



Landslide susceptibility assessment and validation in the Oued Sra catchment, Central Rif, Morocco

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Landslides are an important source of risk within the central Rif, Morocco. Landslide activity is controlled by natural conditions such as topography, lithology and rainfall regime, and is promoted by unadjusted human actions, including the destruction of the original vegetation cover for farming and pasturage purposes. Landslide consequences are significant at the ecological, economical and social levels, namely through the destruction of farming lands and the widespread disruption of roads. The present study focuses in the oued Sra basin, which is located near the southern limit of the central Rif, 80 km north from Fes. The test site is 68 km² and the altitude ranges from 275 to 1020 m ASL. The morphology of the study area follows the general trends of the Rif chain, which presents a marked curvature towards the North. Regional lithology is characterized by the prevalence of marls and schists ranging in age from the lower cretaceous to the upper tortonian. The landside inventory for the study area was made following geomorphological field techniques and aerial photo interpretation, allowing the identification of 49 slope movements, including rockfalls, rotational slides, shallow translational slides and complex movements. The landslide map was integrated into a GIS which includes also a set of thematic layers assumed to be relevant landslide conditioning factors (e.g. slope angle, aspect, slope curvature, lithology and land use). 15 shallow translational slides and 14 rotational slides were selected for the present study. The landslide susceptibility was assessed for each landslide type, with the following assumptions: (i) the likelihood of future landslide occurrence can be computed through statistical relationships between known past slope movements and the spatial data sets of landslide predisposing factors; and (ii) the distinct spatial incidence of

different types of slope movements can be related to diverse threshold conditions concerning the preparatory factors. Landslide susceptibility was carried out applying the Joint Conditional Probability Function on unique condition sub-areas resulting from the overlay of the total set of thematic layers. The original landslide data base was randomly partitioned in two groups: (i) landslide training and (ii) landslide validation. The landslide susceptibility model was constructed using the landslide training group, and was validated by overlaying the second landslide set (validation group). The obtained prediction rate curves are also used to interpret and classify the susceptibility maps, providing an estimation of the spatial probability of occurrence of future landslide events.