



Soil erosion and overgrazing pressure as indicators for desertification vulnerability assessment in Sardinia (Italy): an integrated modelling approach

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Success in combating desertification requires an improved understanding of its causes, impacts and connections with climate, soil, water, land cover and socio-economic factors. At this regard, land degradation assessment and monitoring is a primary goal in decision support system for environmental protection. The Northern Mediterranean countries are still searching for a common methodology to identify and to use indicators enabling them to assess their vulnerability to desertification. In general, national maps of desertification risk based on different combinations of climate, soil and vegetation indices have been produced.

The D.P.S.I.R. (Driving forces, Pressures, State, Impacts, Responses) framework was often chosen to characterize desertification indicators, because it seemed to be the most comprehensive among those designed to describe interactions existing between natural and socio-economic systems.

As a model-based methodology appears suitable to monitor degradation processes and to plan mitigation actions, in our approach, we added in that framework some

land degradation models handling numerous indicators, producing some new ones and allowing a dynamic link between D.P.S.I.R. domains.

Assuming desertification as a product of predisposing, triggering and accelerating factors, developed methodology combines many desertification indicators of the Mediterranean area on a modelling basis, integrating them into a final one representing the general vulnerability of the area.

This scheme is applied for desertification risk evaluation in Sardinia Island (Italy), providing tools to analyse both the direction and the rate of land degradation, and its potential impacts. A large multi-thematic dataset has been acquired, these data have been processed and re-arranged in a G.I.S. environment in order to supply the inputs to the models.

The aim of this work is to present the rationale of the research, the methodological approach and an application experience in dealing with desertification indicators. In particular, this study highlights the importance of soil erosion and overgrazing pressure inside the integrated modelling framework. To achieve this aim, two models dealing with soil erosion and grazing sustainability, respectively, are used to derive trends of degradation, also according to several scenarios of land use and climate changes.

The output contains information on potential losses of superficial soil and on overgrazing pressure, and it will allow to enhance the knowledge of the responses to environmental changes in an area that represents a typical example of Mediterranean ecosystem.

As the input, the model results can be spatialized to provide “vulnerability maps” to erosion and overgrazing, respectively. Derived degradation indices could be operated, again in a GIS-oriented approach, with other ones, provided by different degradation process models as vegetation productivity, soil carbon content and groundwater salinization. That way it is possible to consider different phenomena of desertification, their magnitude and their development rate on a temporal basis.

The risk is considered to be the final product between vulnerability and value of “at risk” elements; it will then be possible, from environmental vulnerability assessment and jointly with socio-economic analysis of land use trends, to supply a useful instrument for predisposing prevention, adaptation or mitigation measures against land degradation.