



Extension of spatial models to predict landslide hazard from one area to another

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Current extreme climate fluctuations have caused unexpected severe rainstorms in many parts of the world, and in turn they have triggered disastrous mass movements in the areas where occurrences of landslides were not recorded in recent history. Consider a problem of land-use planning for an area where no severe rainstorm has occurred to date but in which the geomorphologic and topographic features and characteristics are similar to the ones in the area hit by recent catastrophic mass movements. A landslide hazard map of the area that predicts the location of future landslide occurrences is required for the land-use planners. A similar problem also arises for earthquake-induced mass movements. For example the Chi-Chi earthquake in 1999 in Taiwan generated massive landslides near the epicenter of the earthquake. In order to predict the location of landslide hazardous areas due to the next possible earthquake in the area, several different neighboring areas should be considered as possible locations of the epicenter. As the location of the potential epicenter is tentatively moved to another location, the location of the future landslide hazardous areas will change.

We propose a new procedure to generate a hazard prediction map for such an area by: (i) establishing the quantitative correlations between the landslides and the geomorphologic/topographic settings of the area previously hit by tragic mass movements in recent times; (ii) extending the correlations to the area not yet hit by severe rainstorms to generate a landslide hazard prediction map; and (iii) providing a cross-validation procedure or "blind test" to evaluate the prediction results of such an extension.

For rain-induced landslides, the Fanhões-Trancão area, north of Lisbon in Portugal

and for studying earthquake induced landslides, the Chi-Chi earthquake area in Taiwan was used in the study. The causal factors that represent the geomorphologic/topographic settings of the landslides in the study area are: elevation, slope angle, aspect angle maps forming the digital elevation model (DEM), geology map, and land use map.

The approach proposes an analytical strategy for generating predictions based on spatial correlations established outside the study area.