



## **Application of a logistic regression model for landslide susceptibility mapping in the Emilia-Romagna region**

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The aim of this work is to produce a landslide susceptibility map for the whole Apennines of the Emilia-Romagna region (Italy). This is a very large area (about 10500 Km<sup>2</sup>), characterized by a great amount of landslides (more than 70.000 landslides bodies have been recognized for a territorial mean landslide index of about 24%) but it is operationally difficult to assess the susceptibility by means of a physically based model due to the variety and structural complexity of the outcropping formations. Therefore a multivariate statistical approach such as the logistic regression was used to perform the susceptibility analysis. The territorial base unit was a 10x10m grid, obtained by the regional cartography at 1:5000 scale. The used data set was obtained by: 1) processing the landslide inventory map in order to extract the upstream point of each branch of the landslides since, because of the typical triggering mechanism, this point is the most representative of the instability conditions that leads to the landslide start; 2) sampling an adequate amount of points, suitably chosen to be probably "out of instable areas"; 3) joining each landslide and out-of-landslide point with a set of geo-morphological properties obtained from the original categorical maps (such as the land-use map, the geological map, etc.) and DEM processed maps (such as the topographic wetness index map, the aspect map, etc). Statistical analysis permitted to evaluate the effect of the single independents by their own and in conjunction (interference) with lithology. This study shows the results in terms of the influence of each property coupled with the lithology by a tri-variate Bayesian analysis. Based on these relations the best set of independent variables was selected through a significativity analysis. The susceptibility map obtained by the logistic regression model has been

validated with a subset of landslide points and, at the end, has been compared with other maps obtained by different statistical models.