State of Art a Probabilistic Seismic Hazard Analysis in Himalaya

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ABSTRACT

The seismic hazard analysis is concerned with getting an estimate of the strong-motion parameters data site for the purpose of earthquake resistant design or seismic safety assessment. For generalized applications, seismic hazard analysis can also be used to prepare macro or micro zoning maps of an area by estimating the strong-motion parameters for a closely spaced grid of sites. Basically, two methodologies used for the purpose are the "deterministic" and the "probabilistic" seismic hazard analysis (PSHA) approaches. In the deterministic (DSHA) approach, the strong-motion parameters are estimated for the maximum credible earthquake, assumed to occur at the closest possible distance from the site of interest, without considering the likelihood of its occurrence during a specified exposure period. On the other hand, the probabilistic approach integrates the effects of all the earthquakes expected to occur at different locations during a specified life period. Acknowledging the fact that the basic purpose of both DSHA and PSHA approaches is to facilitate engineering designs and decisions, and not to predict the actual earthquakes and ground motions. Seismic hazard analysis involves the quantitative estimation of ground shaking at a particular site or for a particular region. Traditionally, peak ground acceleration (PGA) has been used to quantify ground motion in PSHA. Probabilistic Seismic Hazard Analysis (PSHA) has been carried out for Uttarakhand state. The study region is one of the most seismically active regions of Himalaya, India due to presence of numerous major seismic faults. The contributions of smaller local faults cannot be ignore such as the Yamuna Fault near Haridwar and Alaknanda Fault near Rudraprayag make the region more seismic vulnerable. For the purpose of PSHA of Uttrakhand, having 13-districts has been divided into Four Seismotectonic source zones as (UK-I, UK-II, UK-III and UK_IV. Seismic Hazard computations have been performed using CRISIS 2015for the purpose the study area has been divided into grid size of 0.2° x 0.2°to estimate PGA at each grid. The input parameters are seismicity parameters and attenuation models. Seismic hazard is computed in terms of PGA for 20%, 10% and 2% probability of exceedance in 50 years which are equivalent to return periods of 225, 475 and 2475 years respectively. The results show that rate of occurrence of earthquakes is high in source zone UK- I as compared to other zones and low in source zone UK-II. Seismic hazard also has been estimated in terms of PGA for various return periods in different districts of Uttarakhand considering two NGA 2014 attenuation models. Results show that Rudraprayag district has maximum PGA value and Udham Singh Nagar has minimum value. The results of the probabilistic approach are able to account for the effects of all the controlling factors in a balanced way, and can thus be considered scientifically more sound method for seismic hazard analysis.

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