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The calibration in the landslides hazard previsional models

C. Glisci, G. Spilotro

Dept. of Structural and Geotechnical Engineering and of Engineering Geology University of Basilicata, Potenza, Italy

Many models for calculating the susceptibility and landslide hazard are based on algorithms that correlate with each other, simply or not, the various factors predisposing the landslides. To each of these factors (slope, litology, aspect, land use, depth of groundwater, etc.. . .) is usually associated a weight expressing the importance of the same factor on the potential landslide process. In some models, especially in the heuristic ones, the weight, once given in a subjective way, remains fixed and typical of the model: this makes the algorithms "static", not editable with the changing conditions of the territory and less precise on areas with different characteristics from the first implementation-model areas. That's why, an objective procedure must be introduced in methods for setting the weights: this procedure is better fitting the algorithm and the territory which it is applied on, and mostly, with its evolutionary history in terms of geomorphology.
The authors, starting from the observance of the previous landslides, have implemented a "scores and weights" heuristic model, valid for different geolitological situations, which uses map inventory of landslides to calibrate the process. Indeed, the weights to be included in the calculation are evalued on a statistical way starting from the distribution of landslides by considering the instability predisposing factors (geology, plasticity, slope, hydrogeological conditions, land use and complexity) reclassified on the basis of assigned scores. This allows you to analyze the evolution of morphological slopes by considering, across its weights, the predisposing instabilities causes hard to estimate, such as seismicity and rainfall.
So, a turning point for the application of the models is the definition of the "regional-

ized" matrix of the weights of the factors used by a calibration due on a map containing significant extension of the historic landslides.
The procedure, as mentioned, is decisive also by considering two issues intrinsically related to the calibration area, such as climate and seismicity.
In the case of the study area the authors are known landslides occurred in a period sufficiently long to report the previous historical landslides to climatic or seismic events with high return times, that is, in the case of seismic events, to a large field of variability of intensities and of epicentral distances. As regards the relation between landslides and seisms in particular, it should be pointed out how the relation of cause-effect is expressed with delay times that can be very long, that the morphological element also responds in relation to the orientation of the site with respect to the epicentre areas and finally, that the states of cyclic deformation with yielding of the soil can basically be accumulated. The delay of the seismic effect on the process of instability may finally be led back to indirect mechanisms like breaking surface or underground water courses.
Finally, the procedure can be considered more representative for the definition of susceptibility and landslide hazard in relation to more specific seismic zonation models (eg Keefer, 1984, 2002), but that have to use calibration samples necessarily limited to more recent events.

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