Seismic hazard curve as dynamic parameters in earthquake building design for Sabah, Malaysia

ABSTRACT

This paper presents the significance of a seismic hazard curve plot as a dynamic parameter in estimating earthquake-resistant structures. Various cases of structural damages in Malaysia are due to underestimating earthquake loadings since mostly buildings were designed without seismic loads. Sabah is classified as having low to moderate seismic activity due to a few active fault lines. Background point, area, and line sources are the three tectonic features that have impacted Sabah. Data on earthquakes from 1900 to 2021 have been collected by a number of earthquake data centers. The seismicity is based on a list of historical seismicities in the area, which stretches from latitudes 4 ◦S to 8 ◦N and longitudes 115 ◦E to 120 ◦E. The goal of this research is to develop a seismic hazard curve based on a conventional probabilistic seismic hazard analysis being examined for the maximum peak ground acceleration at 10% probability of exceedance as published in MSEN1998-1:2015. This study extended to 5% and 2% probability of exceedance combined with the seismic hazard curve by using Ranau as a case study. To calculate the expected ground motion recurrence, such as peak ground acceleration at the site, earthquake recurrence models were combined with selected ground motion models. A logic tree structure was used to combine simple quantities such as maximum magnitudes and the chosen ground motion models to describe epistemic uncertainty. The result demonstrates that peak ground acceleration values at the bedrock were estimated to be 0.16, 0.21, and 0.28 g of the total seismic hazard curve at 10%, 5%, and 2% PE in a 50-year return period, respectively. The seismic hazard study at a Ranau site basically depends on the seismicity of a region and the consequences of failure in the past. Thus, the results can be used as a basis for benchmarking design or evaluation decisions and for designing remedial measures for Sabah constructions to minimize structural failure.