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Soil erosion and desertification: a combined approach using RUSLE and ESAs models in the Tusciano basin (southern Italy).

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To identify the desertification prone areas the ESAs (Environmentally Sensitive Areas) model was developed in 1999 in the framework of MEDALUS (MEditerranean Desertification And Land USe) European project; this method has been used in many Mediterranean Countries (Greece, Portugal Italy, Egypt, etc.).
The identification of areas sensitive to desertification by using the ESAs model has been carried out in the Tusciano river basin (261 km2) located in southern Italy (Campania region). All data defining the four groups of parameters related to soil quality, climate quality, vegetation quality, and management quality have been introduced in a geographical database, and overlain using a GIS. Afterwards, a sensitivity analysis highlighted the different impact of the desertification parameters on the mountainous, hilly, and downstream areas of the catchment, strongly different in terms of morphological, geological, climatic and land-use features.
The assessment of desertification sensitivity shows a clear vulnerability status in the Tusciano river basin, where more than half of the area is susceptible to desertification risk.
The results of the ESAs model have been combined with those of the soil loss, achieved using the RUSLE method, based approximately on the same environmental factors; nevertheless, ESAs model considers a wider range of parameters, allowing to characterize in detail the catchment, from the climatic, geomorphological, vegetational and socio-economical point of view.
The comparison between the desertification prone areas map and the potential erosion map of the Tusciano river basin shows fundamental differences. The areas at higher erosion risk are located in the mountain and hilly sectors of the basin, while the downstream areas, at high desertification risk, are characterized by a low erosion risk. The hilly sector is especially prone to both risks, desertification and erosion.
Finally, a correlation analysis for the risk classes was developed using the GIS, which allows spatial statistics, and the comparison of the maps obtained by using the two methods was computed for each pixel (30 m x 30 m).
The result was a high correlation coefficient for the mountain sector (20 % of the total area) not at erosion and desertification risk and for the hilly sector at high erosion/desertification risk (10 % of the total area). In the downstream part of the catchment the correlation coefficient is very low for the high desertification risk (depending on the high human impact) and for the low erosion risk (depending on the low topographic slope).
The final map drawn up represents therefore the erosion/desertification risk and can be considered a synthesis risk map, showing the differences between areas characterized by high or low risk.