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GIS AND FIELD-BASED INTEGRATED METHODOLOGY FOR THE ANALYSIS OF LANDSLIDE SUSCEPTIBILITY IN THE ABRUZZO PIEDMONT-COASTAL HILLY AREA

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Landslide susceptibility is the probability or likelihood that a risk phenomenon happens in a specific area and in a not determined date, based on the correlation of the controlling factors with the distribution of past events.

This work presents the preliminary results of the geomorphological analysis for the landslide susceptibility assessment in the Feltrino Stream basin and minor surrounding coastal basins (south-eastern Abruzzo Region, Central Italy), based on geographic information system (GIS) processing and geomorphological field work.

This area, as well as the whole Adriatic hills, is characterized by moderate to high landslide susceptibility, because of the complex geological, geomorphological and climatic features.

Geologically, the study area is characterized by a clay-sandstone-conglomerate bedrock belonging to the Upper Pliocene – Lower Pleistocene marine deposits and locally to the Middle Pleistocene marine to continental transitional deposits. Furthermore, the bedrock is largely covered by near-surface clay-silt-sand-gravel continental deposits ranging in age from the Upper Pleistocene to the Holocene. Geomorphologically, the area is characterized by different landslides phenomena (rock falls, rotational, translational and complex landslides, earth flows) which affect ~15% of the overall surface area. This area is representative of the Adriatic piedmont and the results has been compared with other drainage basins of the Abruzzo piedmont hills.

The landslide susceptibility study was carried out through a geostatistical analysis of the landslides driving factors. Air-photos analysis was conducted for the larger landslides and hillslope areas. The identified landslide were corroborated through a detailed field geomorphological survey. The methodology involve three main steps: 1) definition and GIS mapping of morphology, geology and geomorphology factors, directly or indirectly linked to slope instability (slope, topographic curvature, drainage density, bedrock lithology, superficial deposits, deposit thickness and land use), by DTM processing, photogeological analysis and detailed geomorphological field survey; 2) landslide inventory for different type of instabilities (rock falls, landslides, earth flows); 3) GIS modelling of landslide susceptibility based on the statistical relationships between factors and instability process, calibrated through field surveys and recent landslide events (2011-2015); landslides susceptibility maps for different type of instabilities.

The preliminary results of this study outline slope and lithology as main predisposing factor, but the superficial deposits play a key role in the 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 reactivation of landslides.

