show a wide range of total loss estimates and impact the spatial distribution of losses.