

Probabilistic Seismic Hazard in Low Seismicity Region: Kalimantan, Indonesia

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The island of Kalimantan lies upon the southeastern margin of the greater Eurasian plate. The features that affected Kalimantan came from its great tectonic activity during Late Paleozoic-Pliocene. The absence of present-day major earthquakes makes the island is considered as a relatively stable block. In the past decades, seismic hazard analysis in Kalimantan is not prioritized due to its low seismicity. However, two moderate yet destructive earthquakes hit the island in 2015: the 6.5 Mw Sabah (Northern part of Kalimantan, Malaysia) earthquake on June 5, and the 6.1 Mw Tarakan (Eastern part of Kalimantan, Indonesia) earthquake on December 21. It seems that the eastern and northern parts of the island are subject to potential hazard from small to medium sized earthquakes. Those recent earthquakes show that Kalimantan is not sterile from destructive earthquakes. Hence, we must remain alert to the possibility of such an earthquake disaster, as it had happened last year and 95 years ago. In addition, more than 18 million people living in this island should be considered.

In order to reduce earthquake disaster, the Kalimantan seismic hazard map was created using probabilistic approach called PSHA. The uncertainties of size, location and time of earthquake sources and GMPE were taken into account in calculation of acceleration. Seismic hazard analyses involve the quantitative estimation of ground-shaking intensity that was obtained by converting the acceleration on 0.3 second RSA (Response Spectral Acceleration) having 10% probability of exceedance in 50 years (500 years return period). Based on ground-shaking intensity, the hazard level was divided into four classes: they are very low ($MMI < V$), low ($V \leq MMI \leq VII$), moderate ($VII < MMI \leq VIII$), and high ($MMI > VIII$) respectively. Important to note, this classification is primarily intended to non-engineered building, a common building in Indonesia.

The hazard level in Kalimantan is mainly controlled by diffuse zones of deformation (background seismicity) while Palu Koro and/or North Sulawesi subduction affected eastern tip of Mangkalihat Peninsula. The inclusion of site amplification is another important aspect that included in the hazard map, since it can change the hazard level significantly.

Keywords: PSHA, Kalimantan , Low Seismicity Region, Seismic Hazard Map