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HAZUS Scenario and Annualized
Earthquake Loss Estimation for California
by
Rui Chen, David M. Branum, and Chris J. Wills

Earthquake loss estimation and planning scenarios quantify seismic risk based on seismic hazard and exposure and vulnerability of the built environment. This study, and previous studies by CGS, use HAZUS, a computer program developed for FEMA to quantify the effects of earthquakes. These studies need to be frequently updated because of continuing development of the built environment and evolving technology in earthquake ground motion prediction and seismic hazard assessments.

Using HAZUS default information for built environment and demographics, CGS studied statewide annualized earthquake losses (AEL) based on standard seismic hazard models developed by CGS and USGS for the National Seismic Hazard Maps. The annualized loss estimation incorporated the effect of local soil conditions using current ground motion prediction equations. AELs were estimated at three levels of geographic resolution: census tract, county, and Metropolitan Statistical Area (MSA). Our calculations show that the lower ground motions predicted by the newer ground motion prediction equations translate directly to substantially lower annual earthquake loss estimations in California.

CGS also studied potential losses due to scenario earthquakes. Each scenario includes estimates of damage, casualties, and other consequences of the scenario earthquake. In northern California the three most damaging scenario earthquakes involve co-seismic rupture of different combinations of segments of the San Andreas Fault, with estimated economic losses ranging from nearly $70 billion to over $80 billion. In southern California, the most damaging scenario is the M7.1 earthquake on the Puente Hills Fault, with up to 30% building loss in some census tracts and total predicted building loss of $79 billion ($82.8 billion in total economic loss). Similarly to the results for AEL, calculated losses for scenarios are significantly lower when current ground motion prediction equations are used to develop the scenario ground shaking.

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