
GIS based multi-criteria evaluation and logistic regression for landslide susceptibility mapping: A case study in Phuentsholing, Bhutan.

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Abstract

The southern foothills of Bhutan lie within the Main Central Thrust (MCT) and Main Boundary Fault (MBF) of Himalayan range. The region is subjected to frequent landslides across the length of the country mostly impacting the road network. This has major impact on the socio-economic activities of country. Landslide inventory and landslide susceptibility maps can aid in the planning and decision making for landslide prevention and mitigation. In the present study, Landslide susceptibility maps was generated for the study area of 130 km² encompassing an important trade town and an industrial town area. Landslide inventory was created from historical data and interpretation of google earth images. Landslide susceptibility maps (LSM) based on level of severity were generated using GIS based analytic hierarchy process (AHP) multi-criteria evaluation (MCE) and logistic regression technique. Causal factors of landslides such as slope degree, slope aspect, distance from road, distance from drainage, distance from fault, lithology, landcover, normalized difference vegetation index (NDVI) and altitude were evaluated for correlation and used as the parameters in the models. For comparison and validation of the two methods employed, 20% randomly generated sample, equally proportioned between both landslide and non-landslide pixels were used. Area under curve (AUC) of the receiver operating characteristic (ROC) was conducted on the both the training and the validation samples. The validation samples were also overlaid on the LSM to check the performance of the techniques.

Keywords: Landslide susceptibility map, Geographic information system (GIS), Multicriteria evaluation (MCE), Frequency ratio, Logistic regression

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