Landslide hazard zone mapping using Information Value model: the case of Gidole Landslide, Southern Ethiopia

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Landslide hazard is becoming serious environmental constraints for the developmental activities in the highlands of Ethiopia. With the current infrastructure development, urbanization, rural development, and with the present landslide management system, it is predictable that the frequency and magnitude of landslide and losses due to such hazards would continue to increase. In the present study, landslide hazard zone mapping were carried out in and around Gidole Town in Southern Ethiopia. The main objective of the study was to map landslide hazard zone using Information Value Bi-variant statistical model. For landslide hazard zonation of the study area six causative factors namely; aspect, slope angle, elevation, Lithology, Normalized Difference Vegetation Index (NDVI) and land-use and land-cover were considered. The landslide inventory mapping for the present study area was carried out through field observations and Google Earth image interpretation. Later, Information value was calculated based on the influence of causative factors on past landslide. The distribution of landslide over each causative factor maps was obtained and analyzed. Weights for the class with in these causative factor maps was obtained using information value model. Distribution of landslide in the study area was largely governed by aspect of southwest facing, slope angle of 30-45º, elevation of 1815-2150m, NDVI of 0.27-0.37, Lithology of colluvial deposit and land-use and land-cover of agricultural land. The landslide hazard zonation map shows that 78.38km² (36.3%) area fall within very low hazard (VLH) zone, 72.85km² (34.2%) of the area fall within low hazard (LH) zone, 12.78 km² (6.6%), 32.72 km² (15.4%) and 15.89 km² (7.5%) of the area falls into very high hazard (VHH), high hazard (HH) and moderate hazard (MH), respectively. Further, validation of LHZ map with past landslide inventory data shows that 92.3% of the existing landslides fall in very high hazard (VHH) and high hazard (VHH) zone. Thus, it can safely be concluded that the hazard zones delineated in the present study validates with the past landslide data and the potential zone depicted can reasonably be applied for the safe planning of the area.

Key words: Landslide, Gidole, Landslide hazard zone, Information Value model