Seismic Hazard Assessment and Site Response Study for Seismic Microzonation of Dehra Dun.

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ABSTRACT

The synclinal Dehradun basin, which lies between the Lesser Himalayas and the frontal Siwaliks, is one of the most active seismic zones of the Himalayas. Bounded by the Main Boundary Thrust and Himalayan Frontal Thrust system, this area has experienced a lot of neotectonic activity. Since this particular area has not experienced any major earthquakes for the last 300 to 500 years so it is believed that enough strain has already been accumulated along this zone, which can be released in terms of a series of high magnitude earthquakes. Since this is going to happen in the near future so there is need for mitigation measures which include identifying areas that are going to be most affected, assessing the nature of hazards and risks involved, developing and implementing proper building codes and practices, and designing earthquake resistant buildings and facilities.

For designing earthquake resistant buildings and structures, it is necessary to assess the probable seismic hazard of a particular area. To understand how the structures and facilities will behave in case of an earthquake it is a prerequisite to understand the nature of the local material as well as their response in case of an earthquake. A measure of the ground amplification level during the expected earthquake can be ascertained from the response spectra. One-dimensional numerical approach is one of the popular methods to evaluate the ground shaking response. SHAKE software, which is a widely used computer programme for calculating the one-dimensional ground response, has been used in this study for site response analysis. It requires a number of input parameters such as soil profile, material type and the geotechnical properties of the subsurface material to. One of the important parameters required for the analysis is the subsurface soil profile. Tube well lithologs provide readily available data source that could be used for site response analysis. Both the subsurface material and the thickness of the material can be obtained from the tube well lithologs. This study describes how the tube well lithologs can be analyzed with reference to the local geology and geomorphology, to generate the response spectra to find out the average shear wave velocity and peak spectral acceleration for different locations of Dehradun city. On the basis of the analysis, different spectral acceleration maps at particular frequency ranges that correspond to the natural frequency of the buildings, are prepared. The peak spectral acceleration, which denotes the frequency at which the material is going to amplify the maximum, are found to be confined to the frequency zone of 2 to 3 Hz, at all most all the sites, though there are local variations.