LAND AFFECTED BY DESERTIFICATION		
Land	**Desertification**	

The methodology for this indicator is currently under revision in the context of the Land Degradation Assessment in Drylands (LADA) project implemented by the Food and Agricultural Organization (FAO) and partners. Consequently, the information contained in the present version mainly reflects the status of the methodology in the previous two editions of the CSD indicators.

1. INDICATOR

(a) Name: Land Affected by Desertification.

(b) Brief Definition: This is a measure of the amount of land affected by desertification and its proportion of national territory.

(c) Unit of Measurement: Area (Km^2) and % of land area affected.

(d) Placement in the CSD Indicator Set: Land/Desertification.

2. POLICY RELEVANCE

(a) Purpose: The indicator describes the extent and severity of desertification at the national level. It should be: (i) a measure of the state of the problem at any one time; (ii) an indication of the trend in the severity of the problem over time and success of response mechanisms; and (iii) a means of comparing the severity of the problem from one country to another.

(b) Relevance to Sustainable/Unsustainable Development (theme/sub-theme): The indicator should be a mechanism for determining the importance of this issue at the national level. Trend data over time can indicate success of response mechanisms. For dryland areas, desertification is a central problem in sustainable development. While many dryland ecosystems have generally low levels of absolute productivity, maintenance of that productivity is critical to the present and future livelihood of many hundreds of millions of people. Combating desertification is the core of sustainable development for large areas of the world. Severe degradation is a major impedent to sustainable development; moderate or slight degradation is also a significant barrier.

(c) International Conventions and Agreements: The two most significant agreements are: Agenda 21 of the 1992 UN Conference on Environment and Development; and the UN Convention to Combat Desertification, 1994. In addition, the Desertification Convention texts (INCD-10/ New York) spell out a sound methodology for developing indicators. No definitive set of indicators has been agreed upon within the context of the desertification Convention.

(d) International Targets/Recommended Standards: No specific targets have been defined, however, the goal should be to reduce the area and percentage of land affected by desertification, and/or reduce the severity of desertification.

(e) Linkages to Other Indicators: This state and trends indicator needs to be considered in conjunction with related driving force and response indicators, integrating physical and socio-economic processes, for meaningful interpretation and policy relevance at the national level. It is closely linked with indicators concerning land use, such as deforestation, use of marginal land, protected area as a percent of total land area, and population living below the poverty line.

3. METHODOLOGICAL DESCRIPTION

(a) Underlying Definitions and Concepts: For the purposes of this indicator, desertification is defined as land degradation in arid, semi-arid, and dry sub-humid areas resulting from various factors, including climatic variations and human activities (UN Convention to Combat Desertification, 1994). *Land degradation* means reduction or loss, in arid, semi-arid and dry sub-humid areas of the biological or economic productivity and complexity of rainfed cropland, irrigated cropland, or range, pasture, forest and woodlands resulting from land uses or from a process or combination of processes, including processes arising from human activities and habitation patterns, such as: (i) soil erosion caused by wind and/or water; (ii) deterioration of the physical, chemical and biological or economic properties of soil; and, (iii) long-term loss of natural vegetation. Land degradation, therefore, includes processes which lead to surface salt accumulation and waterlogging associated with salt-affected areas.
Arid, semi-arid, and dry sub-humid areas means areas, other than polar and sub-polar regions, in which the ratio of annual precipitation to potential evapotranspiration falls within the range from 0.05 to 0.65 (UN Convention to Combat Desertification, 1994).

(b) Measurement Methods: Measurement for this indicator initially requires an assessment of the extent of land degradation throughout the arid, semi-arid, and dry sub-humid zones of the nation. This is best done by a combination of previous assessments represented in map form, carried out by the United Nations Environment Programme (UNEP) with the United Nations Office to Combat Desertification and Drought (UNSO), and the Food and Agricultural Organization (FAO); and updates from a combination of remote sensing and local knowledge.
The creation of an index that combines degrees of severity will require the following measures:

(i) Area subjected to severe land degradation xKm^2 (severe here includes both the severe and very severe categories of UNEP.
(ii) Area subjected to moderate land degradation yKm^2.
(iii) Area subjected to slight land degradation = zKm^2.
(iv) National area (excluding surface water bodies) nKm^2.
(v) National area of drylands (vulnerable to desertification, assuming that all drylands are potentially vulnerable to desertification. Hyper-arid lands are excluded), consisting of arid, semi-arid, and dry subhumid land = dKm^2.

From the above measurements, the following sets of numbers can be derived:

Indicator computations:

a. National area affected by desertification
$= x + y + z Km^2$

b. Percent of national area affected by desertification
$= \frac{x + y + z}{n} X 100$

c. Percentages of national area affected by severe, moderate and slight desertification respectively can be calculated in the same way.

d. Percent of national drylands affected by desertification
$= \frac{x + y + z}{d} X 100$

e. National area not affected by desertification
$= n - (x + y + z) Km^2$

f. National dryland area not affected by desertification
$= d - (x + y + z) Km^2$

Trends can be determined by comparing results computed for a sequence of years (for example, every five years).

A useful extension of the indicator would be for countries to report dryland areas (d) as a percentage of all agriculturally productive areas (e=n-hyper arid land) to give an indication of the overall vulnerability of the country to desertification.

While it is based on a combination of analytical and subjective assessment, if these are done systematically on an annual basis, a sound database can be developed. Given the importance of determining the extent and severity of desertification to the index, it may be that a periodic special survey using remote sensing and ground assessment may be important, though this may only be technically feasible for some countries.

An important issue in the basis measurement of degradation is the factors that are measured to assess the degree of local degradation. As Bie (1990) clearly points out, the two factors of *productivity* and *resilience* are the most important elements in assessing the existence and the extent of dryland degradation. Accurate measurement of land affected by desertification is a problem about which there is not yet complete consensus and further work needs to be done to agree on a comparable methodology for the various countries affected by desertification (UNEP, Atlas of Desertification; UNEP/ISRIC/ISS/FAO, Global Assessment of the Status of Human-induced Soil Degradation (GLASOD)).

(c) Limitations of the Indicator: There are a number of issues to be resolved before this indicator can be entirely satisfactory. The ecosystems addressed in this definition undergo cyclic episodes of more or less rainfall, as well as long-term degradation in many cases. Separating short-term fluctuations from longer-term trends is important, though scientists often find this difficult to determine, except for longer time periods. Also, the United Nations Environment Programme (UNEP) has generally defined desertification (degradation) in categories (severe, moderate, slight), and a national indicator needs to include an assessment of this kind. It has been a practice to include problems of waterlogging and salinization as part of desertification, if they occur within the ecosystems as defined above. In this case, the area affected by these problems should also be included in the desertified area.

Because of these issues, the indicator may well benefit from further refinement and definition. The concepts of land degradation in arid, semi-arid, and dry sub-humid areas are well defined and described in a number of UNSO, UNEP, and other UN

publications, as well as in the academic literature. The translation of these concepts into agreed national level indicators has not been so well articulated. (Mabbutt, J.A. 1986; Maimuet 1991).

(d) Status of the Methodology: The methodology is currently under revision.

(e) Alternative Definitions/Indicators: Not available.

4. ASSESSMENT OF DATA

(a) Data Needed to Complete the Indicator: The data needed to compile the indicator are the extent and severity of dryland degradation in the country concerned, the dryland area, and national area (excluding surface water bodies). The degree of accuracy and reliability of both spatial and statistical data varies considerably and are often poorly documented and/or out of date. For some countries, the data do not yet exist. Benchmark data on desertification is critical to measuring progress.

(b) National and International Data Availability and Sources:
The webpage of the LADA project contains a number of country case studies and a wealth of related information. Information on drylands and national areas can also be obtained from national statistical institutions and publications, and can also be found in standard World Resources Institute (WRI), UN and World Bank publications. Some data on extent and degree of land degradation are available at the country level in national institutions or from non-government organizations, in donor countries, and in publications of the United Nations Development Programme (UNDP)/UNSO, UNEP, FAO and other international institutions.

5. AGENCIES INVOLVED IN THE DEVELOPMENT OF THE INDICATOR

(a) Lead Agency: The lead agency will be the Food and Agricultural Organization (FAO).

(b) Other Contributing Organizations: Other contributing organizations include: UNDP Dryland Development Centre, UNEP, Consultative Group on International Agricultural Research (CGIAR), International Fund for Agricultural Development (IFAD), World Soil Information (ISRIC).

6. REFERENCES

(a) Readings:
Bie, Stein W. 1990. *Dryland Degradation Measurement Techniques*, World Bank, Environment Work Paper No. 26, 42 p.
Dregre, H., Kassas M. and Rozanov, B. 1991 A new assessment of the world status of desertification. *Desertification Control Bulletin* 20. p. 6-18.
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UNEP/ISRIC. 1988. Guidelines for General Assessment of the Status of Human-induced Soil Degradation (GLASOD).
UNEP/ISRIC. 1990. World Map of the Status of Human-induced Soil Degradation: *An Explanatory Note (*GLASOD*).*
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UNEP/ISRIC/ISSS/FAO. 1995. Global and National Soils and Terrain Digital Databases (SOTER), Procedures Manual (revised edition). ISBN 90-6672-059-X.
UNEP/Netherlands National Institute of Public Health and Environment (RIVM). 1994. An Overview of Environmental Indicators: State of the art and perspective. UNEP/EATR.94-01:RIVM/402001001. Environmental Assessment Sub-Programme, UNEP, Nairobi. ISBN 92-807-1427-9.
WB/FAO/UNDP/UNEP. In print. *Land Quality Indicators.* World Bank Discussion Papers.

(b) Internet sites:

Food and Agricultural Organization: Land Degradation Assessment in Drylands
http://lada.virtualcentre.org/pagedisplay/display.asp
FAO Webpage on Desertification:
http://www.fao.org/desertification/default.asp?lang=en
United Nations Convention to Combat Desertification. http://www.unccd.ch
United Nations Development Programme's Dryland Development Centre:
http://www.undp.org/drylands/
World Soil Information (ISRIC): http://www.isric.org/