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Landslide susceptibility mapping in a semi-arid mountain environment: example of the southern slopes of Sierra Nevada (Granada, Spain)

J. P. Jiménez-Perálvarez, C. Irigaray, R. El Hamdouni, P. Fernández, and J. Chacón
Department of Civil Engineering, University of Granada, Granada, Spain (jorgejp@ugr.es)

Landslide susceptibility in a Mediterranean mountain environment, southern slope of Sierra Nevada, is analyzed. In the study area of 460 km2, 252 landslides were inventoried affecting a 3,2% of the total area. These landslides comprising mainly slides and flows on phyllites, schist and marble units in the Inner Zone of the Betic Cordillera, with colluvial, alluvial or scree deposits, along slopes mainly oriented toward the Mediterranean Sea. The more relevant determining factors are elevation, slope angle, aspect and lithology. A homogeneous distribution of elevations, inclined to very inclined slopes and aspect mainly toward the South are observed. Triggering factors in this region includes mainly short term landslide generation during heavy rainfall, as also unevenly occurring earthquakes or long term activations by a widespread deforestation, land-use changes and river over excavation. Although the landslide susceptibility, assessed by a GIS matrix method, is predominantly low, a 15% of the study area shows moderate to very high susceptibility, just were very valuable infrastructures of the region are settled. A validation of the obtained map is made by using the degree of fit method, showing only a 6% of landslides in the lower susceptibility classes, in relation with observed slope failures along road cuts, until more than 80% of landslides appear in the higher susceptibility classes. The landslide inventory used for the validation, is based on movements generated in the 1996-1997 winter season, as a consequence of heavy rains in the study area in late 1996 and early 1997 (more than 700 mm between November and January)