

# Deserts and drylands

**D**ESERTS AND DRYLANDS are the largely unfenced, unforested parts of the planet, where low and erratic rainfall makes the land unsuitable for cultivation. The land is used for grazing domesticated animals, set aside for wild animals or simply set aside. Human population density is generally low, except around water sources or the focus of economic activity such as minerals. But sophisticated nomadic and pastoral cultures often thrive in the marginal land, some of which is suitable for cultivation if irrigated, making it a potentially valuable resource where water is available.

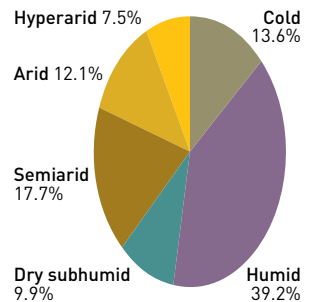
Desert margins, generally called drylands, have great biological value. They are the original homes of many of the world's most important food grains – wheat, barley, millet and sorghum – and botanical medicines, resins and oils, as well as many animal and bird species. Dryland soils are unusually vulnerable to degradation. New soil forms only very slowly in these arid environments, and salts tend to build up owing to infrequent rains. The dry sparsely covered topsoil is easy victim to erosion by wind or by the rains when they do come. Regions susceptible to such erosion include the desert margins of North and Southern Africa, the Great Plains and pampas of the Americas, the steppes of Southeast Europe and Asia, the Australian “outback” and the Mediterranean margins.

Degradation, often known as “desertification”, may arise from human misuse of the land or climatic change, and may or may not be reversible. Either way it can force people to leave the land. A fifth of the world's drylands, or around a billion hectares, are thought to be affected by human-induced soil erosion, and an estimated 250 million people, including many of the poorest, most marginalized and politically weak citizens<sup>1</sup>, are directly affected by land degradation in arid areas. International action to improve management of the world's drylands is concentrated on the 1996 United Nations Convention to Combat Desertification, but it has so far failed to attract substantial funding from donor nations.

There is continuing uncertainty about the processes and definitions of desertification<sup>2</sup>. The term came into wide use in the 1970s with images of the Sahel, a band of semiarid land on the southern borders of the Sahara desert, “marching” south. In places it advanced by up to 100 kilometers between 1950 and 1975, a process seen at the time as an irreversible human-induced phenomenon. But satellite images have now revealed the Saharan advance to have been largely a consequence of short-term climatic change. The desert border has advanced and retreated with the rains several times since 1980<sup>3</sup>.

Some historical incidents of desertification, for instance the abandonment of farming in the Negev desert, are now also held to have arisen as much from changing climate as poor land management<sup>4</sup>. In many cases, however, the two go together, with intensified landuse leaving vegetation and soils vulnerable to degradation during drought. The “dust bowl” in the American Midwest in the 1930s had such multiple causes.

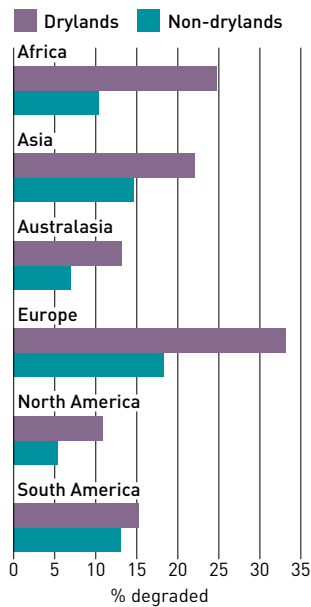
## GLOBAL LAND AREA



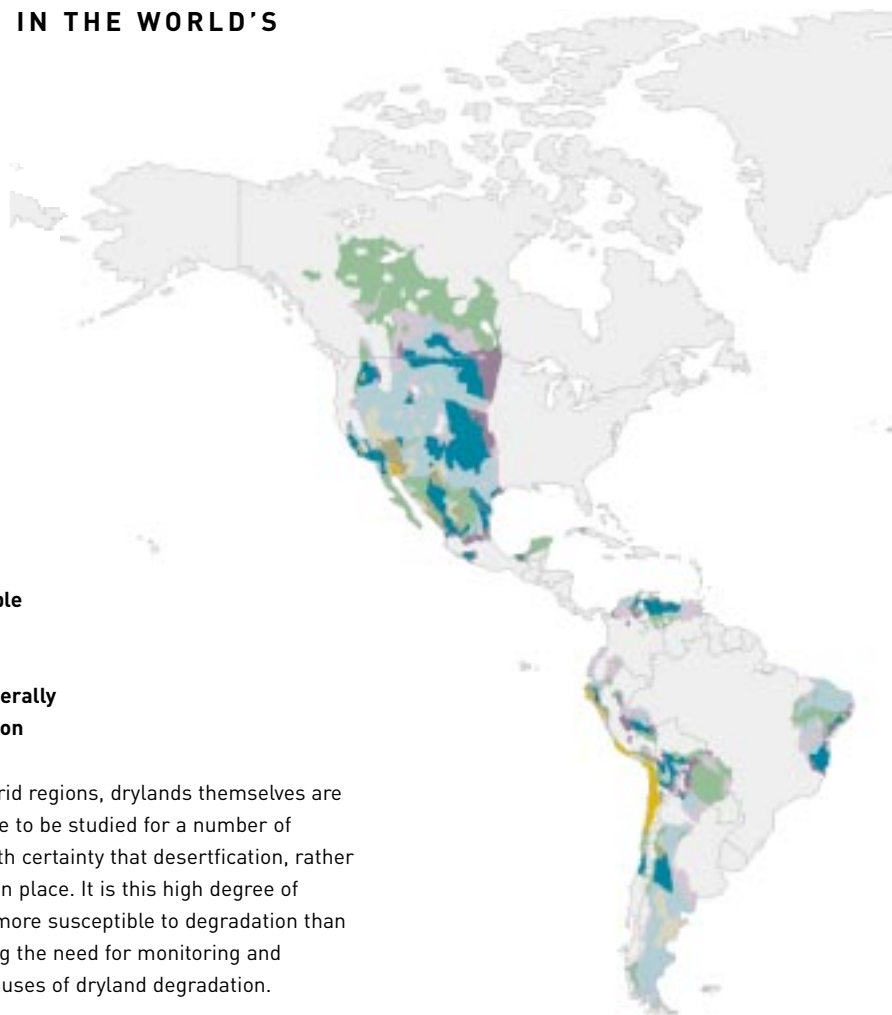
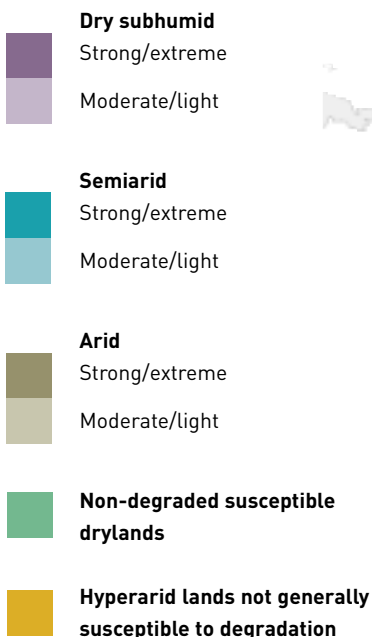
Total land area: 13 049 million hectares

Source: UNEP.

### GLOBAL SOIL DEGRADATION, 1990s



### SOIL DEGRADATION IN THE WORLD'S DRYLANDS, 1990s



Owing to the erratic rainfall in arid regions, drylands themselves are difficult to define, and areas have to be studied for a number of decades before it can be said with certainty that desertification, rather than natural variability, has taken place. It is this high degree of variability that makes drylands more susceptible to degradation than other regions, and more pressing the need for monitoring and understanding the underlying causes of dryland degradation.

### HUMAN-INDUCED SALINIZATION IN SUSCEPTIBLE DRYLANDS, 1990s

Region	Million hectares
North America	1.8
South America	1.0
Europe	3.0
Africa	5.8
Asia	35.4
Australasia	0.9
<b>Total</b>	<b>47.9</b>

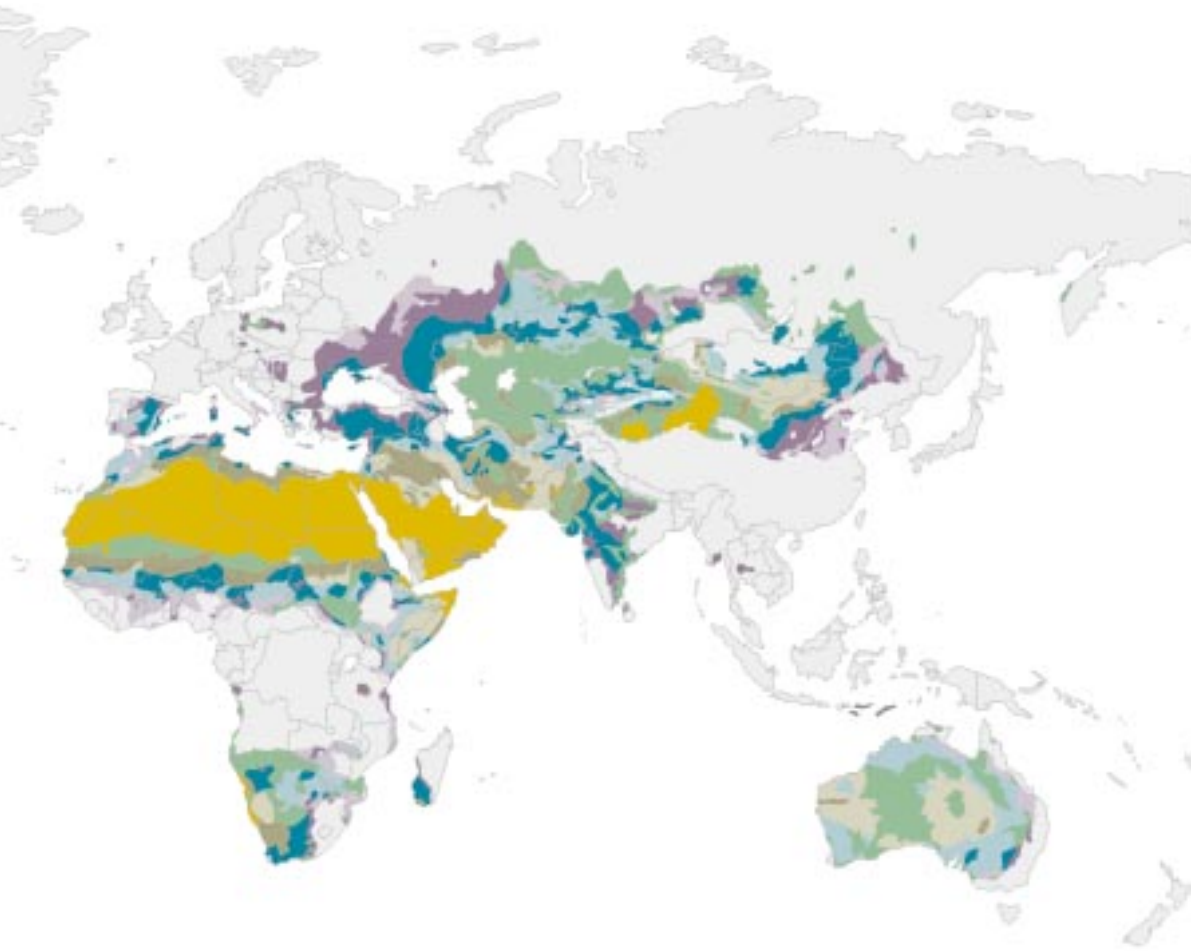
Source: UNEP.

### SOIL DEGRADATION BY REGION IN SUSCEPTIBLE DRYLANDS, 1990s

Million hectares

Region	Water erosion	Wind erosion	Chemical deterioration	Physical deterioration	Total
North America	38.4	37.8	2.2	1.0	79.4
South America	34.7	26.9	17.0	0.4	79.0
Europe	48.1	38.6	4.1	8.6	99.4
Africa	119.1	159.9	26.5	13.9	319.4
Asia	157.5	153.2	50.2	9.6	370.5
Australasia	69.6	16.0	0.6	1.2	87.4
<b>Total</b>	<b>467.4</b>	<b>432.4</b>	<b>100.7</b>	<b>34.7</b>	<b>1 035.2</b>

Source: UNEP.



Source: UNEP.

**COUNTRIES WITH LARGE AREAS OF DRYLANDS**

	Population growth rate 1995-2000	Population density per km <sup>2</sup> 1995	GDP per capita \$US 1995
Afghanistan	5.3	30.9	id
Albania	0.6	125.6	648
Algeria	2.3	11.7	1 474
Angola	3.3	8.9	344
Argentina	1.3	12.6	8 084
Armenia	0.2	126.7	783
Australia	1.1	2.4	19 522
Azerbaijan	0.8	87.8	461
Botswana	2.2	2.6	2 978
Bulgaria	-0.5	79.3	1 453
Burkina Faso	2.8	37.7	222
Chad	2.8	5.1	180
China	0.9	131.0	572
Egypt	1.9	63.2	763
El Salvador	2.2	278.4	1 673
Eritrea	3.7	35.0	id
Ethiopia	3.2	50.0	94
Greece	0.3	81.1	8 662
India	1.6	314.7	349
Iran	2.2	41.1	1 756
Iraq	2.8	46.8	2 755
Israel	1.9	273.0	16 645
Jordan	3.3	61.2	1 187
Kazakhstan	0.1	6.4	1 273
Kenya	2.2	49.7	335
Kuwait	3.0	86.8	15 760
Kyrgyzstan	0.4	24.8	685
Lebanon	1.8	294.1	3 703
Libya	3.3	3.1	4 984
Macedonia	0.7	85.1	937
Madagascar	3.1	25.4	215
Malawi	2.5	118.3	151
Mali	3.0	8.8	225
Mauritania	2.5	2.2	470
Mexico	1.6	49.1	2 743
Moldova	0.1	134.4	793
Mongolia	2.1	1.5	349
Morocco	1.8	60.6	1 222
Mozambique	2.5	20.4	85
Namibia	2.4	1.9	1 974
Niger	3.3	7.2	203
Nigeria	2.8	122.7	362
Oman	4.2	10.2	5 483
Pakistan	2.7	182.3	445
Romania	-0.2	99.1	1 563
Russia	-0.3	8.6	2 333
Saudi Arabia	3.4	8.3	6 875
Somalia	3.9	14.7	106*
South Africa	2.2	34.0	3 281
Spain	0.1	79.3	14 097
Sudan	2.2	11.8	239
Syria	2.5	79.8	1 182
Turkmenistan	1.9	8.4	961
Turkey	1.6	80.5	2 709
Tajikistan	1.9	42.8	343
Yemen	3.7	27.5	319
UAE	2.0	22.8	17 696
Ukraine	-0.4	88.7	1 548
USA	0.8	27.5	26 026
Uzbekistan	1.9	53.7	947
Venezuela	2.0	24.8	3 434
Zimbabwe	2.1	29.1	583
<b>World</b>	<b>1.4</b>	<b>43.6</b>	<b>4 896</b>

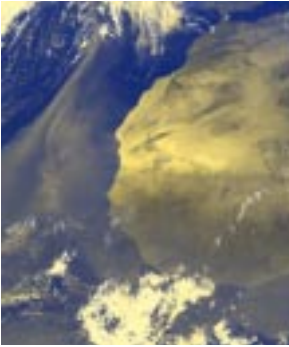
\*1990

Source: WRI.

**SOIL DEGRADATION BY DEGREE IN SUSCEPTIBLE DRYLANDS, 1990s**  
Million hectares

	Water erosion	Wind erosion	Chemical deterioration	Physical deterioration	Total
Light	175.1	197.2	44.3	10.8	427.3
Moderate	208.5	215.4	31.4	15.0	470.3
Strong	79.0	18.0	24.2	8.9	130.1
Extreme	4.8	1.8	0.8	0.0	7.5
<b>Total</b>	<b>467.4</b>	<b>432.4</b>	<b>100.7</b>	<b>34.7</b>	<b>1 035.2</b>

Source: UNEP.



**The movement of “lost” soils can be dramatic, as seen in this satellite image of a dustcloud off the west coast of Africa, taken in February 2000. Up to 100 million tons of dust cross the Atlantic annually from West Africa to the Caribbean<sup>11</sup>. In 1998, a dust storm originating in China could be tracked as it crossed the United States<sup>12</sup>.**

**By some estimates, the world loses 24 billion tons of topsoil each year<sup>13</sup>, with South Africa alone estimated to lose 300–400 million tons annually. The decline in soil and vegetation reduces the ability of the land to hold water after infrequent rains, accelerating desertification and flooding, since surface runoff increases.**

Photo: NOAA/Operational Significant Event Imagery.

In most cases “desertification” does not involve advancing desert sands, but rather a progressive decline in the productivity of the land. The largest single cause worldwide is the overgrazing of pastures<sup>5</sup>. Plants in semiarid regions are adapted to being eaten by large grazing animals at low densities, with regular nomadic stock movements maintaining this vegetation. But the trend towards sedentarization, the use of fences to separate domesticated animals from wildlife and the concentration of animals around water boreholes have often caused loss of vegetation followed by soil erosion.

Many governments exacerbate these problems by trying to halt nomadism, particularly across national borders. They also try to concentrate wildlife within national parks, such as Amboseli in Kenya, which is being overgrazed by elephants and other large herbivores<sup>6</sup>. Other threats to natural vegetation and soils include deforestation and the collection of wood for fuel, cultivation of marginal land and poor irrigation practices, which can lead to an accumulation of salt in soils and eventual abandonment of the land.

While not generally densely populated, the world’s arid lands have some of the fastest population growth rates in the world. This growth tends to extend and intensify cultivated land and squeeze out nomadic groups. In the Sahel region of Africa, population has risen fourfold since 1930 and is expected to double again in the next 30 years, even allowing for the migration of some 20 million people to coastal areas<sup>7</sup>.

Desertification makes 12 million hectares of land useless for cultivation every year. Since 1965, one sixth of the populations of Mali and Burkina Faso have lost their livelihoods and fled to cities. In Mauritania between 1965 and 1988, the proportion of the population who were nomads fell from 73 percent to 7 percent, while the proportion of the population in the capital Nouakchott rose from 9 percent to 41 percent.

But desertification is not exclusively a problem of the developing world. Commercial agriculture and livestock farming can cause as much damage to arid ecosystems as pastoralism and subsistence agriculture. Australia, one of the world’s richest but least densely populated countries, has one of the most serious land degradation problems.

The simple view of population pressure in a fragile environment causing permanent environmental degradation has been subject to re-evaluation. In the Yatenga province of Burkina Faso, farmers rescued their fields from imminent desertification by erecting low stone walls along the contours of hillsides to keep soil and water on the land. The Dogon people of eastern Mali practice some of the most intensive irrigated agriculture in Africa to feed a rapidly rising population in an era of declining rainfall – but do so without causing desertification<sup>8</sup>. Elsewhere in the Sahel communities have adopted rainwater harvesting methods to halt soil loss and improve the productivity of their lands.

The Machakos district in Kenya was considered to be on the verge of desertification in the 1930s. But in the ensuing decades, even with a fivefold population increase, water and soil conservation measures, such as cutting hillside terraces and digging water-storage ponds, are generally held to have improved the environment<sup>9</sup>. Similarly, adaptive farming methods have maintained a productive agricultural landscape despite a very high population density in semiarid northern Nigeria<sup>10</sup>. Critics of these studies point out that in both cases large urban areas nearby (Nairobi and Kano respectively) mean the areas are far from typical of drylands under population pressure.