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The Landslide Susceptibility Map of Sardinia- Italy: a new tool for risk management

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In this study the results of the application of a statistical-based landslide susceptibility model is discussed. Susceptibility is defined as the likelihood of a landslide occurring in an area depending on local terrain conditions, estimating “where” landslides are likely to occur. In this study the new Landslide Susceptibility Map of Sardinia (Italy) is presented. The chosen method is a direct, statistical, probabilistic method that uses the Certainty Factor (CF) approach to evaluate the contribution of the various parameters related to slope instability. The proposed methodological approach also provides for a specific differentiation related to the type of landslide, for which different instability indicators are considered depending on the different types of landslide. The calculated CF values are finally to be reclassified into six classes of potential instability or probability of a landslide phenomenon. The input data for the creation of the landslide susceptibility map are: a Digital Terrain Model with 10 m of spatial resolution, the Geological Map of Sardinia, and some Datasets of landslides. Based on these input data, the landslide susceptibility map considered the following factors: Lithology, slope, Concavity and convexity of the slopes and, Topographic Index. The lithology map was obtained with a reclassification operation of the geological map of Sardinia on a scale of 1: 25000. This cartography has a decidedly high detail that reflects, among other things, the geological complexity of the island (there are more than 60 thousand polygons) for which we proceeded to merge the cartographic formations following the lithological criteria. Following several analyzes and considerations, the final restitution took place by assigning each polygon to each of the following 21 classes. In order to have a control technique of the methodology adopted, not all the 3399 landslide areas entered as input into the model: a part was considered only as a last resort to verify if the classes of susceptibility to failure also included these perimeters. In particular, 75% of the points acted as training datasets (2549 observations) and the remaining 255 was used as a validation dataset (850 observations). In order to proceed with the validation of the product obtained, the classes of maximum calculated instability were compared with the dataset not used as input in the model, providing good and encouraging results: in the susceptibility classes 1 and 2 just over 20% of the pixels, while in the instability classes more than 77% of the data.

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