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QUANTITATIVE EVALUATION OF LANDSLIDE SUSCEPTIBILITY IN THE BÂRLAD BASIN

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Abstract

Landslides constitute an abrupt and short-lived geomorphic risk phenomena, which may cause significant damages to human made infrastructures or even claim human lives. The present study aims to assess landslide susceptibility, at regional scale, in the Bârlad Basin, situated in eastern Romania. The subject is approached by means of logistic regression analysis, which is one of the main methods employed for this purpose worldwide. A landslide inventory was carried out by digitizing the active landslide polygons from 1:25,000 topographic maps. As potential predictors, the study takes into account geomorphometrical parameters (slope, aspect, relative altitude, mass balance index, terrain curvatures), surface geology and land use. Random point samples were generated inside and outside landslide area and subsamples were extracted for independent validation of the model. The point samples were coded according to the presence (1) or absence (0) of landslides and they were used to extract the values of predictors from raster layers. A continuous landslide susceptibility model was achieved in GIS environment and classified into 5 susceptibility classes, using the natural breaks algorithm. The validation stage implied the analysis of confusion matrices, receiver operating characteristic (ROC) curve and the percentages of landslide area falling into the high and very high susceptibility classes. The results of logistic regression show that the main factors influencing landslide occurrences are slope, land use, surface geology and exposition classes. The validation parameters indicate a good statistical and spatial model. The overall accuracy, according to confusion matrices, is 77.27%, for the training sample and 78.75% for the validation sample, while the area under the ROC curve is 0.851. The percentage of landslide area falling into the high and very high susceptibility classes is 79%. About a quarter of the basin's surface falls into the high and very high landslide susceptibility classes. Compared to the actual extent of active landslides, according to the medium scale topographic maps, which is about 9% of the study region, it results that large areas are prone to landslide manifestation.

Key words: landslides, logistic regression, susceptibility mapping

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