



Assessing the environmental sensitivity to land degradation. A validation of the MEDALUS method in SW Spain

J. F. Lavado Contador, S. Schnabel, A. Gómez Gutiérrez, and M. Pulido Fernández

Geoenvironmental Research Group. Dpto. de A. y CC. del Territorio. Universidad de Extremadura. Avda. de la Universidad s/n. 10071 Cáceres, Spain.(frlavado@unex.es)

In places where drought is one of the main climatic constraints, land degradation and desertification can take place if soils have suffered from a loss of biological production and resilience caused by both, natural and anthropogenic factors. It is important to identify such sensitive areas and to describe the driving forces leading to land degradation in order to properly understand the phenomenon.

The main goal of this work is to identify places with different sensitivity to land degradation in Extremadura (Spain) by means of a modeling approach developed in the European Commission funded MEDALUS project (Mediterranean Desertification Land Use) (Kosmas et al., 1999), which identifies such areas on the basis of an index (ESA index, Environmental Sensitive Area index) in which environmental quality (climate, vegetation, soil) as well as anthropogenic factors (management) are included.

A geographical information system approach was applied in this study. Sensitivity to degradation is analyzed by combining four quality indexes (soil, climate, vegetation and management). The first three giving information about environmental conditions and the later about man-related factors. Each of those quality indexes result from averaging several parameters involved in their calculation. The study area covered the whole region of the Extremadura (41.633 km²), located in the SW Iberian Peninsula. For the classification of soil cover classes, the CORINE land cover 2000 maps were used and reclassified according to the requirements. Some information was also gathered from the National Forest Inventory. A digital elevation model of 25 m pixel size was used to calculate terrain slope and aspect and the climate data were obtained from the Digital Climatic Atlas of the Iberian Peninsula.

Two maps of environmental sensitivity to land degradation with different legend resolution (4 and 8 classes) were established and tested by comparing the results obtained (classes of sensitivity) with an extensive number of 2,690 true field data gathered from sampling plots distributed all over the study region. Independent data for validation consisted of 9 degradation-related types of variables, and the method tested the performance of the whole model and the statistical separability among classes of sensitivity, as well as the capability of the variables in delimiting the classes of sensitivity. Results showed a good performance of the whole model to both, the maps of 4 and 8 classes. Separation among classes of sensitivity showed a slightly different behaviour of both maps, identifying transitional classes in the map of eight classes where classification could be improved in terms of the ranges of ESA index values assigned to the different classes. A significant statistical correlation was established between most of the variables used to validate the model and the different classes of sensitivity. Seven out of the nine variables used for map validation behave well in terms of the high values of correlation observed. Particularly the percentage of soil covered by vegetation, root content and observed sheet erosion features, proved to have the higher correlations with the sensitivity in both maps.

References:

Kosmas C, Ferrara A, Briassoulis H, Imeson A. (1999): Methodology for mapping Environmentally Sensitive Areas (ESAs) to Desertification. In: The Medalus project: Mediterranean desertification and land use. Manual on key indicators of desertification and mapping environmentally sensitive areas to desertification (Kosmas, C.; Kirkby, M.; Geeson, N. eds), European Union 18882, ISBN 92-828-6349-2, pp. 31-47.