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Scenario Earthquake based Seismic Susceptibility Assessment of Kohima urban agglomeration within active seismo- tectonic domain of NE India

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Scenario Earthquake based Seismic Susceptibility Assessment (SSA) was attempted in one of the most seismically active urban agglomeration of Kohima, Nagaland to quantify the expected ground motion parameters. The identified seismic source zones within the 300 km radius of Kohima town with records of significant past seismicity are a) Belt of Schuppen, b) Indo-Myanmar subduction zone, c) Himalayan fold thrust belt, d) Shillong-Mikir Hills massif and e) Bengal basin-Tripura-Mizoram fold belt. An earthquake catalogue containing 1,684 nos. of earthquake events (2.6Mw to 8.7 Mw) between 1869 and 2013 around 300 km radius of Kohima was collated from data source like IMD, USGS, GSI, etc and used for seismicity analysis. The uniform conversion of earthquake magnitudes from Mb and Ms to Mw was carried out following the relation of Scordilis, 2006 [4]. The estimated 'a' value (7.84) and 'b' value (0.987) obtained from G-R Frequency - Magnitude relation [3], indicates high seismicity (nearly 8 nos. of events M 4 and above per year), relatively higher stress, higher abundance of low magnitude EQ in the catalogue and to be magnitude of completeness at 4.9Mw. Peak ground acceleration (PGA) was initially estimated considering the maximum credible earthquake for all the five seismic sources and using the attenuation relation of Atkinson & Boore, 2003 [1], Boore and Atkinson, 2008 [2]. The estimated peak ground acceleration at bedrock level in Kohima related to all the identified seismic sources indicates highest PGA value of 0.308g considering Indo-Myanmar subduction zone as seismic source for a scenario earthquake (MCE) of 7.7 Mw located at hypo central distance of 80.72 km. Considering the seismic source and scenario earthquake and using the said attenuation relation, bedrock level PGA across the Kohima Master plan area was estimated and PGA map for the study area was generated which shows variation from 0.22g to 0.33g. The prepared surficial geological map of the Kohima urban agglomeration shows distribution of rock/overburden and nature & abundance of overburden across the study area. Considering the surficial geology and estimated depth of overburden it is interpreted that at surface level, PGA may increase substantially (2 to 3 times) with respect to bed rock level and may reach intensity VIII equivalent of MSK scale. The result and inferences of the study may be utilised for Seismic susceptibility assessment, setting building codes and design hazard risks and hence will be useful for future urban planning. Also, the generated database can be utilized further detail seismic hazard analysis of the seismo-tectonic domain including that of Kohima.

References:

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