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Landslide Susceptibility Mapping on a Macro-Scale along a road corridor using heuristic approach

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Landslide Susceptibility mapping, covering around 400 sq. km along Narkanda- Rampur- Khab National Highway (NH-22) was carried out on 1:50 000 scale following the Bureau of Indian Standards (BIS) guidelines, modified by the Geological Survey of India (GSI). The study area exposes rocks belonging to Kullu, Rampur and Vaikrita Groups. The main rock type includes schists, quartzites, slate, phyllite, gneisses and migmatized metasediments. The rocks are highly deformed. The general trend is NW-SE with low to moderate dip towards N to NE. The Kulu and Vaikrita Thrusts are the main tectonic elements. Patches of Quaternary deposits including glaciated drift deposits, relict moraines and valley-fill deposits such as river terraces, debris cones and fans are exposed along the road.

The zonation was carried out using rating techniques derived heuristically, as specified in the guidelines. A total 12 causative factor maps were prepared for the analysis. The Landslide Hazard Evaluation Factor (LHEF) provides a rating scheme. The lithology, structure, slope morphometry and stability status have been assigned maximum Landslide Hazard Evaluation Factor (LHEF) rating of 2 each; while erosion, land use, land cover, relative relief, hydrological condition and rainfall were assigned a value of 1 each, thus bringing the total score to 14. Additional correction factors for weathering zones have also been incorporated. From LHEF, the Total Estimated Hazard (TEHD) is obtained for each facet, taken as a mapping unit, by adding the ratings of all the twelve causative factors. Finally, a landslide susceptibility zonation map is prepared by classifying TEHD values in 5 classes ranging from very high (TEHD > 10.5), high (TEHD 8.41-10.5), moderate (TEHD 7.1-8.4), low (TEHD 4.91-7.0) and very low (TEHD < 4.9).



The study area has been divided into 423 slope facets out of which 16 facets can be categorised as 'high' (TEHD 8.41-10.5), 94 facets as 'moderate', 311 facets as 'low', and 2 facets as 'very low' (TEHD < 4.9). Many vulnerable slopes which fall in high and moderate zones are the result of slope modification by road construction (Figure 1). The landslide susceptibility mapping [1] of the area is of utmost importance for the proper development of the area. Such mapping helps in identification of areas threatened by present and potential slope instability which will help in suggesting remedial measures for the prevention of unstable slopes [2].

Figure 1: Debris slide near Rampur, H.P.

References:

- [1] Brabb E E (1984) In: IV International Symposium on Landslides, Toronto, Proceedings Vol1: 307-324
- [2] BIS Code No. IS 14680 (1999) Landslide Control Measures - Guidelines

