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COUNTRIES STRICKEN BY DESERTIFICATION AND DROUGHT

COUNTRIES STRICKEN BY DESERTIFICATION AND DROUGHT

Report of the Secretary-General

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I. INTRODUCTION

1. The present report is submitted in accordance with General Assembly resolutions 39/208 of 17 December 1984 and 40/175 of 17 December 1985, as well as Economic and Social Council decision 1985/176. The Secretary-General also wishes to draw the attention of the members of the General Assembly to the documentation prepared for the special session on the critical economic situation in Africa, in particular section IV of the report of the Secretary-General on the critical economic situation in Africa (A/S-13/2) and to the relevant actions taken by the Assembly at the special session.

2. The specific subject of countries stricken by desertification and drought was first introduced as a separate item of the agenda at the thirty-ninth session of the General Assembly, on the initiative of the President of Senegal acting on behalf of the Ministerial Conference for a joint policy to combat desertification in the countries of the Permanent Inter-State Committee on Drought Control in the Sahel (CILSS) and the Economic Community of West African States, in the Maghreb countries and in Egypt and the Sudan, convened at Dakar in July 1984.

3. The General Assembly, in its resolution 39/208, inter alia, welcomed the results of the Ministerial Conference and recommended that various actions be taken by the affected countries and by bilateral and multilateral assistance programmes, giving priority to the fight against desertification and drought in view of the extent of those problems. It also requested the Secretary-General to report to the Assembly, at its fortieth session, through the Economic and Social Council, on the evolution of the situation in the affected countries and to formulate proposals for specific, co-ordinated action.

4. There was not sufficient time for consultations with the bodies concerned of the United Nations system and with the Organization of African Unity (OAU) between the adoption of resolution 39/208 on 17 December 1984 and the preparation of the report in advance of the second regular session of the Economic and Social Council in 1985. Consequently, a preliminary report was prepared and submitted, with the understanding that a final report would be submitted to the General Assembly at its forty-first session (A/40/392-E/1985/117).

5. The preliminary report was presented first to the Economic and Social Council at its second regular session of 1985. The Council, in its decision 1985/176, took note of the preliminary report and requested the Secretary-General to submit the final report to the General Assembly, taking into account the views expressed by delegations during the second regular session of 1985. A number of statements were made by delegations to the Economic and Social Council at that session. The principal comments were that the report was too literal in its treatment of countries stricken by desertification and drought, using strictly technical criteria in drawing up the list of countries affected by desertification and drought. It was suggested that the final report should concentrate on those countries most seriously affected - especially from the socio-economic viewpoint - and that these were principally countries in Africa. It was also proposed that the other factors that could not be analysed in detail in the preliminary report in view of the time constraints should be covered in the final report.

6. The General Assembly, in its resolution 40/175, took note of the preliminary report of the Secretary-General and welcomed the results of the second Ministerial Conference for a joint policy to combat desertification, which was held at Dakar in November 1985. The Assembly, inter alia, also took note with satisfaction of the establishment by the Organization of African Unity of the Special Emergency Assistance Fund for Drought and Famine in Africa; welcomed the establishment by six East African countries - Djibouti, Ethiopia, Kenya, Somalia, the Sudan and Uganda - of an Intergovernmental Authority for Drought and Development (IGADD) for the purpose of combating the effects of drought in those countries; noted the positive action taken by the United Nations Sudano-Sahelian Office (UNSO) as part of a joint effort by the United Nations Development Programme (UNDP) and the United Nations Environment Programme (UNEP) to help 22 African countries in combating desertification; recommended that high priority be given in development plans and programmes of affected countries to desertification and drought and that special efforts be made by the international community, particularly the developed countries, in support of actions taken individually or collectively by the affected countries; recommended that they continue to provide coherent short-, medium- and long-term assistance to those countries in order to support effectively the rehabilitation process and the renewal of growth of agricultural production; recommended that within the framework of bilateral and multilateral development aid programmes the fight against desertification and drought be granted priority; appealed to all members of the international community to provide full support in all forms to the development efforts of countries stricken by desertification and drought; and noted with satisfaction the generosity with which the international community had responded to the emergency in Africa, particularly as regards food aid, transport and medical assistance.

7. The Assembly also requested the appropriate organs and agencies of the United Nations to provide the Secretary-General, for the benefit of the stricken countries, with all relevant studies carried out in their respective spheres of competence. Finally, the Assembly requested the Secretary-General to take all necessary steps to ensure that his final report contains proposals for specific action to be undertaken, as indicated in resolution 40/175.

II. DESERTIFICATION AND DROUGHT: OPERATING DEFINITIONS

8. Before proceeding with an identification of countries that may be classified as stricken by desertification and drought, it is necessary to define these terms. The definitions should be of a practical, operational nature, capable of forming a basis for the drawing up of lists of the countries affected, and for determining where the problems are most severe and what action is needed.

9. It should be noted from the outset that desertification and drought, although interrelated, are distinct. Desertification is a man-made process of land degradation, whereas drought is a natural phenomenon.

10. The definition of desertification is given in the Plan of Action to Combat Desertification adopted by the United Nations Conference on Desertification on 9 September 1977 and approved by the General Assembly in resolution 32/172 of 19 December 1977:

> Desertification is the diminution or destruction of the biological potential of the land, and can lead ultimately to desert-like conditions. 1/

11. Desertification is a process of degradation of fragile ecosystems found in arid, semi-arid and sub-humid lands. For the purposes of the present report, only warm ecosystems have been included, following the criteria used at the United Nations Conference on Desertification, which excluded cold desert regions such as Antarctica and parts of Canada. The natural, or climatic, deserts are also excluded, since those deserts came into being many millenia ago when long-term geologic changes caused certain areas to be hyper-arid and thus natural deserts. Desertification is principally the result of the misuse or overuse of the land by human beings and, in pastoral economies, by their livestock. In these fragile ecosystems, which are mainly found close to the climatic deserts, the delicate balance of nature can easily be upset. The resulting ecological disequilibrium is accompanied by environmental degradation in the form of desertification, as manifested in deforestation, rangeland deterioration, the degradation of rainfed croplands, the salinization of irrigated lands and, in the most severe cases, moving sands. Among the consequences of desertification are the loss of valuable top soil, declines of land fertility and agricultural production leading in extreme cases to crop failures, food shortages and even famine.

12. Drought is a natural phenomenon owing to various climatic and meteorological factors, although there is some evidence that it may be induced by man-made devegetation causing changes in the earth's reflectivity (i.e. the albedo effect (see paras. 29-40 below)). Specialists on the subject have pointed to three kinds of drought - meteorological, hydrological and agricultural. Meteorological drought is defined roughly as extended periods (i.e. two years or more) of below-average precipitation as measured by the amount of rainfall recorded on monthly or annual bases. Hydrological drought, as defined in the study entitled Hydrological Aspects of Drought, 2/ is reflected in the lowering of water tables in lakes, rivers, storage reservoirs and the like, reduced river flows, the depletion of groundwater aquifers, etc. Agricultural drought is reflected in damage to tree and field crops, reduced agricultural production, severe plant stress and crop failures.

13. While concepts of hydrological and agricultural drought are perhaps more useful in that they deal with the impact of drought, it has been noted by the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the World Meteorological Organization (WMO) that it would be very difficult to quantify the necessary data and to separate the impact of rainfall differences from the impacts brought about by other factors. For these reasons, operating definitions of drought are mainly from the meteorological viewpoint, which, as noted above, is in terms of extended periods - two years or more - of below-average precipitation. It was on this basis that a list of countries affected by desertification and drought was drawn up in the preliminary report of the Secretary-General. The list is reproduced in table 1. The preliminary report noted that the list should be considered tentative and that:

> [T]he classification contained in the report is based on a literal interpretation of the term "countries stricken by desertification and drought". The classification does not take into account that in certain countries only a small part of the territory and the population is affected. Neither does it take into account that the concept of desertification could be narrowed so as to cover only those countries, the major areas of which are arid, semi-arid or sub-humid, and the economies of which are adversely affected to a large degree by drought and desertification. The General Assembly may wish to include these factors in its consideration of further action to be taken under the item. (A/40/392-E/1985/117, para. 7)

14. In commenting on this list, WMO pointed out that quantitative assessments of drought usually use monthly precipitation values, derived from daily observations, such as exchanged globally via the WMO Global Telecommunications Network (GTS) as CLIMAT reports. For a reliable assessment, the following are required:

(a) A spatially uniform station network of approximately 10 stations per 250,000 km^2 (approximately 5° latitude-longitude grid in equatorial regions);

(b) Long time-series (at least 30 years) of data to establish stable normals;

(c) Uninterrupted data collection and data exchange.

15. WMO provided world-wide drought statistics indicating drought conditions or lack of sufficient meteorological data, by country, for the years 1974 to 1984, with some preliminary estimates for 1985. These are reproduced in the annex to the present report.

16. There are, as was pointed out in the preliminary report, other considerations on which further light has been shed based on the Secretary-General's consultations with the United Nations agencies concerned. As to the extent of the territory affected by drought, WMO has suggested that for any particular country or region, the following meteorological criterion may be applied to identify drought conditions: 60 per cent or less of normal annual precipitation, for over two consecutive years, for over 50 per cent of the spatial extent of the region. 3/

17. According to UNESCO, a country can be considered drought-stricken if serious drought conditions exist in more than 30 per cent of the area of the country, or in 20 per cent of that part of the country that has an average annual precipitation of more than 400 mm. Drought conditions exist if, over the past 12 months, the total rainfall was less than the fifteenth percentile, or the total amount of rainfall in the past 24 months was less than two times the twenty-fifth percentile.

18. These spatial and other quantitative criteria would narrow down the list of countries "stricken" by desertification and drought contained in the preliminary report of the Secretary-General.

Table 1. Countries affected by desertification and drought

Region	Country		
Africa south of the Sahara	Angola	Ghana	Nigeria
	Benin a/	Guinea a/ b/	Rwanda b/
	Botswana a/	Guinea-Bissau a/ b/	Senegal
	Burkina Faso a/	Kenya	Somalia a/
	Burundi a/ b/	Lesotho a/	Sudan a/
	Cameroon	Liberia	Swaziland a/
	Cape Verde a/	Madagascar	Togo a/
	Chad a/	Malawi a/	Uganda a/
	Côte d'Ivoire b/	Mali a/	United Republic of Tanzania a/
	Djibouti a/	Mauritania	
	Ethiopia a/	Mozambique	Zambia
	Gambia a/	Niger a/	Zimbabwe
North Africa	Algeria	Morocco	
	Egypt	Tunisia	
	Libyan Arab Jamahiriya		
Middle East	Bahrain	Lebanon	Syrian Arab Republic
	Democratic Yemen	Oman	Turkey
	Iraq	Qatar	United Arab Emirates
	Kuwait	Saudi Arabia	Yemen a/
Asia	Afghanistan a/	Iran (Islamic Republic of)	
	China	Mongolia	
	India	Pakistan	
Latin America	Argentina	Ecuador	
	Bolivia	Mexico	
	Brazil	Paraguay	
	Chile	Peru	
	Colombia	Venezuela	
Europe	Portugal		
	Spain		
Other developed countries	Australia		
	Israel		
	Union of Soviet Socialist Republics		
	United States of America		
Others	Namibia		
	South Africa		

Source: "Countries stricken by desertification and drought: preliminary report of the Secretary-General" (A/40/392-E/1985/117).

Note: Antarctica and parts of Canada are considered "cold" deserts and are excluded from the classification of countries subject to desertification.

a/ Least developed countries.

b/ Stricken by drought but not currently affected by desertification.

19. Other important factors, which were alluded to in the preliminary report, are the effect of the drought and desertification on the countries' economic structure and their ability to cope with them. For instance, the impact of drought depends on the climate of the region, the land use of the region, the number of people affected and their livelihood systems, including financial and other means of coping with the consequences of the drought. Industrialized countries with important urban centres may have more people affected by the drought, but to a lesser degree since less water is needed to continue production and more technological and financial means are available to offset the adverse consequences of drought. In arid countries, especially those that export oil, the absence of rainfall may be compensated for through irrigation systems from large rivers and there may be little or no agriculture or other activities dependent on rainfall. Such countries may have sufficient capacity to help the people living in arid or drought-stricken areas, without resorting to external assistance.

20. Taking all the above-noted considerations into account, it is clear that the countries most seriously affected by desertification and drought, that is, the countries that may be said to be truly "stricken" and not only "affected" by those two factors, can be narrowed down principally to countries on the African continent. The report's focus on countries stricken by desertification and drought in Africa is in accordance with extensive discussions on the subject at the Economic and Social Council during its second regular session of 1985, at the General Assembly during its fortieth session and at the special session of the General Assembly on the critical economic situation in Africa. It reflects the fact that Africa has the world's largest desert - the Sahara - that 60 per cent of the land area is classified as arid or semi-arid, compared to 33 per cent of the world as a whole (excluding Antarctica), and that 50 per cent of the continent's land surface has a rainfall deficit season of such length as to restrict agricultural production seriously. It may also be noted that parts of Africa (for example, the Sahel) have undergone the longest and most extensive drought of this century, a drought with a duration of at least 17 years (that some climatologists have called a continental-scale drought during a part of this period). Finally, Africa has the largest number of economically disadvantaged countries, including the greatest number of least developed countries in the world.

21. Table 2 lists the countries of Africa stricken, that is, severely affected, by desertification and drought according to income categories based on the World Bank's World Development Reports and the United Nations classification of least developed countries. As can be seen, a total of 38 countries severely affected by desertification and drought are in the lower middle-income, low-income and least developed countries categories.

Table 2. Countries of Africa stricken by desertification and drought, by income category a/

High-income

Libyan Arab Jamahiriya

Upper middle-income

Algeria

Lower middle-income

Angola
Cameroon
Côte d'Ivoire c/
Egypt
Lesotho b/
Liberia c/
Mauritania
Morocco
Nigeria
Senegal
Tunisia
Zambia
Zimbabwe

Low income

Benin b/
Botswana b/
Burkina Faso b/
Burundi b/ c/
Cape Verde b/
Chad b/
Djibouti b/
Ethiopia b/
Gambia b/
Ghana
Guinea b/ c/
Guinea-Bissau b/ c/
Kenya
Madagascar
Malawi b/
Mali b/
Mozambique
Niger b/
Rwanda c/
Somalia b/
Sudan b/
Swaziland b/
Togo b/
Uganda b/
United Republic of Tanzania b/

Others

Namibia
South Africa

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a/ Income categories are taken from World Bank, World Development Report, 1985.

b/ Least developed countries.

c/ Stricken by drought but not by desertification.

III. CAUSES OF DESERTIFICATION AND DROUGHT

A. Desertification

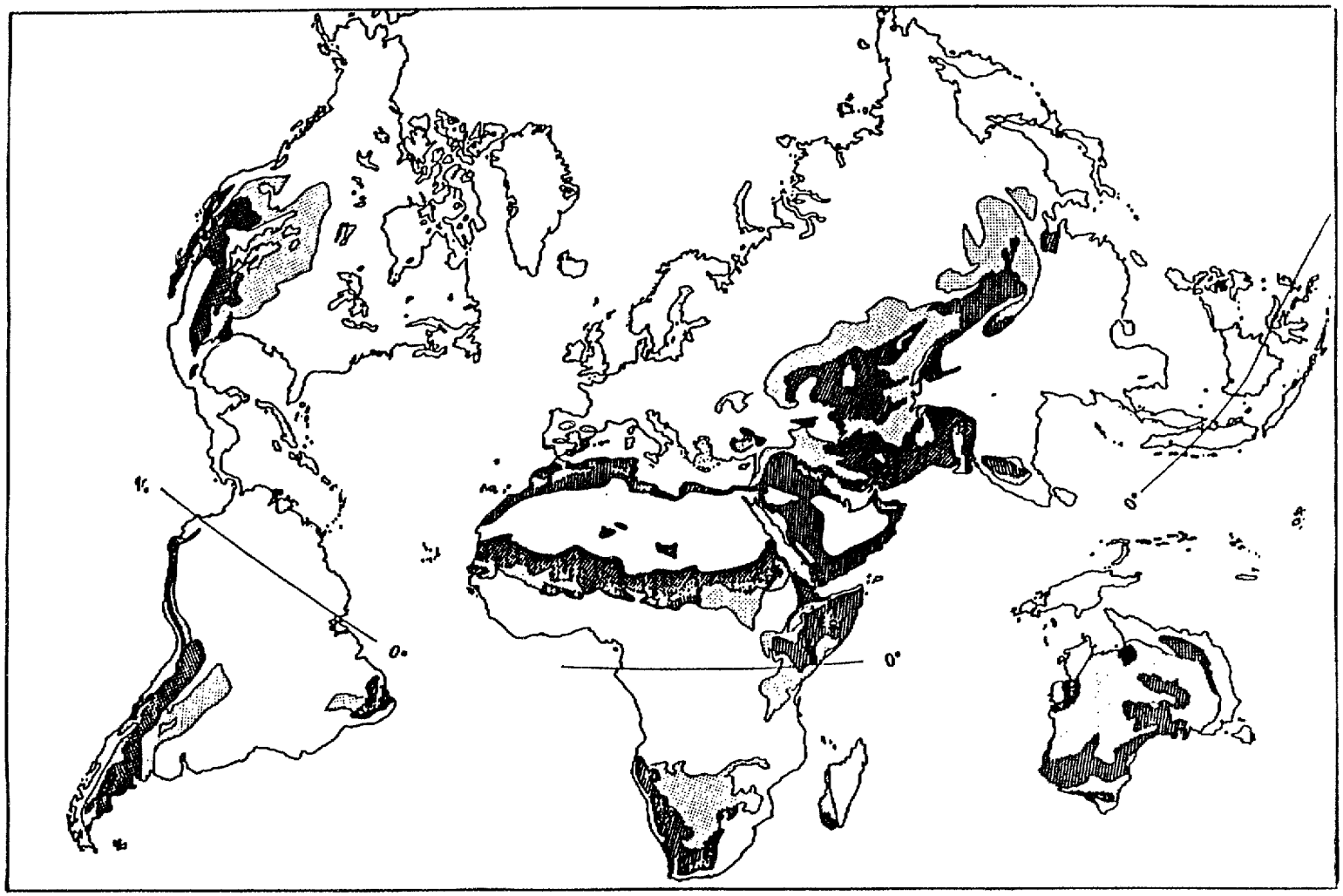
22. A world map of desertification, adapted from the world map accepted by the United Nations Conference on Desertification (A/CONF.74/2) as a first approximation based on degrees of desertification hazards, is reproduced in the present report. Desertification, as previously noted, is basically caused by human activities. There is no evidence of any changes in precipitation patterns of a long-term, climatic nature; both the United Nations Conference on Desertification and the World Climate Conference concluded that there was no evidence of a shift in the climate of Africa. More recently, computerized simulations of 500-year weather patterns were prepared for the Scientific Round Table on the Climatic Situation and Drought in Africa, which was held at Addis Ababa in February 1984, under the auspices of the Economic Commission for Africa (ECA), UNEP, UNSO and WMO. Those simulations indicate that the present African drought is, although the worst in this century, within a normal range of variability. There are indications from climatic records that rainfall declined for a period of 20 to 30 years in the 1820s and 1830s when the level of Lake Chad dropped to about where it is today.

23. The principal causes of desertification are the cutting of trees and woody shrubs for fuelwood and construction purposes, the overgrazing of rangelands, the cultivation of crops and the tilling of the soil in marginal areas where rainfall is insufficient or the rains recurrently fail, and other unsound land use practices. Other causes are bush fires and, in irrigated areas, the lack of drainage, which causes a rise in the water-table leading to waterlogging and salinization. Table 3 shows a rating of desertification hazards by country in Africa based on a study and preliminary maps prepared by the Food and Agriculture Organization of the United Nations (FAO) and the Environmental Systems Research Institute (ESRI) for UNEP in May 1984.

24. It should be noted, however, that the causes of desertification are not merely a question of lack of respect for the environment or of knowledge of sound land management. The cutting of trees and woody shrubs for fuel is very much an economic necessity; these ligneous resources account for up to 90 per cent of the domestic energy consumption in the countries concerned, which cannot afford imported fossil fuels. Overgrazing often reflects the overstocking of rangelands, the carrying capacity of which has remained constant or decreased in the face of rising human and animal populations. Livestock remains among the principal economic activities in the drought-prone regions of Africa since rainfall is not sufficient to support agriculture and the wetter areas are often subject to diseases such as trypanosomiasis and onchocerciasis not generally found in the drier areas such as the Sudano-Sahelian region, the Kalahari basin and northern Africa. The cultivation of land in the marginal areas reflects the shortage of and demand for food-producing land.

25. The people are caught in a dilemma, for they are subject to a severe energy as well as food crisis. It is not sufficient to exhort them to stop overgrazing, cutting of trees and shrubs for fuelwood or cultivating lands at risk unless alternative or supplementary livelihood systems are provided, as well as financial resources for more productive and ecologically sound land management systems.

WORLD MAP OF DESERTIFICATION



VERY HIGH HIGH MODERATE

Adapted from the United Nations Conference on Desertification, 1977 (A/CONF.74/2).

Table 3. Degree of desertification hazards by country in Africa

(Percentage of area)

Country	Desertification hazards rating			
	None to slight a/	Moderate	Severe	Very severe
Algeria	4.1	28.3	38.9	28.7
Angola	85.8	11.4	2.6	.2
Benin	79.0	21.0	-0-	-0-
Botswana	39.3	60.7	-0-	-0-
Burkina Faso	41.7	58.3	-0-	-0-
Burundi	100.0	-0-	-0-	-0-
Cameroon	94.9	5.1	-0-	-0-
Canary Islands	-0-	28.2	54.1	17.7
Cape Verde	-0-	-0-	-0-	100.0
Central African Republic	96.6	3.4	-0-	-0-
Chad	21.8	28.9	39.7	9.6
Comoros	100.0	-0-	-0-	-0-
Congo	100.0	-0-	-0-	-0-
Côte d'Ivoire	100.0	-0-	-0-	-0-
Djibouti	-0-	90.4	6.9	2.7
Egypt	<.1	23.4	36.2	40.3
Equatorial Guinea	100.0	-0-	-0-	-0-
Ethiopia	44.4	36.2	15.0	4.4
Gabon	100.0	-0-	-0-	-0-
Gambia	44.4	56.0	-0-	-0-
Ghana	95.6	4.4	-0-	-0-
Guinea	97.5	2.5	-0-	-0-
Guinea-Bissau	98.8	1.2	-0-	-0-
Kenya	13.0	64.3	21.0	1.7
Lesotho	26.9	57.2	-0-	15.9
Liberia	100.0	-0-	-0-	-0-
Libyan Arab Jamahiriya	.5	28.3	48.4	22.8
Madagascar	91.4	6.1	2.4	<.1
Madeira	-0-	-0-	100.0	-0-
Malawi	94.5	5.5	-0-	-0-
Mali	12.8	45.1	6.0	36.1
Mauritania	5.7	17.0	23.0	54.4
Mauritius	100.0	-0-	-0-	-0-
Morocco	34.0	27.1	35.5	3.4
Mozambique	79.9	20.1	.1	-0-
Namibia	25.5	50.2	24.2	.1
Niger	.1	17.9	52.9	29.1
Nigeria	62.8	31.4	5.8	-0-
Réunion	100.0	-0-	-0-	-0-
Rwanda	100.0	-0-	-0-	-0-

/...

Table 3 (continued)

Country	Desertification hazards rating			
	None to slight a/	Moderate	Severe	Very severe
Sao Tome and Principe	100.0	-0-	-0-	-0-
Senegal	26.7	72.0	1.3	-0-
Sierra Leone	100.0	-0-	-0-	-0-
Somalia	7.9	56.7	34.2	1.2
South Africa	11.4	17.5	33.3	37.8
Sudan	34.1	33.8	7.7	24.4
Swaziland	69.6	30.4	-0-	-0-
Togo	100.0	-0-	-0-	-0-
Tunisia	13.7	25.9	42.6	17.8
Uganda	80.2	19.2	.6	-0-
United Republic of Tanzania	65.4	33.4	1.2	-0-
Western Sahara	-0-	11.7	69.8	18.5
Zaire	100.0	-0-	-0-	-0-
Zambia	97.1	2.9	-0-	-0-
Zimbabwe	39.2	55.0	5.8	-0-

Source: Map of Desertification Hazards, Explanatory Note (prepared for UNEP by FAO and Environmental Systems Research Institute, May 1984).

a/ Includes areas not rated for desertification hazards. Land degradation hazards may occur.

26. Although drought per se is not a cause of desertification since drought-prone ecosystems will survive and regenerate if left alone or not overexploited, drought exacerbates and accelerates the process of desertification. Drought in Africa has been a major factor in the severity of the desertification and economic stagnation or decline of the countries of post-independence Africa.

B. Drought

27. The causes of drought are still not fully understood and established, although considerable research is being done and extensive knowledge has already been accumulated on the subject. The following discussion is based mainly on material provided by WMO for the present report.

28. The basic requirements for rainfall are the presence of water vapour in the air, an optimum number of condensation nuclei around which water droplets form, and rising air motion that promotes condensation (through cooling by transport of

moisture to cooler air aloft). The factors promoting drought in the real atmosphere are the absence of available water vapour or the presence of sinking air motions (called subsidence, which results from large-scale atmospheric flows as part of the circulation of the entire atmosphere). Also, rainfall tends to form in organized atmospheric disturbances (for example, squall lines), so that an additional promoting factor of drought is the absence of such systems.

29. The above drought-causing factors refer to the presence or absence of particular elements in a local context. However, it should be emphasized that drought cannot be analysed or assessed in a local context: keys to understanding the cause of drought lie within the global general circulation and climate system. In addition, anthropogenic forces can play an important role. It is speculated that the persistence of drought in Western Africa, for example, is possibly due to a combination of atmospheric circulation fluctuations plus changes induced by man (land-use practices such as overgrazing and deforestation), which affect surface albedo, surface hydrology and moisture recycling mechanisms.

30. In recent times, the most severe incidence of widespread drought occurred during the 1982-1984 period. The following areas were affected:

(a) Large areas in Africa, including Western Africa/Sudano-Sahel, Eastern and Southern Africa;

(b) Parts of Asia, including South-East Asia, the Western Pacific and Australia;

(c) Parts of Latin America, particularly the northern and north-eastern areas.

31. The most adversely affected areas were in Africa, both in terms of drought intensity and duration.

IV. CLIMATOLOGY OF AFRICA

32. Africa spans a belt of latitudes that includes not only the tropics, but low latitude portions of both the northern and southern hemisphere temperate zones as well. Precipitation over the continent varies from near zero over the vast Sahara desert in the north and the smaller Somalia (Horn of Africa) and Namib (south-west) deserts, to over 1,600 mm in the western equatorial region. A large portion of the continent consists of semi-arid zones, with 200-800 mm of annual rainfall generally concentrated in a single rainy season. Here, agricultural productivity is extremely sensitive to fluctuations in the already marginal rainfall amounts. Apart from a small region in north-west Africa, this semi-arid region extends as a crescent-shaped area eastward across the relatively narrow sub-Saharan zone to Ethiopia, then southward and south-westward to around the Kalahari and Namib deserts of Botswana and Namibia. Annual average rainfall in this semi-arid crescent region exhibits a large variability as measured by the average departures from the long-term annual mean - typically, 20 to 30 per cent. In the Sahelo-Saharan region zone of Africa, for instance, the coefficient of variation is 50 per cent in the Sahelian zone, 30 to 50 per cent in the Sudano-Sahelian zone,

and in the wetter Sudano-Guinean zone it is only 15 to 20 per cent. An important characteristic of the drylands of Africa is not only low rainfall but also erratic rainfall. The correspondence between the zone of countries affected by food shortages in 1984 and the semi-arid crescent is striking.

33. Within the tropics, the rainy season is tied to the high-sun season, and migrates northward and southward roughly with the sun, but usually with a lag of a month or two. In eastern and southern Africa, this migration is associated with the seasonal monsoon extending over the Indian Ocean and South Asia. More generally, the seasonal changes over the continent are linked to the seasonal migration of the zone of converging low-level flow from the two hemispheres, namely, the Inter-Tropical Convergence Zone (ITCZ). The characteristic rainfall pattern resulting from these shifts consists of two equinoctial rainfall maxima in the equatorial zone and a local summertime wet season to the north and south. Thus, rainfall near the equator tends to be spread over many months, while at higher latitudes it tends to be concentrated in the summer season. For example, as one progresses northward in the sub-Sahara zone, the rainy season shortens from three-four months to little more than a month on the fringes of the desert. With the shorter rainy season comes less mean annual rainfall and greater year-to-year variability.

A. Inter-annual rainfall variability

34. Significant features of the typical pattern of variability of much of the tropics and large portions of Africa are as follows:

(a) Much of the variability is of a year-to-year nature; on occasion, there are large back-to-back departures of the same sign, and occasionally notable wet or dry periods extended over a few years;

(b) There is no identifiable anomaly pattern on longer time scales in contrast to the sub-Saharan-Sahel region;

(c) At least some of the year-to-year variability is linked to large-scale fluctuations in the atmosphere and ocean as indicated by variations in sea surface temperature (SST); they mostly coincide with significantly dry episodes associated with massive displacement of normal rainfall régimes in the tropical belt.

35. In the sub-Saharan region, climatologist Sharon Nicholson has shown that year-to-year rainfall fluctuations are associated with continental scale anomaly patterns, which are coherent across the continent, with anomalies of opposite sign to the north and south. It has been demonstrated recently that SST fluctuations in the low-latitude Atlantic Ocean are "linked" to these two anomaly patterns. It is not yet clear to what extent the SST anomalies are a cause-effect factor as opposed to simply a response to large-scale circulation changes that produce both SST and rainfall anomalies. It is emphasized that the pattern of African rainfall anomalies, which itself is continental in scale, is related to even larger-scale patterns of ocean-atmosphere anomalies.

B. African drought: two time scales

36. WMO has noted that the most recent widespread drought episodes began during 1981 or 1982 in most regions, about a decade after the previous intense drought, which in most regions peaked around 1972-1973. African drought appears to be characterized by phenomena on two time scales:

(a) Relatively short "episodes" of serious widespread drought, which usually last a year or two, sometimes a little longer, but rarely more than four to five years. This pattern of recurrent wet and dry episodes is typical of the drought-prone semi-arid regions of the world;

(b) Long dry "periods" spanning a decade or more, which may include several very dry episodes.

37. The inter-annual year-to-year rainfall variability is probably related to and strongly influenced by large-scale atmosphere-ocean fluctuations occurring around the world. For example, during the 1982-1983 El-Niño/Southern Oscillation (ENSO), the dominant tropical centre of convective activity and rising motion shifted east (over the Pacific) resulting in an altered configuration of east-west overturning circulation cells (Walker cells) and enhanced subsidence over Africa - subsidence being accompanied by an absence of or reduced rainfall.

38. Of the 28 El-Niño events during the past 110 years, 22 were accompanied by below normal rainfall as measured by an areal-average precipitation index for Southern and Eastern Africa. Of the 20 driest years during this period, 12 were ENSO years, where only 5 would be expected by chance. Thus, while the El-Niño phenomenon is strongly linked to rainfall variability, other factors also influence rainfall over Africa.

39. In contrast, the causes of the long-term dry periods - particularly the most recent, drastic downturn in sub-Saharan rainfall - are unclear. This phenomenon may be related to factors very different from those that control the shorter dry episodes. For example, it is speculated that interactions between the atmosphere and the underlying land surface/vegetation could be a factor. In semi-arid regions short-term, dry, climatic impulses could lead to the rapid deterioration of soil and vegetation conditions, and the disruption of the hydrological cycle (including soil moisture recycling mechanisms) from which recovery could be markedly slow.

40. In addition to the aforementioned natural phenomena, there is evidence that the devegetation associated with desertification decreases precipitation by changing the reflectivity of the earth's surface, or albedo, surface hydrology and dust - all of which are major influences on climate. In particular, surface runoff increases and percolation and soil moisture decrease, reducing in turn the volume of water available for evapotranspiration back into the atmosphere. In addition, there is less evapotranspiration from fewer plants and grasses. This can reduce rainfall since in many areas rainfall is derived from water vapour produced by local evapotranspiration. Another possible contribution comes from the cooling effect caused by the increase in reflectivity and dust. The cooling effect draws dry air down from the upper atmosphere, reinforcing the effect of decreased soil

moisture. The mechanisms of drought and desertification can thus feed upon themselves. The converse of this may be that reforestation can reverse the process of man-induced drought.

V. CONSEQUENCES OF DESERTIFICATION AND DROUGHT

41. It is estimated that the population of the African drylands - populations at risk - number close to 185 million, with 30 million immediately threatened, living in areas recently undergoing desertification. It is estimated that in the past 50 years, 65 million hectares of once productive land have become desert on the southern edge of the Sahara alone. Close to 6 million hectares of land are irreversibly lost each year, and 21 million hectares deteriorate to levels of zero or negative net returns in the world as a whole.

42. The recent droughts have caused crop failures, water shortages, destruction to both animal and plant populations, accelerating crop failures and famines. At the end of January 1986, the unmet relief needs of 16 affected countries, mainly for food and other emergency requirements, amounted to $881 million. This financial estimate does not reflect the malnutrition, starvation and untold human suffering resulting from the scourges of drought and desertification. Despite the arrival of ample rains during the 1985/86 rainy season in various parts of Africa, some 19.2 million people, including 3 million displaced persons, continue to be affected by the emergency situation, principally in four seriously affected countries - Angola, Ethiopia, Mozambique and the Sudan. Table 4 lists the 15 countries still severely affected by the drought-induced emergency situation as at 1 April 1986.

43. The prolonged meteorological drought has caused severe hydrological drought. Although comprehensive quantitative measures are not possible, water levels and river flows have been considerably reduced. For instance, Lake Chad contracted to one third its normal area, Lake Volta saw drastic drops in its water levels to below the operating levels for the Akosombo dam power stations and the Niger River stopped flowing beyond Niamey. Such developments have had severe adverse effects on irrigation. They have also had serious implications for countries that are developing their hydroelectric potential to lessen their dependence on oil imports. In several African countries, the lowering of the water-table has had serious repercussions for productive capacities and basic social services.

44. Among the economic consequences of drought and desertification in Africa has been an increase in imports coupled with drastically decreased exports, which have compounded the indebtedness problems of the countries affected. This situation is analysed in detail in the report by the secretariat of the United Nations Conference on Trade and Development (UNCTAD), submitted to the Trade and Development Board at its thirty-second session, in March 1986, entitled "The drought and the external trade of the countries members of the Permanent Inter-State Committee on Drought Control in the Sahel (CILSS)" (TD/B/1082), which is referred to specifically in paragraph 9 of General Assembly resolutions 40/175 and 39/208.

Table 4. Countries stricken by desertification and drought with populations critically affected by the emergency situation, as at 1 April 1986

Most critically affected

Angola
Ethiopia
Mozambique
Sudan

Critically affected

Botswana
Burkina Faso
Cape Verde
Chad
Lesotho
Mali
Mauritania
Niger
Rwanda
Somalia
Zambia

Source: United Nations Office for Emergency Operations in Africa.

VI. SPECIFIC ACTION TO BE TAKEN

A. Proposals of United Nations organizations

45. The General Assembly in paragraph 10 of its resolution 40/175, requested the Secretary-General "to take all necessary steps to ensure that his final report ... contains proposals for specific action to be undetaken, as indicated in the present resolution". In this connection, the proposals for action made by the relevant organs and specialized agencies of the United Nations are outlined below.

46. FAO has noted that it has an ongoing Agricultural Rehabilitation Programme for Africa (ARPA), which was presented in January 1985 to FAO member countries with regard to Ethiopia, in March 1985 for 20 additional African countries, and again in June-July 1985 for four more African countries. The programme consists of 262 short- and medium-term projects costing $245 million and concern crop production, rural development, fisheries and forestry. The programme is suggested by FAO as a good example of prompt assistance for emergency aid and agricultural recovery.

47. UNESCO has drawn specific attention to the need for a minimum of information on water, soils and other natural resources. It suggests that national information and documentation centres be established covering the fields of water, soils and biological resources, and that the United Nations system support such centres. UNESCO has also drawn attention to its programme on Man and the Biosphere (MAB) which provides a scientific basis for integrated management of arid and semi-arid lands with a view to preventing desertification, rehabilitating degraded areas and mitigating the possible effects of prolonged droughts.

48. WMO has specifically suggested plans for optimizing food production systems using weather and climate information. These include planning the crops to be planted, farm systems and crop rotations based on probability distributions of rainfall amount and timing. WMO also suggests the choice of crops and varieties with life cycles in accordance with rainfall patterns and the timing of agricultural operations (weeding, thinning, fertilizer application, irrigation, plant protection, ridging and harvesting) in accordance with annual rainfall cycles. It stresses the importance of data gathering, diagnostic studies and research and training. To implement such procedures, WMO has assisted in the development of the Training Centre for Agro-Meteorological and Hydrological Studies (AGRHYMET) programme in the CILSS countries and is planning to establish similar activities in Eastern and Southern Africa. In addition, WMO has conducted a series of roving seminars throughout Africa directed at combating wind and rain erosion.

49. UNEP has described its major contributions targeted up to the year 1990 along the following lines:

(a) On the basis of the new policy of concentration of UNEP, some 11 seriously affected countries in Africa have been earmarked for concerted assistance over a limited period, during which they will be helped to formulate and implement national plans designed to orient development patterns towards sustainable development as concrete measures for combating desertification. The countries UNEP has earmarked are Botswana, Burkina Faso, Kenya, Mali, Mauritania, the Niger, Somalia, Senegal, the Sudan, Tunisia and the United Republic of Tanzania.

(b) Within the framework of the first African Ministerial Conference on the Environment, held at Cairo from 16 to 18 December 1985, UNEP intends to elaborate 6 to 10 pilot projects on the development and rehabilitation of traditional systems of rangeland utilization in the countries selected for concentration. It intends to carry out these approaches in close collaboration with the United Nations system, as well as bilateral and multilateral assistance programmes.

50. UNCTAD has proposed that measures be taken at national, regional and international levels for stimulating domestic production, promoting better trade patterns for the affected countries and assisting those countries through increased volumes of external assistance, debt relief, export stabilization and access to markets that have been subject to protectionist policies.

51. UNSO, as the entity within the United Nations system whose mandates are concerned exclusively with the problems of desertification and drought, has taken a multi-disciplinary and integrated approach through concrete projects, as well as

policy-making and co-ordination through contacts with United Nations bodies working in the Sudano-Sahelian and adjacent regions, the donor community and subregional organizations such as CILSS, IGADD and the South African Development Co-ordination Conference (SADCC). These include projects for:

(a) Combating deforestation through afforestation and reforestation including fuelwood plantations and village and family woodlots; reducing the demand for fuelwood through substitutes such as groundnut shell and peat briquettes and other energy sources using agricultural residues wind energy and possibly wave energy; and the promotion of fuel-efficient cooking stoves requiring less fuel inputs than traditional stoves;

(b) Combating range deterioration through range management schemes involving the protection of land around watering points, training, spacing of watering holes and the introduction of market incentives to stock farmers; and projects for bush fire prevention and control;

(c) Water resources conservation, management and development through small dams, water harvesting, river basin development and ground water development;

(d) Sand dune fixation using mechanical and vegetative means.

52. Outside the United Nations system, it should be noted that the OAU has established a Special Emergency Fund for Drought and Famine in Africa. The Fund, for which $40 million has been pledged, is now operational, with over 60 projects in the pipeline. Subregional intergovernmental organizations, including CILSS, IGADD and SADCC, also have programmes for dealing with desertification and drought, as do various non-governmental organizations.

B. Recommendations of the Secretary-General

53. The Secretary-General wishes to draw to the attention of the members of the General Assembly the programmes of the above-noted bodies for their consideration. He suggests that the bodies concerned both within and outside the United Nations system should enhance the co-ordination of their activities with a view not merely to preventing unnecessary overlapping but more importantly to bringing additional financial resources to deal with the scourges of desertification and drought. The following specific courses of action are recommended for consideration by Member States, including affected countries that are recipients of external assistance and donor Governments, as well as relevant organizations and agencies of the United Nations system.

1. Priorities

54. The affected countries and the donor community alike should give priority to projects related to desertification and drought in their development and assistance programmes.

55. The donor community should increase its level of assistance to countries stricken by desertification and drought and take those factors into account in dealing with policies concerning the affected countries' trade and indebtedness problems, including such measures as debt relief, rescheduling and the elimination of protectionist policies vis-à-vis those countries.

2. Combating deforestation

56. Extensive afforestation and reforestation programmes should be carried out using fast-growing, drought-resistant species both in fuelwood plantations and village woodlots, on an ecologically sound basis.

57. Agro-sylvo-pastoral systems should be used to help ensure a complementarity of activities in forestry, field crop production and pastoralism.

58. Concerted efforts should be made for providing alternative sources of energy, including the use of agricultural waste products for fuel, wind energy, peat and such other natural resources as may be available.

59. Financial support should be given to programmes for the development, manufacture and distribution of more fuel-efficient cooking stoves, to help reduce the consumption of fuelwood relative to energy output.

60. Measures for bush fire prevention and control should be carried out taking into account not only efficient methods of fire suppression but also the social and ecological factors underlying bush burning.

3. Water resources management

61. Irrigation schemes should be developed for major river basins, with proper drainage; in existing irrigation systems where they are absent, proper drainage works should be installed.

62. There should be improvements in the design, construction and maintenance of small dams and water harvesting schemes.

63. Expanded ground-water surveys should be carried out to develop ground-water aquifers to their full potential.

64. Measures should be undertaken on an extensive scale for the protection of major watersheds such as the Fouta Djallon Massif and the Blue Nile ecological zone.

65. Hydrometeorological and geological surveys should be made of major river systems such as the Volta River system and the Lake Chad régime with a view ultimately to seeing them restored to appropriate water levels, and to taking whatever action may emerge as necessary on the basis of the findings of the surveys.

4. Rangeland management

66. Surveys should be carried out to determine the carrying capacity of rangelands and the actual as well as desirable stocking rates, based not only on average annual rainfall (which has decreased over at least the past decade) but also on variation patterns.

67. Watering points should be spaced on an optimal basis to prevent the overcrowding of lands around watering holes and the ensuing damage to the land and vegetation.

68. Economic incentives should be promoted to help bring livestock populations in line with economically viable and ecologically sound levels.

69. Research and development should be carried out concerning animals suited to dryland conditions, including not only cattle and goats but also camels and donkeys which are used extensively in various areas of Africa.

5. Sand dune stabilization

70. In the most severely degraded areas, measures should be carried out for sand dune stabilization using vegetative and mechanical means. The most appropriate trees and shrubs should be determined and systematically planted and nurtured, and knowledge of the aerodynamics of sand dune stabilization applied.

6. Alternative and supplementary livelihood systems

71. Alternative or supplementary livelihood systems should be tried on an increasing scale using species such as jojoba, Acacia senegal (for gum arabic) and other native or exotic species to provide the people with ecologically sound sources of revenue and lessen their dependence on traditional land use systems where such systems are no longer viable.

7. Data gathering, studies and research

72. Meteorological and hydrological data gathering programmes should be strengthened so as to enable the countries stricken by desertification and drought to have the necessary information for dealing with the phenomena of drought.

73. Research activities should be continued and strengthened to try to determine further the causes of drought and possible ways of predicting future droughts, as part of a programme of drought preparedness.

74. Drought research should be accelerated on El-Niño, the albedo and other effects of desertification, sea surface temperatures, teleconnections and other elements that may be used for dealing with the phenomena of drought, especially on the African continent.

75. Studies should be carried out on the interrelationship between the damage to the forested coastal ecosystems resulting from the recent drought and the semi-arid and sub-humid ecological zones further inland.

8. Linkages

76. A programme of linkages should be developed and implemented vigorously to act as a bridge between emergency relief operations, recovery and medium- to long-term development. Food aid, it should be noted, is only a stopgap and should not perpetuate the dependence of African countries on food assistance. Measures should be taken not only to help the countries in reviving their agricultural production systems but also in developing those systems on an ecologically sound basis and thus in coping with future droughts. In preparing and implementing national development plans, Governments of affected countries should integrate the principles of ecologically sound development, as contained in the United Nations Plan of Action to Combat Desertification. National plans, strategies and policies for combating desertification should also be developed.

9. Popular participation

77. In the planning, implementation and evaluation of projects, popular participation should be ensured. This should include the involvement of the people from the grassroots level in the field, continuing consultations and the application of the feedback obtained in the direction or redirection of the projects. The people ultimately affected - the land users - should be involved in all aspects and at all stages of development. Special attention should be given to the involvement of women, who play an important role in the development process.

Notes

1/ Report of the United Nations Conference on Desertification, Nairobi, 29 August-9 September 1977 (A/CONF.74/36), chap. I, para. 7.

2/ United Nations Educational, Scientific and Cultural Organization and World Meteorological Organization, Studies and Reports in Hydrology, No. 39 (1985).

3/ Social and economic support systems are usually able to withstand one drought year (60 per cent or less of normal annual precipitation), but find increasing difficulty with two or more; hence, the specifications of two or more consecutive drought years before a region is categorized as drought-affected.

ANNEX

Drought statistics compiled by the World Meteorological Organization

A. Meteorological definition

1. Drought is by definition a sustained, regionally extensive, deficiency in precipitation (rain and/or snow). All other definitions of drought are related to the effect or impact of below normal precipitation on agriculture, water resources, social and economic activities; hence the terms agricultural drought, hydrological drought.

2. For any particular country or region the following meteorological criterion may be applied to identify drought conditions:*

> Sixty per cent or less of normal annual precipitation, for over two consecutive years for over 50 per cent of the spatial extent of the region.

3. In the above definition, it is assumed that in a particular locality, the natural ecosystem would have adjusted to "natural rainfall" conditions, be it 200-800 mm/year (semi-arid regions) or 2,000-3,000 mm/year (tropical forests). An anomalous, protracted, rainfall deficiency is thus expected to adversely impact the natural ecosystem irrespective of the total absolute amount of rainfall per year. There are, of course, exceptions to this rule.

4. Quantitative assessments of drought usually use monthly precipitation values, derived from daily observations, such as exchanged globally via the WMO Global Telecommunications Network (GTS) as CLIMAT reports. For a reliable assessment, the following are required:

(a) A spatially uniform station network of approximately 10 stations per 250,000 km^2 ($\simeq$ 5° latitude-longitude grid in equatorial regions);

(b) Long time-series (at least 30 years) of data to establish stable normals;

(c) Uninterrupted data collection and data exchange.

5. Few countries, in Africa in particular, satisfy all of the above criteria in the context of the global data exchange system. It should be noted that for an assessment of the effects of drought, the distribution of rainfall (over the season) and its timing are important. Other parameters such as solar radiation, temperature and wind are also required to estimate water balance, soil moisture,

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* Social and economic support systems are usually able to withstand one drought year (60 per cent or less of normal annual precipitation), but find increasing difficulty with two or more; hence the specification of two or more consecutive drought years before a region is categorized as drought-affected.

water availability and effects on crops. Other drought indices use such information, where they are available. However, when drought conditions persist, all drought indices should signal drought conditions. Social and economic impact of drought involves a more complex set of variables related to decision-making infrastructures and response mechanisms existing in a country or region.

B. Statistics on drought in Africa

6. In the following table, during the period 1974-1984, regions with two or more consecutive years with less than 60 per cent of normal annual rainfall are categorized as drought-affected. Owing to the lack of uniform spatial coverage by reliable stations, individual years could be: (a) an overestimate of drought conditions where only one station's data were available, or (b) an underestimate where data are completely missing. When possible, spatial interpolation was applied to identify possible drought years where data were missing for a particular location.

7. In 1985, several countries eased out of drought conditions, for example, Burkina Faso, Ethiopia, Kenya, Lesotho, Malawi, South Africa, Swaziland, Uganda, United Republic of Tanzania, Zambia and Zimbabwe. However, drought continued in Mali, Mauritania, the Niger and Senegal. Complete statistics for 1985 are not yet available.

Table 1. Drought statistics: Africa

Country groups WMO St. Nos.	Country	74	75	76	77	78	79	80	81	82	83	84	85 a/	Drought-affected periods	Number of stations in 71	77	84	Affected by drought and desertification b/
08500-08599	Cape Verde	d	-	0	*	*	-	*	*	*	*	*	d	77-78, 80-85	7	6	1	DD
60000-60349	Morocco and Canary Islands	0	-	0	-	-	0	d	-	*	-	*	-		5	1	0	DD
60350-60699	Algeria	*	-	-	-	0	-	-	-	-	-	d	-		7	0	3	DD
60700-60999	Tunisia	d	0	0	0	0	0	0	d	0	-	-	-		3	1	0	DD
61000-61199	Niger	0	0	0	0	0	0	0	-	*	d	d	0	82-84	9	9	9	DD
61200-61399	Mali	0	0	0	*	0	0	-	-	*	d	d	0	82-84	18	0	5	DD
61400-61599	Mauritania	0	0	0	*	d	0	0	-	*	d	d	0	77-78, 82-84	2	0	3	DD
61600-61699	Senegal	0	0	0	d	d	0	d	-	d	d	d	0	77-78, 82-84	12	7	9	DD
61700-61749	Gambia	0	0	0	*	*	*	*	-	*	*	*	0	76-80, 82-84	1	0	0	DD
61750-61799	Guinea-Bissau	*	-	*	*	*	*	*	-	*	*	*	d	76-80, 82-85	1	0	0	DD
61800-61849	Guinea	0	0	0	0	0	0	0	0	0	d	d	0	83-84	1	0	0	DD
61850-61899	Sierra Leone	0	0	0	0	0	0	0	0	0	0	*	0		4	4	0	
61900-61999	Ocean Islands c/	d	d	0	d	d	d	d	d	0	d	0	-	74-75, 77-81	14	11	10	
62000-62999	Libyan Arab Jamahiriya	0	-	-	-	0	0	-	0	0	0	0	-		6	3	2	DD
62300-62599	Egypt	0	0	d	d	d	-	-	-	-	*	*	-	76-78, 83-84	12	5	0	DD
62600-62999	Sudan	0	d	d	*	*	d	0	0	d	d	d	0	75-79, 82-84	20	0	5	DD
63000-63099	Ethiopia (northern)	d	*	0	0	0	0	0	0	*	*	*	0	74-75, 82-84	1	1	1	DD
63100-63149	Djibouti	*	*	0	0	0	0	0	0	-	-	-	-	74-75	1	0	0	DD
63150-63299	Somalia	d	d	d	0	d	0	0	0	-	-	-	0	74-76	2	2	0	DD
63300-63599	Ethiopia (southern)	0	0	0	0	0	0	0	0	*	*	*	0	81-83	1	2	2	DD
63600-63979	Kenya, United Republic of Tanzania and Uganda d/	0	0	d	0	0	0	d	0	0	d	d	0	83-84	15	8	4	DD
63980-63999	Seychelles	-	-	-	-	-	-	-	-	-	-	-	-		0	0	0	
64000-64379	Zaire	-	-	-	-	-	-	-	-	-	-	*	0		1	0	0	
64380-64389	Rwanda	0	0	0	0	-	-	-	-	-	-	*	0		0	0	0	DD
64390-64399	Burundi	0	0	0	0	-	-	-	-	-	-	*	0		0	0	0	DD
64400-64499	Congo	-	-	-	-	-	-	-	-	-	-	-	-		13	0	0	
64500-64599	Gabon	-	-	0	-	-	-	-	0	0	-	-	-		11	0	0	
64600-64699	Central African Republic	0	-	-	0	0	-	-	0	0	0	d	0		0	13	13	
64700-64799	Chad	0	0	d	0	0	-	-	-	*	*	*	0	82-84	13	11	0	DD
64800-64849	Equatorial Guinea	-	-	-	-	-	-	-	-	*	-	-	-		0	0	0	
64850-64999	Cameroon	-	-	-	-	-	-	-	-	*	*	*	0	82-84	3	0	0	DD
65000-65299	Nigeria	0	0	0	-	-	-	-	-	-	*	*	0	83-84	12	0	0	DD

/...

Table 1 (continued)

Country groups WMO St. Nos.	Country	74	75	76	77	78	79	80	81	82	83	84	85 a/	Drought-affected periods	Number of stations in 71	77	84	Affected by drought and desertification b/
65300-65349	Benin	0	0	0	d	0	0	0	-	0	d	-	-		6	6	0	DD
65350-65399	Togo	0	0	0	*	0	0	-	-	0	d	d	0	83-84	5	0	4	DD
65400-65499	Ghana	0	0	0	*	0	0	0	-	*	d	*	0	82-84	5	0	0	DD
65500-65525	Burkina Faso	0	0	0	0	0	*	-	0	0	d	*	0	83-84	7	7	0	DD
65526-65599	Côte d'Ivoire	0	0	0	d	0	0	0	-	0	d	*	-	83-84	11	11	0	DD
65600-65999	Liberia	0	0	-	-	-	0	0	*	0	d	d	-	83-84	2	0	1	DD
66000-66999	Angola	0	*	0	0	-	-	-	*	*	-	-	-	81-82	18	1	0	DD
67000-67199	Madagascar and Comoros	0	0	0	*	0	0	0	0	0	0	0	-		13	6	0	DD
67200-67399	Mozambique	0	0	0	0	0	0	0	*	d	*	0	-	81-83	8	0	7	DD
67400-67999	Zambia, Malawi and Zimbabwe	0	0	0	0	0	0	0	0	d	d	d	0	82-84	13	6	8	DD
68000-68999	South Africa, Botswana, Swaziland, Lesotho	0	0	0	0	0	0	0	*	d	d	d	d	81-85	23	18	15	

Notes: "d" denotes individual dry years with less than 60 per cent of normal precipitation for 50 per cent or more of the spatial extent of a subregion. A basic unit subregion was defined as a 500,000 km^2 area (approximately 5° latitude by 10° longitude in equatorial regions), 50 per cent of which corresponds to the minimum grid resolution used by numerical models to resolve large-scale atmospheric circulation features. Individual countries vary in size from one fifth to 10 such grid areas. An attempt was made to provide details on small countries, but generally they were classified by data available for a larger area. Ideally, 10 stations per 5° grid-box are required to reliably determine "d". As a minimum, one station per 5° grid still provides usable information. In regions where at least this density of stations was unavailable, estimates were attempted based on available surrounding data and climatological spatial continuity.

An asterisk (*) denotes years for which data were insufficient or not available but drought was probable - inferred from surrounding station data as available.

"0" denotes no drought; assessment based on in situ and/or surrounding station data as available.

A hyphen (-) denotes insufficient or no data to assess drought (d) or no drought (0).

The statistics on the number of stations which met the criteria applied for this drought analysis in the years 1971, 1977 and 1984 show a decline in the monthly CLIMAT reporting system owing to either a decrease in the total number of stations reporting or a decrease in the reliability in data reporting/exchange (i.e., increasing missing data). Note that countries are ordered sequentially according to WMO station numbers.

Normals were computed using data available during the period 1951-1980, with less than two months missing data per year. Stations with less than 15 years of data were not used.

a/ The 1985 assessment is based on preliminary data or reports as available.

b/ Country/region included in list of countries affected by drought and desertification (attached to 1985 preliminary report (A/40/392) submitted through the Economic and Social Council to the General Assembly at its fortieth session).

c/ One or more island reporting drought.

d/ One or more country reporting drought.

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C. Statistics on drought in the world (excluding Africa)

8. In the following tables, during the period 1974-1984, regions with two or more consecutive years with less than 60 per cent of normal annual rainfall are categorized as drought-affected. Owing to the lack of uniform spatial coverage by reliable stations, individual years could be: (a) an overestimate of drought conditions where only one station's data were available, or (b) an underestimate where data are completely missing. When possible, spatial interpolation was applied to identify possible drought years where data were missing for a particular location.

9. In 1985, drought conditions were experienced in the following countries: Brazil, Ecuador, Paraguay, Peru and the United States of America. Complete statistics are not yet available.

Table 2. Drought statistics: Asia

Country groups WMO St. Nos.	Country	74	75	76	77	78	79	80	81	82	83	84	Drought-affected periods	Number of stations in 71	77	84	Affected by drought and desertification a/
20000-33999	Union of Soviet Socialist Republics	0	0	d	0	0	d	0	-	-	-	d		94	92	78	DD
40350-40599	Saudi Arabia, Kuwait and other territories	*	*	0	-	d	d	0	-	0	0	d	78-79	5	2	2	DD
40600-40699	Iraq	-	-	-	*	*	d	-	-	-	-	-	77-79	0	0	0	DD
40700-40899	Iran (Islamic Republic of)	-	-	0	0	*	*	-	-	-	-	-	78-79	6	4	0	DD
40900-40999	Afghanistan	0	0	0	-	d	*	0	0	0	0	*	78-79	3	0	0	DD
41000-41499	Maldives	-	-	-	-	-	-	-	-	-	-	-		0	0	0	
41500-41999	Pakistan	-	0	0	0	d	*	d	d	0	0	d	78-81	11	1	10	DD
42000-42999	India (N. lat. 20°)	d	0	0	0	0	d	0	d	0	0	d		27	17	17	DD
43000-43399	India (S. lat. 20°)	d	0	0	0	0	0	d	0	0	0	0		16	14	13	DD
43400-43499	Sri Lanka	d	0	0	0	0	0	d	-	-	d	0		10	8	4	
44000-44199	Tibet	-	-	-	-	-	-	-	-	-	-	-		0	0	0	
44200-44399	Mongolia	0	0	0	0	d	d	d	0	d	0	-	78-80	44	44	0	DD
44400-44999	Nepal	*	0	0	-	0	*	0	-	0	-	-		0	0	0	
45000-45999	Territories of Hong Kong and Macao	0	0	0	d	0	0	0	0	0	0	0		2	2	1	
47000-47199	Democratic People's Republic of Korea, Republic of Korea	0	0	0	0	0	0	0	0	0	0	0		4	4	3	
47200-47999	Japan	0	0	0	0	0	0	0	0	0	0	d		36	36	36	
48000-48599	Burma, Thailand	0	0	-	0	0	d	0	0	0	0	-		15	4	0	
48600-48799	Malaysia, Singapore	0	0	0	0	0	0	0	0	0	0	0		6	6	4	
48800-49999	Viet Nam, Lao People's Democratic Republic and Democratic Kampuchea	0	-	-	-	-	*	-	-	-	-	-		7	0	0	
50000-59999	China	d	d	0	0	0	d	d	d	0	d	-	74-75, 79-81	21	18	0	DD

Notes: See table 1.

a/ Country/region included in list of countries affected by drought and desertification (attached to 1985 preliminary report (A/40/392) submitted through the Economic and Social Council to the General Assembly at its fortieth session).

Table 3. Drought statistics: North, Central and South America

Country groups WMO St. Nos.	Country	74	75	76	77	78	79	80	81	82	83	84	Drought-affected periods	Number of stations in 71	77	84	Affected by drought and desertification
70000-70999	United States of America (Alaska)	d	d	d	d	d	0	0	0	0	0	0	74-78	15	14	13	DD
71000-71999	Canada	0	0	0	0	0	0	0	d	0	d	0		48	48	47	
72000-72999	United States of America	d	0	d	d	0	0	0	d	d	d	0	76-77, 81-83	83	83	53	DD
76000-77999	Mexico	-	-	-	-	0	d	d	-	-	-	-	79-80	11	0	0	DD
78000-78574	Greater Antilles a/	d	0	d	d	0	0	d	0	0	d	C	76-77	7	4	2	
78575-78824	Central America b/	0	0	0	0	0	0	0	0	0	0	0		10	10	3	
78825-79999	Lesser Antilles c/	0	0	0	0	d	0	0	0	0	0	0		5	5	5	
80000-80999	Colombia, Venezuela	0	0	0	0	0	0	*	0	0	d	0		9	7	5	DD
81000-81999	Guyana, Suriname, French Guyana	0	0	0	0	0	0	0	0	0	0	0		4	1	1	
82000-83999	Brazil	0	0	0	0	0	0	0	0	0	d	0		22	25	23	DD
84000-84299	Equador	0	0	0	0	0	d	d	0	0	0	-	79-80	2	2	0	DD
84300-84999	Peru	0	d	d	0	d	d	d	-	-	-	0	75-76, 78-80	11	6	5	DD
85000-85399	Bolivia	0	-	-	0	0	0	0	0	0	d	0		9	9	8	DD
85400-85999	Chile	d	d	d	0	d	d	d	d	0	d	0	74-76, 78-81	12	9	9	DD
86000-86299	Paraguay	0	0	0	0	d	0	0	0	0	0	0		7	5	4	DD
86300-86999	Uruguay	0	0	0	0	0	*	0	0	0	0	0		3	3	6	
87000-87999	Argentina	C	0	*	0	d	d	0	0	0	d	0	78-79	52	11	28	DD

Notes: See table 1.

a/ Bermuda, Bahamas, Turks and Caicos Islands, Cuba, Cayman Islands, Jamaica, Haiti, Dominican Republic, Puerto Rico; "d" when one or more island/country reported drought conditions.

b/ Belize, Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, Panama.

c/ Clipperton, Saint Christopher and Nevis, Antigua and other United Kingdom-administered islands in the vicinity, Sint Maarten, Sint Eustatius, Saba, Saint Martin, Saint Barthelemy, Guadeloupe and other French-administered islands in the vicinity, Dominica, Martinique, Saint Lucia, Barabados, Trinidad and Tobago, Aruba, Curaçao, Bonaire.

Table 4. Drought statistics: Europe

Country groups WMO St. Nos.	Country	74	75	76	77	78	79	80	81	82	83	84	Drought-affected periods	Number of stations in 71	77	84	Affected by drought and desertification
01000-01999	Norway	0	0	0	0	0	0	0	0	0	[illegible]	0		12	11	10	
02000-02799	Sweden	0	0	0	-	0	-	0	0	0	0	0		10	0	9	
02800-02999	Finland	0	0	0	0	0	0	-	0	0	0	0		7	7	7	
03000-03949	United Kingdom of Great Britain and Northern Ireland	0	0	0	0	0	0	0	0	0	0	0		17	16	15	
03950-03999	Ireland	0	0	0	0	0	0	0	0	0	0	0		6	6	6	
04000-04099	Iceland	0	0	0	0	0	0	0	0	0	0	0		5	5	4	
04100-04999	Greenland	-	-	0	0	0	0	0	0	0	0	0		0	7	5	
05000-06599	Denmark, Netherlands, Belgium, Luxembourg	0	0	0	0	0	0	0	0	0	0	0		7	6	6	
06600-06999	Switzerland	0	0	0	0	0	0	0	0	0	0	0		4	4	4	
07000-07999	France	0	0	0	0	0	0	0	0	0	0	0		17	17	17	
08000-08599	Spain, Portugal	d	0	0	0	0	0	0	-	d	d	0	82-83	12	12	11	DD
10000-10999	German Democratic Republic, Federal Republic of Germany	0	0	d	0	0	0	0	0	0	0	0		12	12	12	
11000-11399	Austria	0	0	0	0	0	0	0	0	0	0	0		8	8	7	
11400-11999	Czechoslovakia	0	0	0	0	0	-	0	0	0	0	0		6	6	6	
12000-12699	Poland	0	0	0	0	0	0	0	0	d	0	0		8	8	7	
12700-12999	Hungary	0	0	0	0	0	0	0	0	0	0	0		6	6	6	
13000-13599	Yugoslavia	0	0	0	d	0	0	0	0	0	0	0		6	6	6	
13600-13999	Albania	-	-	-	-	-	-	-	-	-	-	-		0	0	0	
14000-15499	Romania	0	0	0	0	0	0	0	0	0	0	0		7	6	6	
15500-15999	Bulgaria	-	-	-	-	-	-	-	-	-	-	-		0	0	0	
16000-16559	Italy, Malta	d	0	0	d	0	0	0	d	0	0	0		15	15	14	
16600-16999	Greece	0	0	-	*	0	0	0	0	0	0	-		7	0	0	
17000-17599	Turkey	0	0	0	d	0	0	0	0	-	0	0		23	23	21	DD
17600-17619	Cyprus	-	-	-	-	-	-	-	-	-	-	-		1	0	0	
40000-40349	Syria, Lebanon, Israel, Jordan	0	0	d	d	d	d	0	0	0	0	0	76-79	15	10	10	DD

Notes: See table 1.

Table 5. Drought statistics: Pacific

Country groups WMO St. Nos.	Country	74	75	76	77	78	79	80	81	82	83	84	Drought-affected periods	Number of stations in 71	77	84	Affected by drought and desertification
90000-92999	Pacific Islands a/													61	51	28	
	Western (130°E-180°E)	d	d	0	0	d	0	0	0	0	d	d	74-75, 83-84				
	Eastern (130°W-180°W)	d	d	d	0	0	0	0	0	d	d	0	74-76, 82-83				
93000-93999	New Zealand	0	0	0	0	0	0	0	0	0	0	0		11	11	9	
94000-94199	Irian Jaya, Papua New Guinea and Australia (10°S-15°S)	0	0	d	0	0	*	0	0	0	*	0		18	17	6	DD
94200-94999	Australia (15°S-45°S)	0	0	d	d	0	d	d	0	d	*	0	76-77, 79-80, 82-83	322	321	38	DD
95000-97999	Brunei, Indonesia and others b/	0	0	0	0	0	0	0	0	d	d	0	82-83	5	15	6	
98000-98999	Philippines	0	0	*	-	d	0	0	0	0	0	0		9	0	6	

Notes: See table 1.

a/ Solomon Islands, Santa Cruz Islands, New Hebrides, New Caledonia, Kiribati, Tuvalu, Fiji, Tokelau, Samoa, Tonga, Cook Islands, French Polynesia; "d" indicates that one or more subregions in the Pacific experienced drought conditions.

b/ Adelie Land, Malaysia (Sarawak and Sabah), East Timor, Kiritimati Island, Cocos (Keeling) Islands.