

Multi scale modelling of landslide hazard and risk assessment in data scarce area – a case study on Dhalai District, Tripura, India

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Successful landslide management plans and policy depends on in-depth knowledge about the hazard and associated risk. Thus, the present research is intended to present an integrated approach involving uses of geospatial technologies for landslide hazard and risk assessment at different scales (site specific to regional level). The landslide hazard map at regional scale (district level) is prepared by using weight-rating based method. To analyze landslide manifestation in the Dhalai district of Tripura different causative factor maps (lithology, road buffer, slope, relative relief, rainfall, fault buffer, landuse/landcover and drainage density) are derived. The analysis revealed that the geological structure and human interference have more influence than other considered factors on the landslide occurrences. The landslide susceptibility zonation map shows that about 1.64 and 16.68% of the total study area is falling under very high and high susceptibility zones respectively. The landslide risk assessment at district level is generated by integrating hazard scouring and resource damage potential scouring (fuzzy membership values) maps. The values of landslide risk matrix are varying within the range of 0.001 to 0.18 and the risk assessment map shows that only 0.45% (10.80 km²) of the district is under very high risk zone, whereas, about 50% pixels of existing road section are under very high to high level of landslide risk. The major part (94.06%) of the district is under very low to low risk zone. Landslide hazard and risk assessment at site specific level have been carried out through intensive field investigation in which it is found that the Ambassa landslide is located within 150 m buffer zone of fault line. Variation of geo-electrical resistivity (2.2Ωm to 31.4Ωm) indicates the complex geological character in this area. Based on the obtained geo-technical result which helps to identify the degree of risk to the existing resource, it is appropriate to implement the management plans such as construction of sub-surface drainage, extension of retaining walls, cutting/filling of slope in scientific manner.

Keywords: landslide, hazard, risk, fuzzy set theory