

Sensitivity to desertification and drought in Europe – Fact sheet

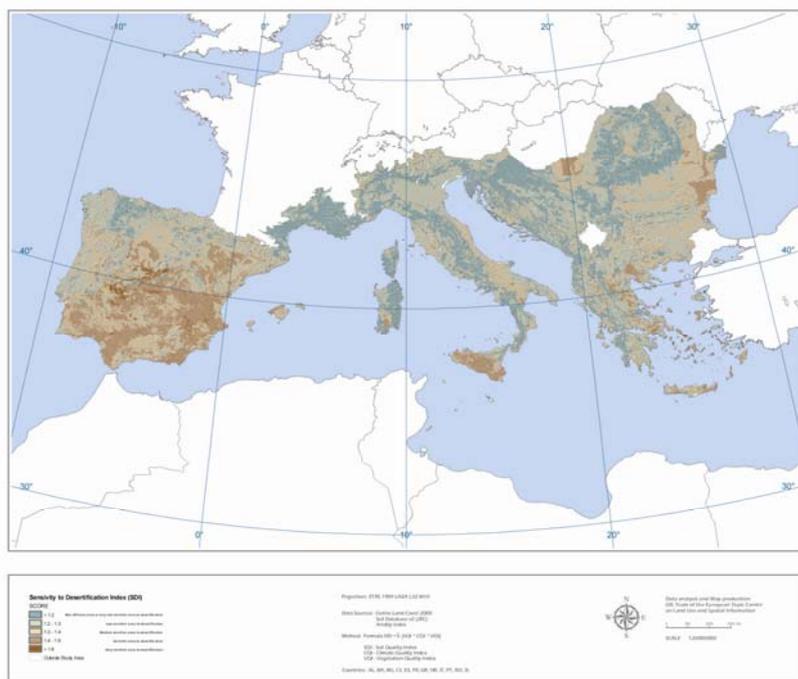
Key messages

Soil degradation is already intense in the dry lands of the Mediterranean and central-eastern Europe. Changes in climate leading to prolonged droughts and more irregular precipitation, in combination with the unsustainable use of water and unsustainable agricultural practices can lead, in extreme cases, to 'desertification'. Vegetation is destroyed by forest fires. Long, dry periods leave exposed soils vulnerable to erosion. Droughts are often broken by intense storms that can wash away large amounts of soil. This is facilitated by low vegetation cover and poor soil conditions (low infiltration rates).

According to the results of a recent assessment, based on a methodology developed within the Desertification Information System for the Mediterranean (DISMED), the sensitivity to desertification and drought is lower in Europe compared to neighbouring regions. However, in the areas of southern, central and eastern Europe for which data are available¹, 8 % of the territory, corresponding to about 14 million ha, currently shows very high and high sensitivity. The affected part increases to more than 40 million ha if moderate sensitivities are also taken into account (see Map).

The situation is most serious in southern Portugal, much of Spain, Sicily, south-eastern Greece, and the areas bordering the Black Sea in Bulgaria and Romania. Predicted changes in climate are expected to increase the vulnerability in these regions.

Presentation of the main indicator



Map Sensitivity to desertification and drought in Europe

Source: EEA (2008); DISMED project (2003)

Rationale

Desertification is an advanced stage of land degradation where the soil has lost part of its capability to support human communities and ecosystems. Desertification is defined by the United Nations Convention to Combat Desertification (UNCCD) as "land degradation in arid, semi-arid and sub-humid areas resulting from various factors, including climatic variations and human activities" (UNCCD, 1997).

A thorough assessment of desertification would require the analysis of several physical and socio-economical factors. Quantitative information on the causal factors is scarce and the use of models to assess the sensitivity to desertification and drought is the most common approach (EC, 2004).

¹ The assessment does not include Cyprus, Kosovo, Malta and Turkey.

The assessment presented here gives an overview of the sensitivity to desertification and drought in a vast European region comprising the Northern Mediterranean and central-eastern Europe. Its main objective is to facilitate the identification of hot-spots at the regional level for early warnings.

Methodology

This assessment uses a methodology developed in the DISMED project (Desertification Information System for the Mediterranean) for the assessment of sensitivities to desertification and drought covering countries in southern Europe and northern Africa (DISMED, 2003). The DISMED classification has been slightly modified to provide more detail in the European part of the region. The geographical coverage has been extended to central and eastern Europe as new data were made available.

The DISMED approach was derived from the MEDALUS methodology for Environmentally Sensitive Areas. Sensitivity to desertification and drought is defined by an index (SDI: Sensitivity to desertification index) obtained from the geometrical average of three indexes of the soil quality, climate and vegetation. The DISMED methodology only takes into account causal factors such as soil properties, climate and vegetation, while socio-economic indicators are not included as further work is still required to test and adapt methodologies implemented at regional or national level.

A more detailed discussion on the methodology is reported in a separate document (EEA, 2008; see also EC, 2004).

Main data sources

Land cover data: CLC2000; soil data: ESDB v2.0; climate data: FAOCLIM/2, 1961-1990 series

Geographical coverage

The map covers European countries included in Annex IV (Northern Mediterranean) and Annex V (Central and Eastern Europe) to the UNCCD for which basic data are available. One or more basic data layers were not available for Cyprus, Malta, Turkey and Kosovo. Except for France, the entire national territory has been considered in the assessment even if not all is included in a relevant climatic zone.

Uncertainties

The quality of the assessment is strongly dependent on the methodology used and the quality of data on causal factors. Firstly, for all the components of the assessment (climate, vegetation and soil) there is a scale factor that is very relevant when considering processes, such as erosion, with important local elements. The second issue is the simplification of the methodology for the vegetation layer since land cover data were used to parametrise the role of the vegetation in protecting the soil and its susceptibility to forest fires. Finally, the scale of the soil data is coarse given its relevance in the assessment.

In relation to the propagation of the errors in the calculation process, it is estimated that depending on the region, the error may range from 20 to 30 %.

For Greece, the assessment may underestimate the desertification risk in some areas, such as Attica and East Peloponnesus, if compared to a national assessment prepared by the National Committee for Combating Desertification (GNCCD) in 1999 (GNCCD, 2002).

Relevance

Soil plays an important role for the well functioning of human and ecological systems through services such as provision of water and nutrients for plant growth, regulation of the water cycle, storage of carbon, buffering capacity. Climate change and its effects (increases in temperature, changing precipitation patterns, floods, droughts) affect the quality of these soil services and therefore the ability of human and ecological systems to adapt to the changing climate (EEA, 2007; IPCC, 2007b).

Climatic conditions make the Mediterranean region one of the areas most severely affected by land degradation. Much of the region is semi-arid and subject to seasonal droughts, high rainfall variability, and sudden intense precipitations. In addition to climate, other physical factors, such as the steep slopes and the frequency of soil types susceptible to degradation, common in many areas, increase

the vulnerabilities.

The above, coupled with changes in land use, the cessation of soil erosion protection measures due to the abandonment of marginal land and increases in the frequency and extension of forest fires, has had a strong impact on soil resources since historical times. Individual storms in the region have been known to remove 100 tonnes from a hectare of land, and more frequently remove 20 to 40 tonnes. In the most extreme cases soil degradation has led to desertification (EEA, 2005a).

In the absence of the vegetation cover, destroyed by forest fires and deforestation, the soil becomes more vulnerable to erosion. Soil loss, in turn, reduces the regeneration potential of the ecosystems. The areas most sensitive to this threat are those with shallow soils, steep slopes and slow rates of recovery of the vegetative cover. For example, burned forests in dry areas with shallow soils are not easily regenerated and therefore they slowly disappear (WWF, 2007).

On the other hand, the climate is dry sub-humid in much of central and eastern Europe (such as in Bulgaria and Romania). Some areas, especially along the northwest coasts of the Black Sea, are even drier and are classified as semi-arid. The level of soil degradation is severe in most of the region, and very severe in some parts, for example along the Adriatic, where the soil cover has almost disappeared in some areas (UNCCD, 2008; EEA, 2007).

Past trends

Changes in data quality and methodology of the indicator make comparison with previous assessments difficult. Nevertheless, an increase in vulnerability has been observed in the past decades in affected regions (IPCC, 2007c; EEA, 2004ab; EEA, 2005b; national reports of affected country parties to the UNCCD²).

Predictions

In the sensitive areas, the vulnerabilities are likely to increase in the future if causal factors, such as climate, deteriorate.

According to current projections, in this century, summer precipitation is expected to decrease especially in southern Europe, with a parallel increase in frequency of extreme weather events such as summer droughts. In parallel, the modified patterns of precipitation and the expected increased incidence of forest fires, consequent to climate change, will probably induce greater risks of soil erosion, depending on the intensity of rain episodes and forest fire danger trends (IPCC, 2007a).

In the sensitive areas, climate change is likely to enlarge the regional differences in terms of quality and availability of natural resources and ecosystems and it is also likely to pose challenges to main economic sectors (such as agriculture and tourism) (IPCC, 2007c).

For all these factors, in the already affected areas, desertification is likely to become irreversible if the environment becomes drier, the pressure from human activities increases and the soil becomes further degraded through erosion and other forms of degradation.

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