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Assessing the effects of land-use changes on landslide susceptibility: a case study in the upper Rivo basin (Molise, Italy)

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Landslides are the results of the complex spatial-temporal interaction of various predisposing and triggering factors, among which land-use is one of the most important. Especially in the short term perspective, whilst geological and geomorphological factors change in relatively long periods, land-use can evolve in few decades, which explains why variations in the land use may determine significant changes in the landslide frequency and distribution, even in a short time span.
In this study, have been analyzed land use changes occurred during the second part of the last century in order to get some hints about their likely influence on activity, dimensions and distribution of landslide-prone areas in small sized rural catchments. The selected study area is the upper sector of the Rivo basin, located in Molise region (Italy). The main goal of this study is to understand the effects of land use changes resulting from land management activities on landslide susceptibility. In the study area, major socio-economical transformations have been identified during the period 1954-2003, regarding both land management and land-use pattern.
To this aim, multi-temporal land-use and landslide inventory maps have been compiled for the considered period, by means of air photo interpretation. Then, using the obtained data sets, different landslide susceptibility maps have been developed in order to quantify the changes in land use and evaluate their effects on landslide proneness. The analysis of the most recent aerial photos reveals a decrease in the landslides occurrence, but, at the same time, an increase in the landslide extinction rate. The preliminary results show that the increase in forested areas, due to the corresponding decrease in pasture and bushes, determines changes in the stability of the slopes, and the development of smaller-size areas with high susceptibility to landslides.
These outcomes represent an important step towards the better understanding of the past trend of the study area in terms of land-use changes, providing a first assessment of the quality of the land-management actions in the analyzed period. Finally, the observation of the past changes can be a useful input for further studies in order to investigate the possible future development of land-use and likely consequences on slope stability in rural areas, and the related landslide susceptibility in a near-future perspective.