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Probabilistic Seismic Hazard assessment for four target sites in the Solomon Islands

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To obtain the probability of ground motion due to earthquakes exceeds a certain threshold at a specific site is the objective of probabilistic seismic hazard analysis. The cumulative distribution function is used to estimate the probability of occurrence of earthquakes in a certain region and the probability of exceedance of a certain ground motion by all the earthquake events that are likely to occur in the region in the future, makes it possible to predict the peak ground acceleration (PGA) for a given probability at any target site. The tradition of this method and its application goes back as far as 1968 to the concept introduced by Cornell (1968), Cornell et al. (1979) and McGuire (1976).

This probabilistic seismic hazard study is the result of study carried out in Solomon Islands for four main target sites in the country, mainly Honiara the capital city (9.4456° S, 159.9729°E), Gizo town (8.1058° S, 156.8350° E), Auki town (8.7679° S, 160.6960° E) and Makira town (10.3304°S 161.4941°E) respectively. Each seismic hazard model obtained for each target site is built from the historical and instrumental earthquake catalog data from the common sources known to the four target sites. The historical earthquake catalogs collected and used in this study were result of a comprehensive collective earthquake magnitude data spanning from 1950 to 2020 (ANSS-USGS). To obtain the number of earthquakes per magnitude per year, The Gutenberg-Richter (GR) relations $\log N(M) = a - b M$, where M is magnitude, N is number of events of M, is derived base on the local catalogue used to characterize earthquakes exponential distribution for earthquakes occurring on faults in the subduction zones, in which their annual recurrence times (rate) were formulated based on instrumental seismicity. To account for the probability exceedance of a ground motion for the the sites, the GMPE or attenuation models used to estimate the exceedance probability. We then combined collective individual earthquakes ($M4.5 \leq M \leq M7$) probability ground motion attenuation rate to formulate the seismic hazard curve for each target site. Finally, we compared our seismic hazard results from this study with that of other similar studies by Y. Rong et al (2010)