Fact sheet - Desertification

WHAT IS IT?

Desertification is a very broad term, which has been defined in many different ways. One definition is “land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities”

However, a broader definition emphasizes “any progressive and unsustainable reduction in the ecosystem services provided by the soil.”, so does not just incorporated drylands. The three most important processes for induced desertification are generally considered to be soil erosion, loss of soil fertility and long-term loss of natural or desirable vegetation.

WHERE DOES IT OCCUR?

Although there are no integrated maps for desertification in Europe, sensitivity to desertification has been recently mapped, based on soil quality, climate and vegetation parameters. The map indicates that 8% of the territory in southern, central and eastern Europe shows very high or high sensitivity to desertification, corresponding to about 14 million ha, and more than 40 million ha if moderate.
As this diagram shows, the starting point for influencing desertification processes is socio-economic and biophysical drivers. Generally speaking, desertification is caused by an interplay of different causes that operate at different organizational levels and different spatial and temporal scales. Thus, to understand desertification, and to find ways to combat it, a good understanding of local biophysical, socio-economic and political conditions is necessary.

**Biophysical drivers**
Since the concept of desertification was identified for the Sahel in the 1980’s, a strong link has always been made between climate and loss of soil quality. Climate change is likely to drive the boundaries of the arid, semi-arid and sub-humid areas in the Euro-Mediterranean region northwards, thereby expanding the area that is potentially susceptible to desertification. Wild fire provides another form of direct influence on the soil and vegetation system and wild fires in dry land areas reduce soil quality and enhance the threat to desertification. Fire occurs naturally, and the risk of fire increases strongly with temperature.

**Socio-economic drivers**
Pressures on the soil and vegetation system are created through inappropriate land use, poor management or overuse of the available resource. One of the most widespread examples of over-exploitation is through increasing grazing density of sheep, goats or cattle in rangeland areas. Population is also a highly significant driver of desertification, although the impacts vary widely according to local conditions. Political context and policies also influence land use and management, with either stimulation or constraint. Policies influence prices, but also land use and management.

**HOW CAN IT BE MEASURED OR ASSESSED?**

The table below lists key and/or proxy indicators for desertification identified by RECARE and ENVASSO projects.

<table>
<thead>
<tr>
<th>Soil threat</th>
<th>RECARE indicators</th>
<th>ENVASSO indicators</th>
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</thead>
<tbody>
<tr>
<td>Desertification</td>
<td>TOP3 indicators by ENVASSO</td>
<td>• land area at risk of desertification (ha)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• land area burnt by forest fires (ha)</td>
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<tr>
<td></td>
<td></td>
<td>• soil organic carbon content in desertified areas (% g kg⁻¹)</td>
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</tbody>
</table>
The table below lists key indicators, purpose of the indicator, methods and corresponding references for desertification.

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Purpose</th>
<th>Methods</th>
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<tbody>
<tr>
<td>land area at risk of desertification</td>
<td>• determine indices of soil quality, climate quality, vegetation quality and management quality</td>
<td>High resolution field survey maps; ARC GIS; MEDALUS model 4, 5, 6</td>
</tr>
<tr>
<td>land area burnt by forest fires</td>
<td>• assess land damage due to forest fire</td>
<td>European Forest Fire Information System (EFFIS) 12 ‘rapid damage assessment’ tool for forest fires 4</td>
</tr>
<tr>
<td>soil organic carbon content in desertified areas</td>
<td>• measure SOC content</td>
<td>Dry or wet combustions 4, 7</td>
</tr>
<tr>
<td></td>
<td>• assess land damage due to forest fire</td>
<td>European Forest Fire Information System (EFFIS) 12 ‘rapid damage assessment’ tool for forest fires 4</td>
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**HOW CAN IT BE PREVENTED OR REMEDIATED?**

There are a range of different measures that can be used to prevent and remediate desertification, but increasingly an integrated approach is viewed as being the most effective.

<table>
<thead>
<tr>
<th>Agronomic measures</th>
<th>Vegetative measures</th>
<th>Structural measures</th>
<th>Management measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agroforestry</td>
<td>Growing vegetation</td>
<td>Supplemental irrigation</td>
<td>Controlling grazing at an optimal rate</td>
</tr>
<tr>
<td>Planted fallows</td>
<td>Leaving crop residues and mulching</td>
<td>Enclosing pasture</td>
<td>Commercialisation of desertification control</td>
</tr>
</tbody>
</table>

- Re-seeding with Lyme grass, Iceland (Photo: Jane Mills)
- Straw mulching, Spain (Photo: Artemi Cerdà)
- Restoration with birch and lupin, Iceland (Photo: Jane Mills)
**HOW DOES IT INTERACT WITH OTHER SOIL THREATS?**

All soil threats could contribute to an increase in desertification. For example, soil compaction and disruption of soil surfaces (cyanobacteria, lichens, and mosses) caused by livestock, people, and off-road vehicles results in increased vulnerability to desertification. Alternatively, desertification also affects other soil threats. A reduction in desertification will improve biomass production and thereby soil organic matter and nutrient cycles. The increase in vegetative cover and plant roots will also reduce the risk of wind and water erosion.

**HOW DOES IT AFFECT SOIL FUNCTIONS?**

Clearly, desertification will affect all soil functions, with greatest impact being on biomass and food production, biological habitat, and environmental services. When soils are degraded, they lose their capacity to capture and store water, nutrients and carbon and to support microbiological processes. Considering the slow natural formation of soils, the loss of soil functions due to desertification is often irreversible.

<table>
<thead>
<tr>
<th>Soil Threat</th>
<th>Biomass production</th>
<th>Storing/filtering/transforming</th>
<th>Gene pool (diversity)</th>
<th>Physical basis</th>
<th>Raw materials</th>
<th>Cultural heritage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desertification</td>
<td><img src="image" alt="Large effect" /></td>
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Soil threats impact on soil functions, categorized in classes low, medium and large reflected by the size of the dots. Red means negative effect, green positive.

**REFERENCES**


**MORE INFORMATION**

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