

ABSTRACT

The seismic hazard vulnerability of the Kashmir basin, NW Himalaya is evident from the historical and instrumental earthquake records, especially after the disastrous 8 October 2005 Kashmir earthquake (M_w 7.6). A probabilistic and geotechnical approach to quantify and decipher the earthquake hazard potential of the Kashmir basin was adopted in this study. The first and foremost endeavor that was undertaken in this regard is the probabilistic seismic hazard assessment of the Kashmir basin at the engineering bedrock. The ground motion was assessed by employing appropriate ground motion prediction equations and the hypocentral depth-wise hazard distribution was generated at 0-25 Km, 25-70 Km and >70 Km with 10% probability of exceedance in 50 years and a return period of 475 years. The overall seismic hazard was predicted in terms of peak ground acceleration (PGA) and Pseudo Spectral acceleration (PSA) with 2% and 10% probability of exceedance in 50 years. It is seen that, Kashmir basin is implicated with high seismic hazard, with southeastern part showing higher hazard as compared to northwestern part. The study thus advocates a significantly higher seismic hazard as compared to the national seismic zone map of India and consequently recommends updating of the building code in the region. To decipher the site effect and liquefaction potential of the Kashmir valley alluvium, synthetic ground motions of the 8 October 2005 Kashmir earthquake were used as input motions and transmitted through the soil profiles at 219 borehole locations and analyzed using DEEPSOIL. The shear wave velocity pattern and PGA distribution at the surface exhibits that the local site conditions play an important role in the ground motion distribution in the Kashmir valley. The liquefaction analysis shows that northwestern part of the valley has very high, central part very high to high and Southeastern part low to very low liquefaction potential. Finally an attempt is made to deliver the seismic microzonation map of the capital city of Srinagar using the already developed and appropriately weighted hazard themes. The city has been microzoned into very high to severe hazard level on Seismic Hazard Index, highlighting the susceptibility to very high seismic hazard.

Key Words: earthquake, Kashmir basin, probabilistic seismic hazard assessment, Ground motion prediction equation, site response analysis, liquefaction, seismic microzonation.