A comparison of bivariate statistical model and deterministic model-based landslide susceptibility mapping methods: An example from North Turkey

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In Turkey, landslide is one of the most important natural hazards. Due to landslide occurrence, several landforms and man made structures are adversely affected, and may cause many injuries and loss of life. In this context, landslide susceptibility assessment is important task to determine susceptible areas to landslide occurrence. Especially, several dam reservoir areas in Turkey are threated by landslide phenomena. For this reason, in this study, a dam reservoir area located in North Turkey was selected, and investigated in point of landslide susceptibility assessment. A landslide susceptibility assessment for the Kurtun dam reservoir area (Gumushane, North Turkey) was carried out by geographical information systems (GIS)-based statistical and deterministic models. For this purpose, frequency ratio (FR) and stability index mapping (SINMAP) methodologies were applied. In this context, eight conditioning parameters such as altitude, lithology, slope gradient, slope aspect, distance to drainage, distance to lineament, stream power index (SPI) and topographical wetness index (TWI) were considered. After assessment of these parameters by FR and SINMAP methods in a GIS environment, two landslide susceptibility maps were obtained. Then, the maps obtained were analyzed for verification purpose. For this purpose, area under curvature (AUC) approach was used. At the end of this process, the AUC values of 0.73 and 0.70 were found for FR and SINMAP methods, respectively. Additionally, the SINMAP statistical results showed that the 93.8% of the observed landslides in the area falls into the lower and upper threshold showing the stability index classes. These values indicate that the accuracies of landslide susceptibility maps are acceptable, and the maps are feasible for further natural hazard management affairs in the area.