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Generalization of landslide susceptibility models in geologic-geomorphologic similar context

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The region north of Lisbon, which is known by several forms of slope instability, is the study area of this study. Two sample areas were chosen having similar geological and geomorphological conditions to assess susceptibility regarding shallow translational slides occurrence. Landslide susceptibility was assessed using a bivariate statistical method (Information Value Method) and the developed methodology focuses on the exportation of susceptibility scores obtained in a sample area (modelling area of Fanhões-Trancão) to other area (validation area of Lousa-Loures) having similar geological and geomorphological features. The rationale is that similar environments should have identical landslide susceptibility, i.e., the same causes are likely to generate the same effects. Thus, scores of Information Value obtained in the modelling area of Fanhões-Trancão (20 km2) are used to evaluate the susceptibility in the validation area of Lousa-Loures (17 km2).

The susceptibility scores were obtained for the modelling area by crossing the landslide layer (the dependent variable) with a set of 7 classified predisposing factors for slope instability (assumed as independent variables): slope, aspect, transverse slope profile, lithology, geomorphology, superficial deposits and land use. The same set of landslide predisposing factors was prepared for the validation area and we use the same criteria to define classes within each theme. Field work and aerial-photo interpretation were performed in the validation area and a landslide database was constructed and subsequently used to validate the landslide susceptibility model. In addition, new scores of Information Value were calculated for the validation area by crossing existing shallow translational slides with the predisposing factors of slope instability.

Validation of predictive models is carried out by comparison of success-rate and prediction-rate curves. Furthermore, sensitivity analysis of the variables is performed in order to understand which factors most contribute to discriminate unstable areas.

The obtained results show that it is possible to transfer, with an acceptable degree of fit, susceptibility scores from an area to other having similar geologic and geomorphologic characteristics. However, the availability of landslide inventories is crucial to validate the landslide susceptibility models.

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