



Landslide susceptibility assessment and validation in the framework of municipal planning. A case study in the area north of Lisbon (Portugal)

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A methodology for the evaluation of landslide susceptibility to be used in municipal planning is applied in Loures municipality (169.3 square kilometres) in the area north of Lisbon.

A landslide inventory was made for the whole area starting from the photo-interpretation of detailed digital orthophotomaps combined with the detailed representation of the terrain elevation. The landslide inventory is made up of 419 points, each point representing the centroid of one landslide, and is integrated into a GIS database. This landslide inventory includes only rotational and translational slides. Slope movements of fall and flow types also occur in the study area but they were not considered in this study.

A second landslide inventory made up of polygons representing the landslides identified by field work in two test sites within the municipality is used to evaluate the accuracy of the susceptibility model created by using the first landslide inventory.

For the landslide susceptibility assessment it is assumed that future landslides can be predicted by statistical relationships between past landslides and the spatial data set of the landslide predisposing factors (slope angle, slope aspect, slope curvature, reverse of the topographic wetness index, geology, soil types, and land use). Landslide susceptibility is evaluated using the Information Value Method applied over unique-condition terrain units in a raster basis. The landslide susceptibility map is prepared by sorting all pixels according to the pixel susceptibility value in descending order.

The robustness and accuracy of the landslide susceptibility model are evaluated by a success-rate curve and two prediction-rate curves. In order to plot the first prediction-rate curve, the landslide data set (centroid points) is divided in two parts in a random way. The first subset is used for obtaining a prediction image and the second subset is compared with the prediction results for validation. The second prediction-rate curve is plotted using the second landslide inventory made up of polygons representing some of the landslides which had been validated by field work. The obtained prediction-rate curves are used for the quantitative interpretation of the initial susceptibility map.

The obtained results allow to conclude that 70% of the future landslides will occur in the area classified as most susceptible to landslides corresponding to 20% of the area total. Thus, the inclusion of that area into the National Ecologic Reserve (REN) and the adoption of appropriate measures as regards prevention and protection against landslide risk (e.g. urban development prohibition) could permit the reduction of 70% of the damage caused by future landslides in the Loures municipality.