Geophysical Research Abstracts, Vol. 7, 11076, 2005
SRef-ID: 1607-7962/gra/EGU05-A-11076

Assessing Slopes Vulnerability to Landslides in Tectonic Active Areas using The Bayesian and Dempster-Shafer Probability Models / Prahova Valley / Romania

Iuliana Armas, Ionut Sandric, Rasvan Damian

University of Bucharest, Faculty of Geography, Bd. N. Bălcescu 1, sector 1, cod 010041, Bucharest, Romania; e-mail: iuliaarmas@yahoo.com, sandricionut@yahoo.com

Slope dynamics is an essential element of the Subcarpathian landscape, having a great importance for man-environment interaction. The wide span of the Prahova Valley when emerging from the mountain zone, together with the terraced Subcarpathian slopes, are basically involved in the orientation and type of slope dynamics shaped by slope, fragmentation and exposure conditions. The great variety of landslide types along the Subcarpathion Prahova Valley mirrors the diversity of local conditions and the particular combination of factors that render the slopes unstable. The Bayesian and Dempster-Shafer Probability Models were used to establish the importance of environmental factors for landslide occurrence along the Subcarpathian Prahova Valley. The empirical information obtained by field and digital mapping from topographical maps and satellite images was transformed in a raster database with 10 m cell size. For selecting of the factors to be used in landslide susceptibility mapping, a test of conditional independence was performed in order to calculate the correlation between each information layer and the location of known landslides. For the Prahova Valley, the retained factors (slope gradient, faults density, drainage density, lithology and land use-land cover) were introduced into the Probability Models using Idrisi 32 software. The probability values obtained have a range value between 0 (minimal probability) and 1 (maximal probability for landslide occurrence). The degrees of vulnerability were established by three classes: 0-0.33, low vulnerability; 0.33-0.66, moderate vulnerability; and 0.66-1, high vulnerability. High vulnerability to landsliding processes appears from north to south almost as a continuous belt on hillslopes with marls overlying limestones, calcareous marls and the Gura Beliei marls. In these areas, vegetation has an important role in slope stability (looking at the difference between areas of

high favourability to landsliding and landslide areas proper). In the vicinity of built-in areas (Cornu and Breaza settlements), high vulnerability sectors, even though not very extended, are nevertheless a high risk for the local communities. The areas of moderate vulnerability appear almost as a continuous belt on the left hillslope of the Prahova River. A key role in maintaining these areas at moderate vulnerability have the forested grazes and the orchards. The development of the communication network and of the built-in areas would increase slope susceptibility to mass movements, also reactivating old landslides, all with major impact on the local communities.

The disadvantage of Bayesian Theory is that it assumes the lack of evidence for a hypothesis as evidence for the opposite hypothesis. It does not assume incomplete knowledge or ignorance. Ignorance is acknowledged by Dempster Probability Theory (also implemented in Idrisi 32 software). The basic assumptions of Dempster-Shafer Theory are that ignorance exists in the body of knowledge, and that belief for a hypothesis is not necessarily the complement of belief for its negation (Eastman 2003). Dempster-Shafer probability assignments distribute the remaining belief over the universal hypothesis, whereas classical probability distributions distribute it over the complement of the current hypothesis. Disadvantages are given by potential computational complexity problems and by the fact that it lacks a well-established decision theory (whereas Bayesian decision theory maximizing expected utility is almost universally accepted).