A multidisciplinary approach for analysing landslide susceptibility in Abruzzo piedmont (Italy)

Marco Sciarra, Tullio Urbano, and Laura Coco
University "G. d'Annunzio", Department of Engineering and Geology, Chieti, Italy (lauracoco@libero.it)

Landslide susceptibility is the probability or likelihood that a landslide phenomenon happens in a specific area and in a not determined date, based on the correlation of controlling factors with distribution of past events. The present work presents a landslide susceptibility analysis assessment in the Feltrino Stream basin and minor surrounding coastal basins in south-eastern Abruzzo Region (Central Italy). The work was based on a multidisciplinary approach involving GIS (Geographic Information System) processing and geomorphological field survey.

The study area, as well as the whole Italian Adriatic hills, is characterized by moderate to high landslide susceptibility, because of the complex geological, geomorphological and climatic features. Geologically, the bedrock is mainly characterised by marine deposits composed by clay-sandstone-conglomerate lithology belonging to Upper Pliocene – Lower Pleistocene, and locally by marine to continental transitional deposits belonging to Middle Pleistocene. The bedrock is largely covered by near-surface continental deposits composed by clay-silt-sand-gravel lithology ranging in age from Upper Pleistocene to Holocene. From the geomorphological viewpoint, the area is involved in different landslides phenomena (rock falls, rotational, translational and complex landslides, earth flows) which affect ∼15% of the overall surface area.

The landslide susceptibility study was carried out through a geostatistical analysis of landslides driver factors. Air-photos analysis was conducted for larger landslides and hillslope areas. The identified landslides were corroborated through a detailed geomorphological field survey. The methodology involved three main steps. Firstly, the main driver factors, directly or indirectly linked to slope instability, were defined and mapped by DTM processing, air-photos analysis and detailed geomorphological field survey. Morphological, geological and geomorphological factors were considered: slope, topographic curvature, Morphometric Slope Index (MSI), drainage density, bedrock lithology, surficial deposits, deposit thickness and land use. Secondly, the landslide inventory was conducted for different type of instabilities: rock falls, landslides, earth flows. Finally, landslide susceptibility was modelled via GIS, based on geostatistical relationships between driver factors and instability landforms and calibrated through field surveys and recent landslide events (2011-2015). The outcomes of the entire analysis were the landslides susceptibility maps for different type of instabilities.

The results of this study outline slope and lithology as main predisposing factor of landslides, and the key role of surficial deposits in susceptibility assessment. This methodology has been tested and calibrated in the Abruzzo piedmont but it could be used to assess landslide susceptibility in other areas of the Adriatic hillslopes showing similar morphological, climatic and geomorphologic features and frequent landslides reactivation.