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Building models for automatic landslide susceptibility analysis and mapping in ArcGIS.

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A series of models for the analysis of landslide susceptibility developed using ModelBuilder in ArcGIS are here presented. These models permit not only the calculation of landslide susceptibility levels of terrain units but also the final validation of the obtained landslide susceptibility maps and its availability to be downloaded as ArcGIS tools.

A first stage of the model building is the preparation of a landslide database of geographically referred data where attributes such as geomorphic parameters, typology, activity and degree of development are computed. From a digital elevation model (DEM) a number of morphological and morphometrical features are obtained from which digital terrain models (DTM) are derived. From the DTM landslide determinant factors of the instability processes as elevation, slope angle and attitude are computed. Another landslide determinant factor as the lithology is derived from direct digitizing of field geology maps or available geology maps with its corresponding attributes. Once all these landslide determinant factor are reclassified and transformed into a vectorial format all the combinations between classes of the considered factor are obtained using ArcGIS geoprocessing tools. In this stage the entry data are the DEM and the lithological units map.

In the second stage a landslide matrix is obtained which allows the determination of affected areas by types of landslides and combinations between classes of landslide determinant factors. As entry data requires a landslide inventory by landslide typology reclassified into two classes: with and without landslide. The result is a table with three columns: identifier of factors combination, area affected by landslide type in each combination and area unaffected by landslide type in each combination.

The last stage leads to obtain the landslide susceptibility matrix. It is obtained by com-

puting percentages of area affected by each type of landslide in each of the combination of determinant factors. For this purpose the model generates two new columns in the table showing the landslide matrix: one column shows the total area occupied by each factors combination and the other shows the area percentage of area affected by the given landslide type in that factors combination. Finally, the model offer a spatial projection of areas affected by landslide expressed as percentages representing the landslide susceptibility maps showing a zonation of land units similarly prone to generate landslides.

Also another model is developed for the validation of the obtained map using a separated landslide database not included in the processing of the landslide susceptibility map.

These models allow attaining an interesting automating of the process of generation of landslide susceptibility maps from updated landslide data bases or inventories after each triggering of new landslides associated to rainfall or earthquake.