

GIS-based landslide susceptibility mapping with probabilistic likelihood ratio and spatial multi-criteria evaluation models (north of Tehran, Iran)

ABSTRACT

The aim of this study is to produce landslide susceptibility mapping by probabilistic likelihood ratio (PLR) and spatial multi-criteria evaluation (SMCE) models based on geographic information system (GIS) in the north of Tehran metropolitan, Iran. The landslide locations in the study area were identified by interpretation of aerial photographs, satellite images, and field surveys. In order to generate the necessary factors for the SMCE approach, remote sensing and GIS integrated techniques were applied in the study area. Conditioning factors such as slope degree, slope aspect, altitude, plan curvature, profile curvature, surface area ratio, topographic position index, topographic wetness index, stream power index, slope length, lithology, land use, normalized difference vegetation index, distance from faults, distance from rivers, distance from roads, and drainage density are used for landslide susceptibility mapping. Of 528 landslide locations, 70 % were used in landslide susceptibility mapping, and the remaining 30 % were used for validation of the maps. Using the above conditioning factors, landslide susceptibility was calculated using SMCE and PLR models, and the results were plotted in ILWIS-GIS. Finally, the two landslide susceptibility maps were validated using receiver operating characteristic curves and seed cell area index methods. The validation results showed that area under the curve for SMCE and PLR models is 76.16 and 80.98 %, respectively. The results obtained in this study also showed that the probabilistic likelihood ratio model performed slightly better than the spatial multi-criteria evaluation. These landslide susceptibility maps can be used for preliminary land use planning and hazard mitigation purpose.

Keyword: Landslide susceptibility; Spatial multi-criteria evaluation; Frequency ratio; GIS; Tehran metropolitan