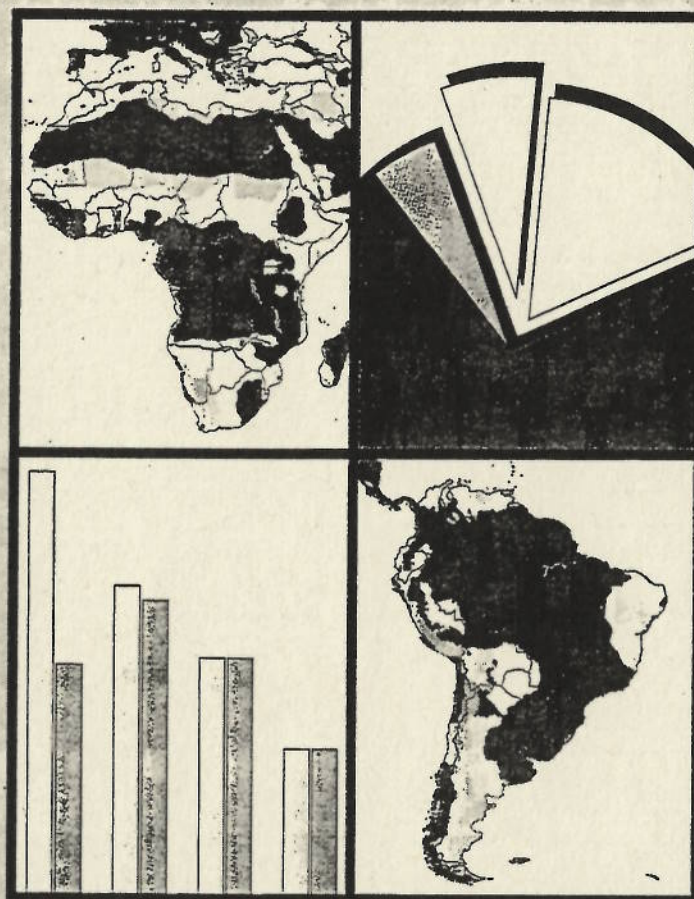




UNEP

An Assessment of Population Levels in the World's Drylands



ARIDITY ZONES AND DRYLAND POPULATIONS

Office to Combat Desertification and Drought (UNSO)



*Historical
Collection*

*This study was undertaken by UNSO
in collaboration with the World Resources Institute (WRI).
WRI is an independent policy research center based in Washington, D.C.*

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LIST OF ACRONYMS.

AI	Aridity Index
AZ	Aridity Zone
CCD	UN Convention to Combat Desertification
CIESIN	Consortium for International Earth Science Information Network
ESRI	Environmental Systems Research Institute
GEMS	Global Environmental Monitoring System
GIS	Geographic Information System
GRID	Global Resources and Information Database
ICRAF	International Centre for Research in Agroforestry
ISRIC	International Soil Reference and Information Centre
MRDD	Medium Resolution Demographic Database
NAP	National Action Programme
NCGIA	National Center for Geographic Information and Analysis
PET	Potential Evapotranspiration (mean annual)
PL	Productive Land (arid, semi-arid, dry subhumid, moist subhumid and humid lands)
PLVD	Productive Land Vulnerable to Desertification (arid, semi-arid, dry subhumid lands)
PPT	Precipitation (mean annual)
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific, and Cultural Organization
UNITAR	United Nations Institute for Training and Research
UNSO	UNDP Office to Combat Desertification and Drought
WAD	World Atlas of Desertification
WRI	World Resources Institute
WWW	World Wide Web

INTRODUCTION

The UN Convention to Combat Desertification (CCD), which entered into force on 26 December, 1996, provides the international community with a framework for sustainable development of drylands. It is founded on the principle that solutions for the problem of desertification and drought should emanate from the affected dryland populations, supported by partnerships with other concerned actors, both national and international. These solutions and supporting partnerships are undertaken within the National Action Programme (NAP) process as the main instrument for the implementation of the CCD at national level.

The orientation of these programmes must be based on accurate information about where desertification occurs, and how resources should be directed to have maximum impact on controlling desertification. Just as a ship without a rudder will run aground in dangerous waters, CCD programmes must be guided by adequate biophysical and socio-economic information about the nature and impact of desertification on human livelihoods.

This study provides regional statistics for the entire world and new country level statistics for Africa on the extent of drylands and population levels therein. The UNDP Office to Combat Desertification and Drought (UNSO) initiated this work in the context of its global work to help combat desertification and the effects of drought.

The central message is that better information about demographic distribution in the drylands is critical to understanding the interaction between man and the land. The main finding is that drylands, as defined within the CCD, are inhabited by a substantial number of people (approximately 2 billion). Of this number, an estimated 1.7 billion inhabitants threatened by desertification and drought are found in developing countries.

The results have several potential users, however the main target audience is that community at the national, sub-regional, regional and global levels having the task of raising awareness of the importance of the CCD to sustainable human development in the drylands.

Similar follow-up studies are being made for assessments of dryland extent and population levels in Asia and Latin America. We hope that this work will eventually contribute to a better analysis of the socio-economic impact of desertification, and improve our understanding of poverty as both a cause and a consequence.

We take this opportunity to express our sincere thanks to Daniel Tunstall, Jake Brunner and Sara Moola of the World Resources Institute for the excellent work they have done in assembling and processing the data, to Uwe Deichmann of the UN Department for Economic and Social Information and Policy Analysis for his comments and insights, and to my colleagues in UNSO, in particular Firouz Sobhani who initiated the work and Peter Gilruth, for drafting the text and providing overall support and guidance.



Samuel Nyambi
Director



**CCD programmes
must be guided
by accurate
information
about where
desertification
occurs.**


***Social, political,
economic, and
cultural factors that
strain the drylands
beyond ecologically
sustainable limits
are often the main
driving forces behind
desertification.***

1. BACKGROUND

Timely and adequate information to support decision-making is a critical element for dryland development. To this end, Article 17 (a) of the UN Convention to Combat Desertification calls on the scientific community to demonstrate the links between socioeconomic and biophysical factors of desertification. As stated in Article 1, desertification is not purely a climatological phenomenon. On the contrary, social, political, economic, and cultural factors that strain the drylands beyond ecologically sustainable limits are often the main driving forces.

To date, there have been several efforts to assess desertification at a global scale, initiated mainly by UNEP in collaboration with the International Soil Reference and Information Centre (ISRIC) in the Netherlands, the UN Food and Agriculture Organization (FAO), and other organizations. UNEP's work was presented in the World Atlas of Desertification (WAD) (UNEP, 1992). These results were useful in attracting world-wide attention to the extent of desertification, although the information presented is applicable mostly at a regional scale. Furthermore, there has been considerable discussion concerning which method should be used to determine the extent of drylands: is it better to use purely physical measures (climatic factors) or agricultural production potential (length of growing period). Moreover, these efforts did not report population statistics at the national level, which may serve as a proxy for pressure in many developing countries where populations are largely dependent on natural resources for their livelihood. Recent advances in information processing technology enable us to explore these relationships using a computer-based geographic information system (GIS).

Desertification is dryland degradation resulting from various factors, including climatic variations and human activities. Drylands are defined in the CCD as land falling within the arid, semi-arid, and dry sub-humid zones. Not covered by the CCD are hyper arid, moist sub-humid, and humid zones. UNESCO first used these aridity zones in 1977 to map the global distribution of arid regions.

This study reports area and population per aridity zone for the major regions and sub-regions of the world using low resolution data from the WAD. Country-level estimates are not given for Asia and Latin America because of the relatively coarse resolution of the climate data used to generate these zones. For purposes of comparison, we also report area and population per aridity zones for every country in Africa, with the exception of Madagascar and the small island states for which no data were available. We used a higher resolution data set compiled from a wide range of sources and which was produced using an advanced interpolation algorithm.

2. DATA AND METHODS

Climate Data

The WAD included a global aridity zone (AZ) map (Figure 1) based on a set of climate surfaces developed by UNEP/GEMS, UNEP/GRID, and the University of East Anglia's Climatic Research Centre. In addition to the six aridity zones used in the 1977 UNESCO map of the world distribution of aridity zones, the World Atlas of Desertification includes a cold zone covering areas

that are both arid and virtually uninhabited. The Atlas also merges the humid and moist sub-humid zones. The methodology for the WAD is described in a report published for UNEP by Deichmann and Eklundh (1991). The global aridity zone map is based on an aridity index (AI) derived from the ratio of mean annual precipitation (PPT) to mean annual potential evapotranspiration (PET). PET is "that amount of moisture that, if it were available, would be removed from a given land area by evaporation and transpiration" (Ahrens, 1982), and can be empirically derived from data on temperature (T) and length of daylight. PPT, T, and PET were calculated from climate station data acquired from 1950 through 1980. The global AZ map has a resolution of 0.5 decimal degree (approximately 50 km).

The table below gives the AI range for each AZ as defined by UNESCO and the corresponding length of growing period (LGP) and crop mix as reported in the Horn of Africa (van Velthuisen and Verelst, 1995). Note that the AI boundary between hyper-arid and arid was adjusted from 0.03 to 0.05 for the WAD to compensate for the underestimation of PET in hyper-arid environments.

TABLE 1: ARIDITY ZONE CHARACTERISTICS

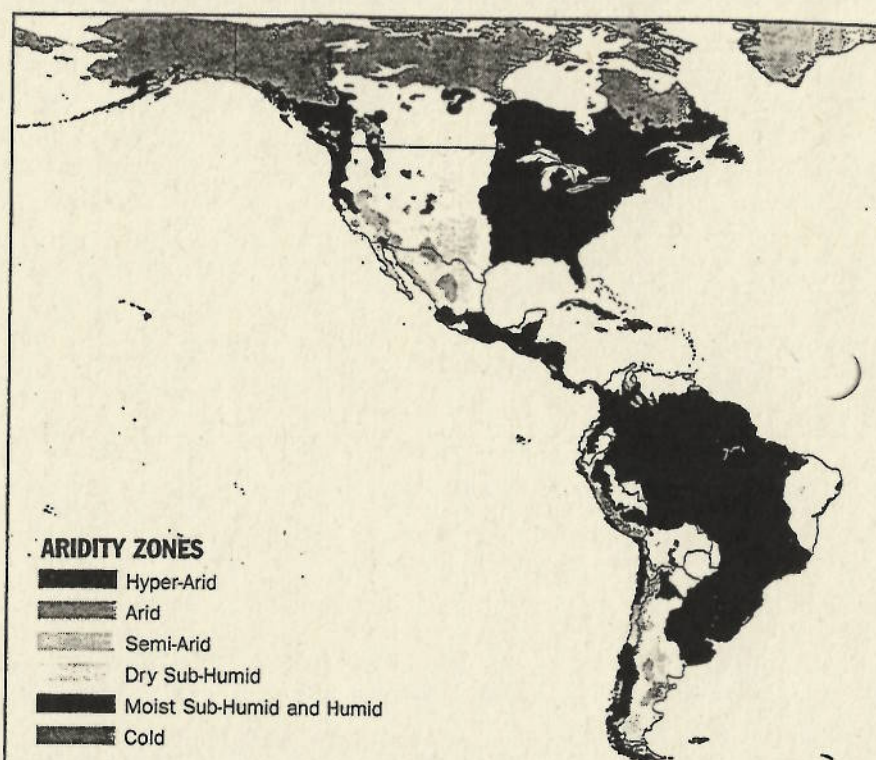
AZ	AI	LGP (days)	Typical crops
Hyper-arid	<0.05	0	No crops, no pasture
Arid	0.05-0.20	1-59	No crops, marginal pasture
Semi-arid	0.20-0.5	60-119	Bulrush millet, sorghum, sesame
Dry sub-humid	0.5-0.65	120-179	Maize, bean, groundnut, peas, barley, wheat, teff
Moist sub-humid	0.65-1	180-269	Maize, cotton, sweet potato, finger millet
Humid	>1	>270	Cassava, coffee, banana, enset, tea, sugar cane

Using the WAD climate surfaces, UNSO (1994) calculated the area per AZ for every country in Africa. This study found that "the number of weather stations is so low that the data become rather unreliable when used at the country level, particularly for smaller countries." As country level information is of interest to affected countries and the global community, there is justification for using higher resolution climate data to produce more accurate estimates of the distribution of population in dryland countries.

To generate climate statistics at the country level, WRI used a high resolution database, published on CD-ROM, comprising mean monthly PPT, PET, and minimum and maximum T. The data were developed by the International Center for Research in Agroforestry and Australian National University in collaboration with other universities and research centers (Corbett, 1995; Corbett and Kruska, 1994). The data were produced using an advanced interpolation algorithm incorporating latitude, longitude, and elevation. The incorporation of a continuous, spatially varying dependence on elevation is a critical factor in the accuracy of these data. They interpolate T to within 0.5 degrees Celsius and PPT to within 10-30% (Hutchinson et al., 1996). The interpolated data have a resolution of 0.05 decimal degree (approximately 5 km).

The climate data were compiled from a wide range of sources and over all

FIGURE 1: ARIDITY ZONES FOR THE WORLD (LOW RESOLUTION DATA)



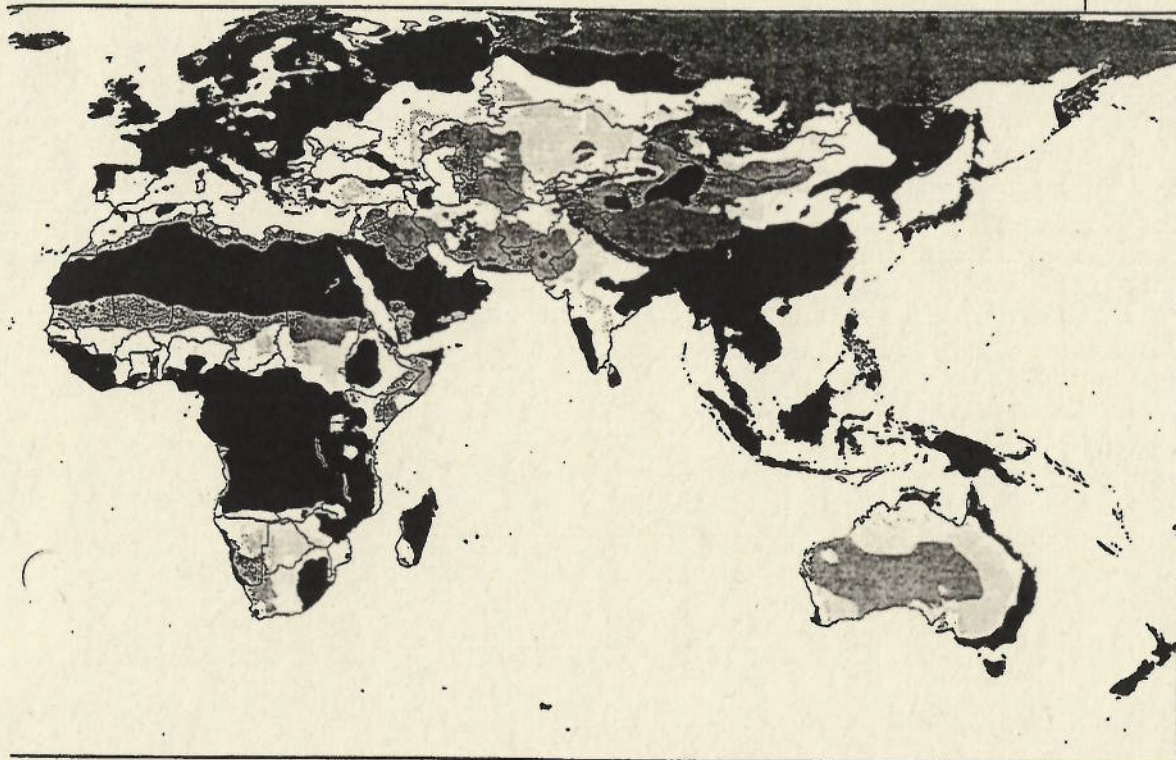
BASED ON: WORLD ATLAS OF DESERTIFICATION (UNEP 1992)

TABLE 2. AREA PER ARIDITY ZONE BY REGION AND SUB-REGION FOR THE WORLD (low resolution data).

(Area numbers are in thousands of square kilometers).

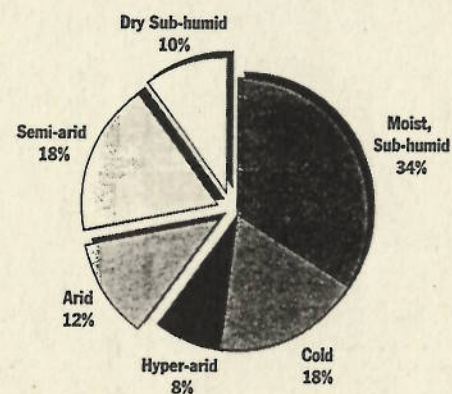
	HYPER-ARID	%	ARID	%	SEMI-ARID	%	DRY SUB-HUMID	%
AFRICA	8,099	27	5,052	17	5,073	17	2,808	9
AMERICAS & THE CARIBBEAN	268	1	1,201	3	7,113	17	4,556	11
ASIA	2,744	6	6,164	13	7,649	16	4,588	9
AUSTRALIA & OCEANIA	0	0	3,488	39	3,532	39	996	11
EUROPE	0	0	5	0	373	7	961	17
WORLD TOTAL	11,110	8	15,909	12	23,740	18	13,910	10

DRYLANDS = ARID, SEMI-ARID, AND DRY SUB-HUMID



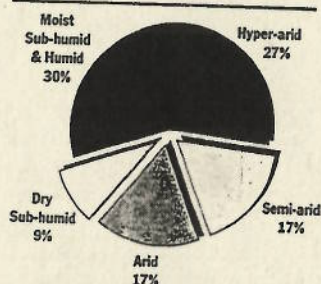
MOIST SUB-HUMID + HUMID	%	COLD	%	TOTAL
9,171	30	0	0	30,203
11,577	41	11,577	28	41,641
14,997	31	12,082	25	48,223
1,019	11	0	0	9,035
4,059	71	289	5	5,687
46,512	34	23,948	18	134,789

GLOBAL DISTRIBUTION OF ARIDITY ZONES

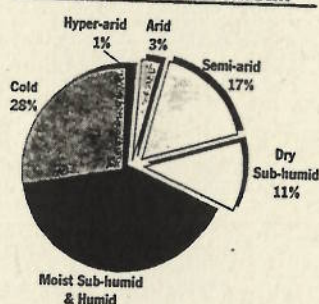


ARIDITY ZONE AREA BY REGION

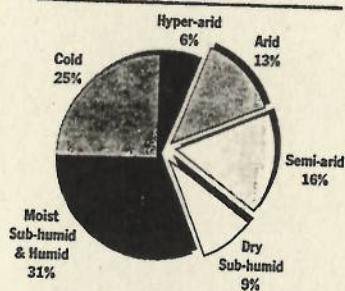
Africa



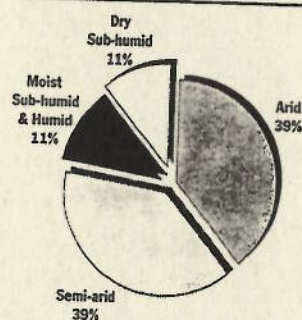
Americas & the Caribbean



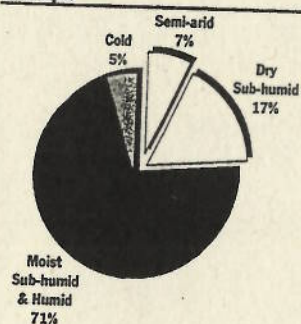
Asia



Australia & Oceania



Europe



available years of record to maximize spatial coverage, subject to the condition that PPT averages covered at least five years of record. Most data were collected between 1920 and 1990 so the surfaces can be interpreted as estimates of the standard means for this period. The number of stations from which data were obtained were 1,504 stations for daily minimum T, 1,499 for daily maximum T, and 6,051 for PPT. The criterion for the inclusion of stations in the WAD, however, was a continuous record of at least 20 years. As a result, fewer stations were used, the coverage was sparser, and the resolution of the interpolated data poorer.

Population Data

In 1995, the U.S. National Center for Geographic Information and Analysis (NCGIA) Global Demography Project produced a global population surface based on census data collected at the first and second sub-national administrative levels (Tobler et al., 1995). NCGIA compiled GIS boundaries and total population counts for approximately 19,000 administrative units for the entire world. The population counts were extrapolated to 1994.

The vector files for Africa were published separately in 1994 as a Medium Resolution Population Database for Africa (Deichmann, 1994). However, for copyright reasons, the production of a global database required the conversion of the polygon files to raster (gridded) surfaces. The population data have a resolution of 0.0833 decimal degree (approximately 10 km).

Data Processing

All processing was carried out using ESRI's ArcView GIS 3.0. Both the low and high resolution climate data were resampled to match the population data. The area and population per AZ for each country were calculated by superimposing the climate and population surfaces and country boundaries. Country boundaries were extracted from ESRI's ArcWorld CD-ROM.

Data Quality

This report does not address issues of data accuracy, however an identification of the possible sources of error is given. A more in-depth analysis of data quality related to climate and population data is given in Deichmann and Eklundh (1991) and Tobler et al. (1995) respectively.

As stated previously, the higher resolution database derives from mean temperature and precipitation values that were used for the WAD, with additional values from stations reporting less than 20 years of data collection. By relaxing the criteria for weather station data inclusion, additional

TABLE 3. POPULATION PER ARIDITY ZONE BY REGION AND SUB-REGION FOR THE WORLD (low resolution data).

(Population numbers are in thousands).

	HYPER-ARID	%	ARID
AFRICA	58,068	9	40,503
AMERICAS & THE CARIBBEAN	4,387	1	19,081
ASIA	29,506	1	161,554
AUSTRALIA & OCEANIA	0	0	275
EUROPE	0	0	629
WORLD TOTAL	91,961	2	222,042

DRYLANDS = ARID, SEMI-ARID, AND DRY SUB-HUMID

climate data became available to define the surface (Figure 2) (Corbett, 1995).

The population surface derives from the latest available national census data, which however varied by country from 1979 to 1994. Standard population growth models were used to derive estimates for 1994. Other sources of error include situations where internal strife has led to major redistribution of population (e.g. Rwanda, Somalia, former Yugoslavia, etc.) and situations where census results are altered for political reasons. The population surfaces were prepared at the second administrative level (zero level corresponding to the country level), however the size of the reporting units varies from one country to the next.

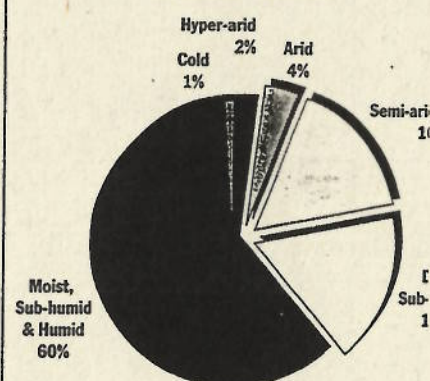
Certain of the maps used for building the population surfaces had inadequate documentation (date, map projection, etc.) which introduces error when gridding the population data for entry into the GIS.

Nevertheless, in spite of these shortcomings, the population surfaces developed are useful in that they can be combined with bio-physical data such as aridity, soils, vegetation cover, etc. which are most readily available in digital format.

3. RESULTS

The main finding of this study is that *drylands are inhabited by approximately 2.0 billion globally nearly, 40% of the world's population*. The extent of the drylands at the global level is impressive and brings to light important facts about their distribution. Globally, approximately 54 million sq. km or 40% of the land area, as shown in Figure 1 and Table 2, can be classified as drylands. The CCD considers arid, semi-arid, and dry sub-humid lands as drylands, but excludes hyper-arid land. At the regional scale, a large proportion of land falls within this category. Africa, which is dominated by the Sahara Desert in the North

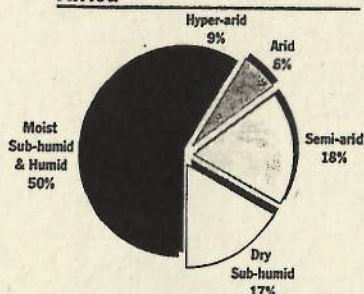
GLOBAL DISTRIBUTION POPULATION IN ARIDITY ZONES



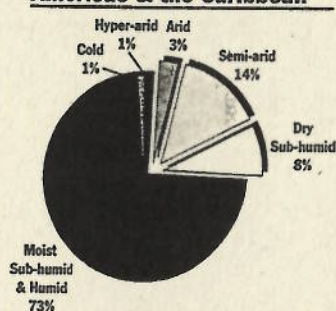
%	SEMI-ARID	%	DRY SUB-HUMID	%	MOIST SUB-HUMID + HUMID	%	COLD	%	TOTAL
6	117,649	18	109,370	17	326,129	50	0	0	651,719
3	100,753	14	58,120	8	510,820	73	10,359	1	703,520
5	625,411	18	657,899	19	1,942,210	56	29,902	1	3,446,483
1	1,342	5	5,318	19	20,447	75	0	0	27,380
6	28,716	5	115,216	20	417,026	74	8,573	2	566,161
4	873,871	16	941,923	17	3,216,632	60	49,834	1	5,395,263

ARIDITY ZONE POPULATION BY REGION

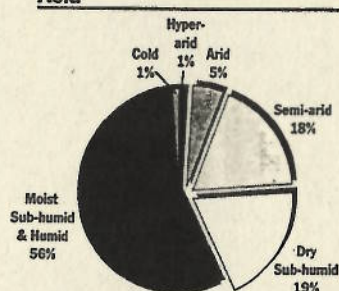
Africa



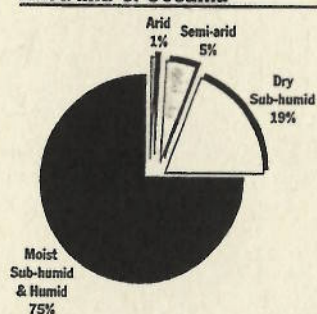
Americas & the Caribbean



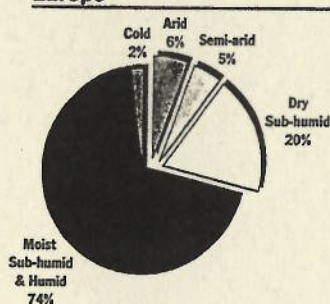
Asia



Australia & Oceania



Europe



and the Namibian and Kalahari Deserts in the South, contains a preponderance of hyper-arid and arid lands, which are mostly unsuitable for crops (see Table 1). In total, 43% of the land mass in Africa is dryland. Indeed, *these data demonstrate that Africa is relatively the driest of the continents*, not only in percentage, but also in terms of available moisture.

Similarly, Asia contains substantial drylands, with 39% of its total land mass included. Most of this land is in the arid and semi-arid categories and is found in Central Asia and Western China.

Surprisingly, even South America, which holds much of the world's rainforests, is 32% dryland.

Annex 1 provides detailed statistics on the area per aridity zone for the major regions and sub-regions of the world using these data.

Of great interest to the international community and Parties to the CCD is the fact that large populations live in the drylands, as shown in Table 3. When reporting population levels in the aridity zones, *we find that, overall, 37% of the world's population live in the arid, semi-arid, and dry subhumid lands* (Table 3). Asia has 42% of its total population living in the drylands, Africa has 41%, and South America has 30%. Annex 2 provides detailed statistics on population levels in aridity zones for the major regions and sub-regions of the world. Country level figures are not given because of the relatively coarse resolution of the data.

When population levels are compared with area calculations, as shown in Figure 2, we see that semi-arid and dry sub-humid lands are preferred habitat within the drylands. As we might expect, population density generally increases with humidity.

In Asia, nevertheless, we find high population density levels even in the arid lands. This fact may be partly due to extensive irrigation of drylands in Asia, although the overall higher population density is the determinant factor.

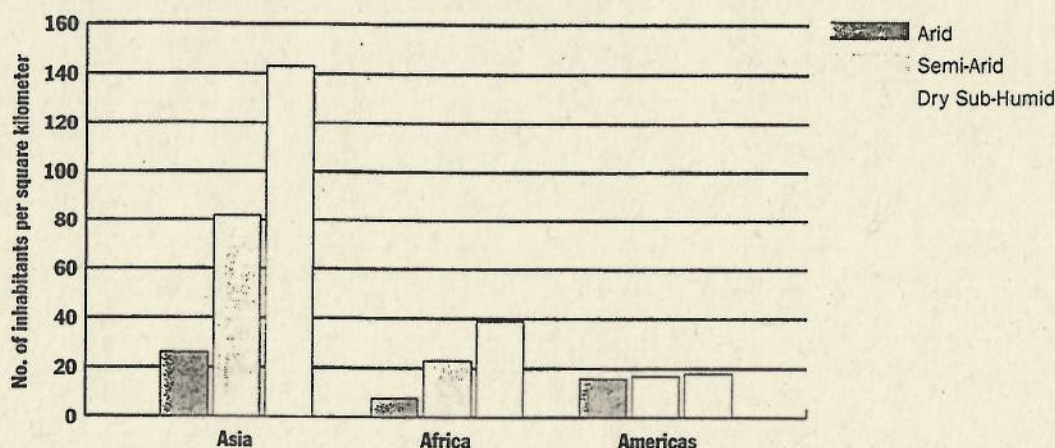
The results of calculating the aridity zones for Africa using the higher resolution climate data are mapped in Figure 3. The accompanying country-level statistics are presented in Table 4. A cursory glance shows that many countries in the Sahara-Sahel region (Egypt, Mauritania, Morocco, Niger, etc.) and in southern Africa (Botswana and Namibia) are entirely within the drylands and suffer from a chronic lack of rainfall. On the other hand, certain countries such as Côte d'Ivoire, Sierra Leone, and Zaire contain insignificant dryland area.

Figure 4 maps the distribution of population within Africa's drylands, whereas Table 5 presents population statistics per aridity zone for every sub-region and country in Africa. We find that in countries such as Nigeria, that population density does increase with moisture availability, as only 38% of the population inhabit the drylands, which cover 52% of its territory. On the other hand, the trend is different in Tanzania, where 51% of the population inhabit its drylands, which in turn cover 51% of the country.

When comparing the results from using high and low resolution data, we note that the numbers in Tables 4 and 5 differ somewhat from those in Annexes 1 and 2. A summary of these differences is presented in Table 6 which compares the area per aridity zone comprising drylands, as a proportion of the land area, for the five sub-regions in Africa using the low and high resolution climate data.

Africa-wide, there is only a small difference between *total* dryland areas estimated using the low and high resolution data (43% and 45%, respectively).

FIGURE 2: POPULATION DENSITY IN DRYLANDS



Differences by *aridity zone* are also minor, although, the differences in dryland area by *sub-region* are larger. An interesting trend is that the results using the higher resolution data place increased emphasis on Eastern and Southern Africa in terms of their relative degree of aridity when compared to other regions in Africa.

The above results are useful in that they serve as a reference for reporting dryland status at the national level.

To deepen our understanding of the usefulness of these results, we used exploratory data analysis to derive a rough indicator of desertification risk from these data. It is logical to assume that, in principle, countries with a high proportion of their agriculturally productive land¹ (PL) located in dry areas will be prone to drought and dryland degradation. Note that hyper-arid lands are excluded. To calculate this proportion, we define:

• **Productive Land Vulnerable to Desertification (PLVD) =**
Arid, Semiarid, and Dry subhumid land

• **Productive Land (PL) =** Arid, Semiarid, Dry subhumid,
Moist subhumid and Humid lands

Similarly, we can assume that those countries with a high proportion of their population in the drylands should also be at risk to dryland degradation. We therefore calculate the percentage of dryland population to population in the productive land (PL), and as a percentage to total population within the country:

• **PLVD Population (PLVDPOP) =** Population level with the drylands

• **PL Population (PLPOP) =** Population level within agriculturally productive lands

For example, Table 7 gives the PL and PLVD for every country in Africa. The indicator of drought and desertification risk, PLVD/PL is calculated for each country in Africa, as well as its percentage of total area to give an idea of the

¹In this context, productive land refers to productivity under rainfed conditions. Although hyper-arid lands are not addressed in the CCD, they can become productive under irrigation. Note that over 90 million people live in hyper-arid lands (e.g. hyper-arid lands located in the flood plain of the Nile River in Egypt), practising irrigated agriculture, mining, etc.

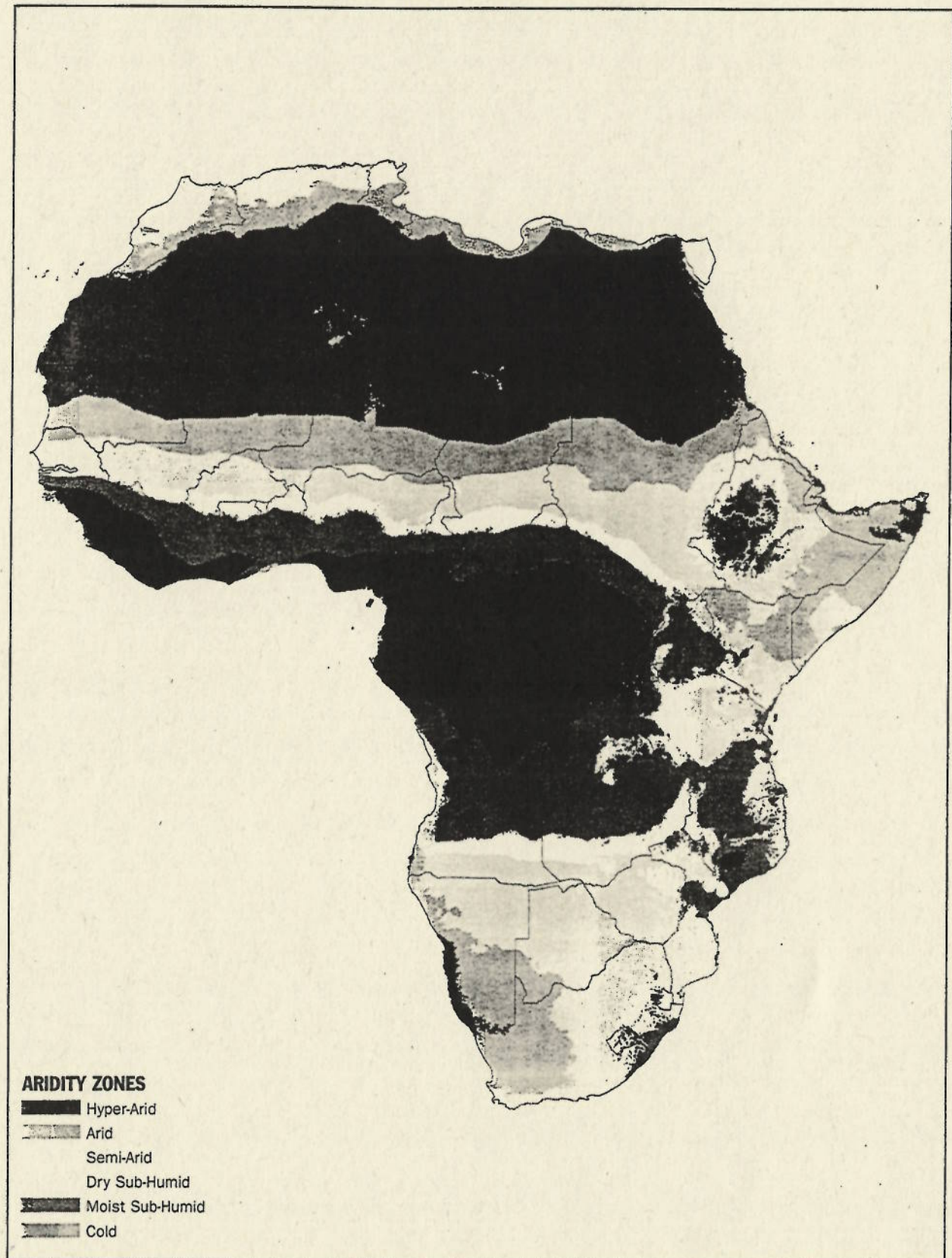
TABLE 4. AREA PER ARIDITY ZONE BY SUB-REGION AND COUNTRY FOR AFRICA (HIGH RESOLUTION DATA).

(Area numbers are in thousands of square kilometers).

	HYPER-ARID		ARID		SEMI-ARID		DRY SUB-HUMID		MOIST SUB-HUMID		HUMID		TOTAL
		%		%		%		%		%		%	
NORTHERN AFRICA													
Algeria	1,903	82	202	9	180	8	28	1	5	0	0	0	2,318
Egypt	877	95	46	5	0	0	0	0	0	0	0	0	923
Libya	1,439	89	163	10	13	0	0	0	0	0	0	0	1,615
Morocco	54	13	159	39	179	44	11	3	0	0	0	0	403
Tunisia	43	27	70	45	39	25	4	3	0	0	0	0	156
Western Sahara	420	100	0	0	0	0	0	0	0	0	0	0	420
TOTAL	4,736	81	640	11	410	7	43	0	6	0	0	0	5,834
WESTERN AFRICA													
Benin	0	0	0	0	37	32	26	23	52	45	0	0	115
Burkina Faso	0	0	14	5	188	69	58	21	14	5	0	0	274
Chad	432	37	306	26	254	22	123	11	51	4	0	0	1,165
Côte d'Ivoire	0	0	0	0	0	0	0	0	201	62	121	38	321
Gambia	0	0	0	0	3	33	7	67	0	0	0	0	11
Ghana	0	0	0	0	9	4	56	23	131	54	44	19	240
Guinea	0	0	0	0	0	0	7	3	80	33	159	65	246
Guinea-Bissau	0	0	0	0	0	0	0	0	16	50	16	50	33
Liberia	0	0	0	0	0	0	0	0	0	0	91	100	91
Mali	583	46	310	25	269	21	62	5	29	2	0	0	1,253
Mauritania	723	70	291	28	26	3	0	0	0	0	0	0	1,040
Niger	625	53	482	41	77	7	0	0	0	0	0	0	1,184
Nigeria	0	0	34	4	298	33	136	15	281	31	162	18	911
Senegal	0	0	28	14	116	59	30	15	23	12	0	0	198
Sierra Leone	0	0	0	0	0	0	0	0	0	0	73	100	73
Togo	0	0	0	0	0	0	9	15	47	82	2	3	58
TOTAL	2,363	33	1,465	20	1,278	18	514	7	925	13	668	9	7,213
CENTRAL AFRICA													
Cameroon	0	0	6	1	37	8	35	8	62	13	325	70	464
CAR	0	0	0	0	29	5	43	7	405	65	142	23	619
Congo	0	0	0	0	0	0	0	0	5	1	340	99	345
Equatorial Guinea	0	0	0	0	0	0	0	0	0	0	26	100	26
Gabon	0	0	0	0	0	0	0	0	0	0	262	100	262
Zaire	0	0	0	0	0	0	65	3	614	26	1,654	71	2,334
TOTAL	0	0	6	0	66	2	144	4	1,086	27	2,749	68	4,050
EASTERN AFRICA													
Burundi	0	0	0	0	0	0	1	5	22	82	3	13	27
Djibouti	3	14	18	85	0	1	0	0	0	0	0	0	22
Ethiopia	5	0	381	30	386	31	158	13	218	17	102	8	1,251
Kenya	0	0	219	38	238	41	48	8	65	11	13	2	583
Rwanda	0	0	0	0	0	0	5	19	15	57	6	24	25
Somalia	94	15	421	66	123	19	0	0	0	0	0	0	638
Sudan	775	31	630	25	776	31	162	6	143	6	0	0	2,487
Tanzania	0	0	0	0	225	24	352	37	348	37	20	2	944
Uganda	0	0	0	0	20	8	41	17	172	71	10	4	243
TOTAL	878	14	1,670	27	1,768	28	767	12	983	16	155	2	6,220
SOUTHERN AFRICA													
Angola	4	0	23	2	263	21	177	14	689	55	98	8	1,253
Botswana	0	0	55	9	529	91	0	0	0	0	0	0	584
Lesotho	0	0	0	0	2	6	15	48	12	39	2	6	30
Malawi	0	0	0	0	3	2	60	50	53	44	4	3	119
Mozambique	0	0	0	0	196	25	216	28	344	44	29	4	785
Namibia	78	8	335	34	569	58	0	0	0	0	0	0	982
South Africa	15	1	410	34	569	47	150	12	78	6	0	0	1,222
Swaziland	0	0	0	0	5	28	9	50	4	22	0	0	17
Zambia	0	0	0	0	121	16	242	32	385	51	6	0	754
Zimbabwe	0	0	2	0	323	84	56	15	0	0	1	0	384
TOTAL	96	2	823	13	2,579	42	924	15	1,565	26	141	2	6,129
AFRICA TOTAL	8,072	27	4,604	16	6,100	21	2,392	8	4,565	16	3,714	13	29,447

SOURCE DATA: CORBETT ET AL. (1996)

FIGURE 3: ARIDITY ZONES FOR AFRICA (HIGH RESOLUTION DATA)



NOTE: DATA NOT AVAILABLE FOR MADAGASCAR, ISLAND STATES, AND THE SINAI.

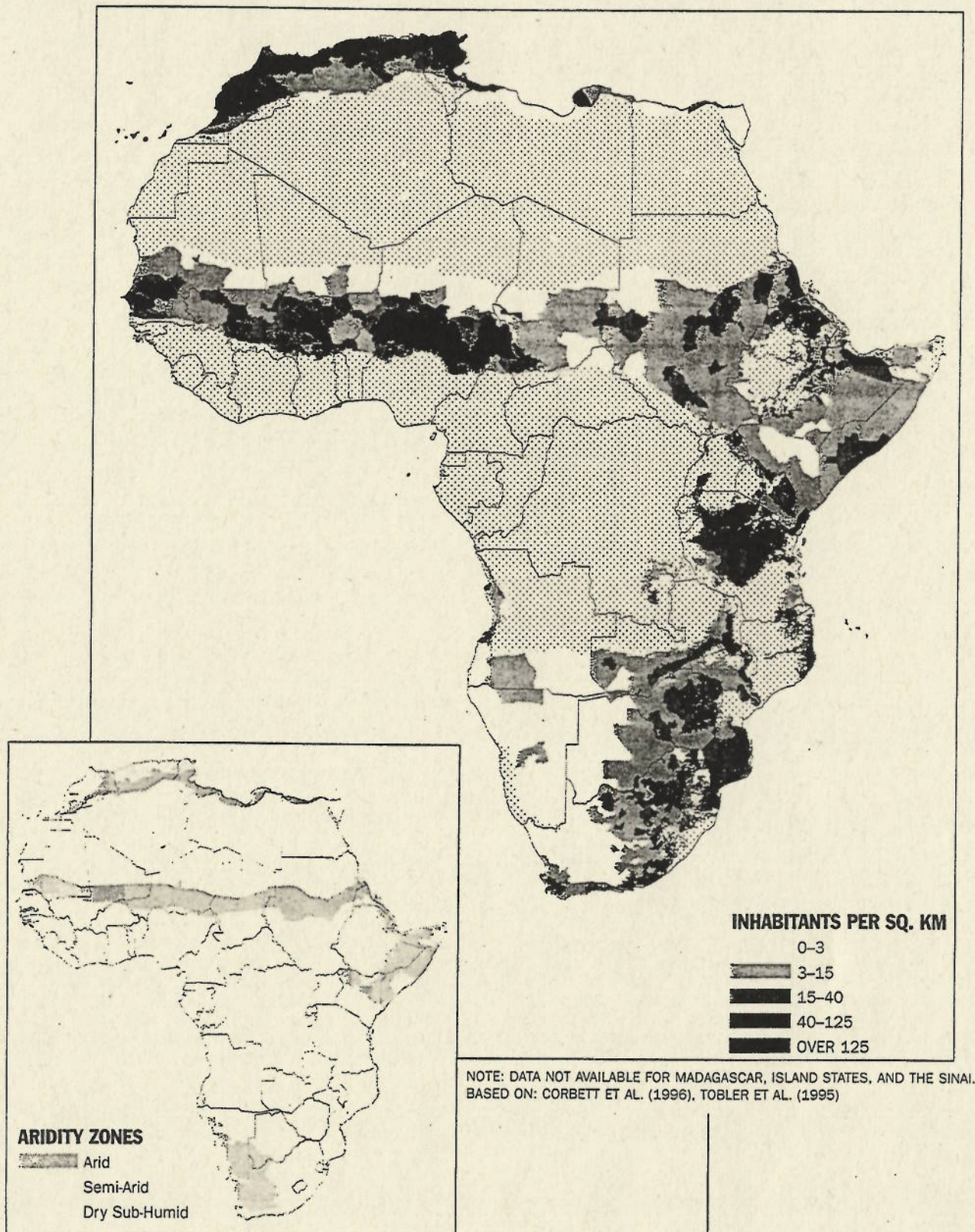
TABLE 5. POPULATION PER ARIDITY ZONE BY SUB-REGION AND COUNTRY FOR AFRICA (HIGH RESOLUTION DATA).

(Population numbers are in thousands).

	HYPER-ARID		ARID		SEMI-ARID		DRY SUB-HUMID		MOIST SUB-HUMID		HUMID		TOTAL
		%		%		%		%		%		%	
NORTHERN AFRICA													
Algeria	1,775	7	2,131	8	13,221	49	8,736	32	1,258	5	0	0	27,120
Egypt	48,721	90	5,650	10	0	0	0	0	0	0	0	0	54,371
Libya	1,657	32	2,983	58	471	9	0	0	0	0	0	0	5,110
Morocco	549	2	4,331	16	20,123	74	1,968	7	40	0	0	0	27,011
Tunisia	174	2	2,725	32	4,967	59	527	6	0	0	0	0	8,393
Western Sahara	245	100	0	0	0	0	0	0	0	0	0	0	245
TOTAL	53,122	43	17,820	15	38,781	32	11,230	9	1,298	1	0	0	122,251
WESTERN AFRICA													
Benin	0	0	0	0	854	25	468	14	2,098	61	0	0	3,420
Burkina Faso	0	0	210	2	7,824	77	1,858	18	281	3	0	0	10,173
Chad	148	2	1,149	18	2,200	35	1,825	29	958	15	0	0	6,279
Côte d'Ivoire	0	0	0	0	0	0	0	0	5,312	40	7,976	60	13,288
Gambia	0	0	0	0	154	18	696	82	0	0	0	0	849
Ghana	0	0	0	0	432	3	2,642	21	4,621	37	4,668	38	12,364
Guinea	0	0	0	0	0	0	90	1	1,541	25	4,575	74	6,206
Guinea-Bissau	0	0	0	0	0	0	0	0	451	44	567	56	1,018
Liberia	0	0	0	0	0	0	0	0	0	0	2,661	100	2,661
Mali	215	2	1,547	16	6,039	62	1,433	15	506	5	0	0	9,740
Mauritania	598	27	1,320	60	266	12	0	0	0	0	0	0	2,184
Niger	205	2	4,947	56	3,631	41	0	0	0	0	0	0	8,783
Nigeria	0	0	1,111	1	25,725	27	9,303	10	23,521	25	36,317	38	95,977
Senegal	0	0	520	7	5,768	75	681	9	710	9	0	0	7,678
Sierra Leone	0	0	0	0	0	0	0	0	0	0	4,478	100	4,478
Togo	0	0	0	0	0	0	944	24	2,840	72	141	4	3,925
TOTAL	1,165	0	10,804	6	52,894	28	19,939	11	42,839	23	61,384	32	189,025
CENTRAL AFRICA													
Cameroon	0	0	23	0	2,017	15	1,077	8	1,102	8	9,430	69	13,649
CAR	0	0	0	0	147	5	124	4	1,722	55	1,165	37	3,159
Congo	0	0	0	0	0	0	0	0	115	5	2,407	95	2,522
Equatorial Guinea	0	0	0	0	0	0	0	0	0	0	355	100	355
Gabon	0	0	0	0	0	0	0	0	0	0	1,365	100	1,365
Zaire	0	0	0	0	0	0	744	2	10,309	25	29,855	73	40,908
TOTAL	0	0	23	0	2,164	3	1,945	3	13,248	21	44,577	72	61,957
EASTERN AFRICA													
Burundi	0	0	0	0	0	0	235	4	4,775	80	926	16	5,938
Djibouti	13	3	421	97	2	0	0	0	0	0	0	0	436
Ethiopia	31	0	3,846	7	10,541	19	9,170	16	23,565	42	9,564	17	56,717
Kenya	0	0	745	3	5,681	22	3,576	14	12,043	47	3,459	14	25,503
Rwanda	0	0	0	0	0	0	808	10	4,784	61	2,275	29	7,868
Somalia	790	8	5,743	60	3,017	32	0	0	0	0	0	0	9,551
Sudan	3,562	13	10,752	39	10,356	37	1,638	6	1,309	5	4	0	27,621
Tanzania	0	0	0	0	6,516	23	10,724	38	10,065	36	831	3	28,135
Uganda	0	0	1	0	316	2	2,464	14	14,701	81	642	4	18,125
TOTAL	4,397	2	21,507	12	36,429	20	28,616	16	71,243	40	17,701	10	179,893
SOUTHERN AFRICA													
Angola	6	0	55	0	2,666	23	899	8	7,035	61	957	8	11,618
Botswana	0	0	20	1	1,483	99	0	0	0	0	0	0	1,503
Lesotho	0	0	0	0	131	7	1,028	53	697	36	89	5	1,945
Malawi	0	0	0	0	298	3	5,623	54	3,980	38	552	5	10,453
Mozambique	0	0	0	0	4,231	25	4,910	29	6,752	40	959	6	16,852
Namibia	35	2	308	20	1,179	77	0	0	0	0	0	0	1,522
South Africa	39	0	1,064	3	23,262	58	7,385	18	8,629	21	4	0	40,382
Swaziland	0	0	0	0	184	22	448	53	221	26	0	0	854
Zambia	0	0	0	0	1,746	20	2,895	33	4,128	47	30	0	8,798
Zimbabwe	0	0	17	0	7,515	68	3,264	29	283	3	35	0	11,113
TOTAL	80	0	1,463	1	42,696	41	26,452	25	31,724	30	2,625	2	105,040
AFRICA TOTAL	58,764	9	51,617	8	172,964	26	88,182	13	160,351	24	126,287	19	658,165

SOURCE DATA: CORBETT ET AL. (1996) AND TOBLER (1995)

**FIGURE 4: ARIDITY ZONES AND POPULATION WITHIN DRYLANDS OF AFRICA
(HIGH RESOLUTION DATA)**



**TABLE 6: DRYLAND AREA BY ARIDITY ZONE AND SUB-REGION IN AFRICA
USING LOW AND HIGH RESOLUTION DATA (percentage of total area)**

	Arid		Semi-arid		Dry sub-humid		Total dryland	
	Low	High	Low	High	Low	High	Low	High
Northern Africa	16%	11%	7%	7%	2%	1%	24%	20%
Western Africa	23%	20%	19%	18%	12%	7%	54%	45%
Central Africa	0%	0%	1%	2%	3%	4%	4%	6%
Eastern Africa	24%	27%	22%	28%	10%	12%	56%	67%
Southern Africa	12%	13%	28%	42%	17%	15%	57%	70%
Total Africa	17%	16%	17%	21%	9%	8%	43%	45%

overall importance of the drylands. The numbers show that 18 African countries have over 90% of their potentially productive land located in drylands. Egypt, for example, has all of its productive land in the dryland, therefore the PLVD/PL indicator is 100%. However, since most of Egypt is hyper-arid, the drylands only occupy a small percentage of the territory. Botswana, on the other hand, also has an indicator of 100%, and all of its territory falls within the drylands

Performing a similar analysis with the population data gives us the results shown in Table 8. Looking at Egypt again, we see that all of its productive land population is in the drylands (hence, PLVDPOP/PLPOP = 100%). Since most of Egypt's population lives along the Nile River and is dependent on irrigated agriculture, the dryland population is only 10% of the total. To better understand the usefulness of the indicator developed here, it is necessary to look at both statistics. Figure 5 graphically presents these findings for selected African countries.

4. POTENTIAL USES AND LIMITATIONS

The results from this study are intended to serve as a reference for those who need to know which countries may be vulnerable to desertification. For example, at the national level, the statistics can be used to demonstrate to policy makers the importance of drylands geographically and demographically. For similar reasons, useful comparisons with other countries can be made. At the regional level, the results can be used to increase awareness within those international development communities that support dryland management.

To prioritize areas for action requires additional analyses to understand the interaction between people and the land, particularly at the local level where actions to combat desertification must originate. Thus, an assessment of land degradation is best pursued in an iterative manner, beginning with a preliminary assessment of where economic loss or social disruption is most apparent, and gathering more detailed information as needed to define the proper response to the problem.

The results from this study are intended to serve as a reference for those who need to know which countries may be vulnerable to desertification.

Limitations of Climate Data for Assessing Desertification Risk

Aridity zones are useful for categorizing lands by atmospheric moisture availability, but by themselves, do not give sufficient information to characterize drought and/or desertification susceptibility.

Because the aridity zones have been defined using climate data averaged over at least 30 years, they do not capture climate variability, a predominant characteristic of drylands. Climate variability can be both temporal and spatial in nature. Drylands with high temporal variability in rainfall are naturally more drought prone, and successive years of drought can trigger desertification in lands pushed beyond their productive capacity. Even mean annual rainfall can be misleading, as high intra-annual variation can lead to situations when total annual rainfall reaches or exceeds the average but may be inadequate for plant growth. For example, if rainfall occurs in a single event, there may be insufficient vegetation growth to support agricultural production.

Spatial variability in precipitation can be equally important in determining drought and desertification susceptibility. Even when countries experience above average rainfall, a particular locality may be in deficit. Assessing spatial variability is a priority for several on-going programmes that provide early warning of drought and potential food shortages.

Although it was not an objective of this study to assess climatic variability in the drylands, sufficient data exist from both weather stations and satellite remote sensing to perform such analyses at regional, national, and local levels.



The statistics

can be used to

demonstrate to

policy makers

the importance

of drylands geo-

graphically and

demographically.

FIGURE 5: DESERTIFICATION RISK FOR SELECTED COUNTRIES

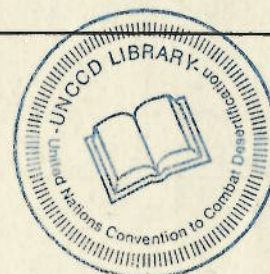
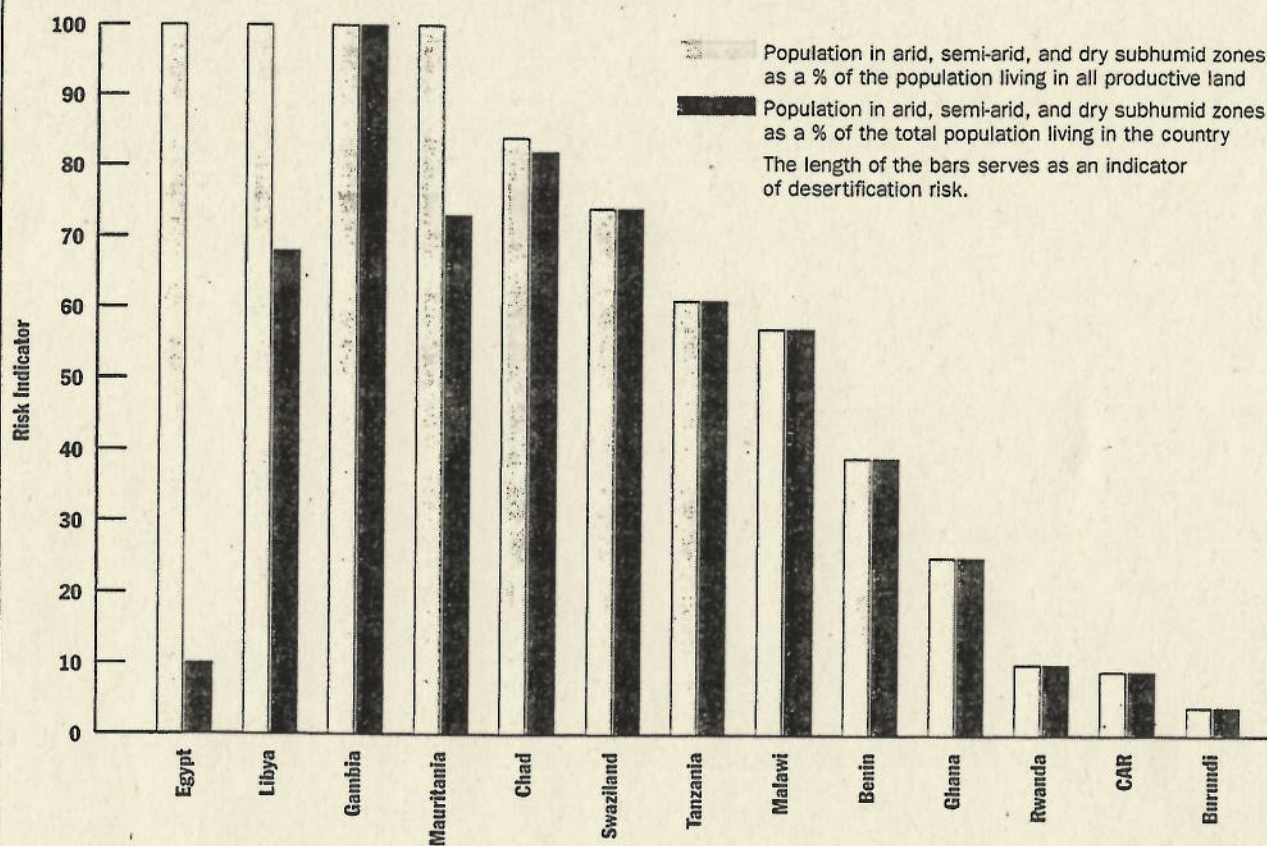


TABLE 7. AREA OF PRODUCTIVE LAND (PL) AND PRODUCTIVE LAND VULNERABLE TO DESERTIFICATION (PLVD) BY COUNTRY FOR AFRICA (HIGH RESOLUTION DATA).
(Area numbers are in thousands of square kilometers).

	TOTAL AREA	PL	PLVD	PLVD/PL (%)	PLVD/TOTAL AREA (%)
Egypt	923	46	46	100	5
Libya	1,615	176	176	100	11
Tunisia	156	113	113	100	73
Gambia	11	11	11	100	100
Mauritania	1,040	317	317	100	30
Niger	1,184	559	559	100	47
Djibouti	22	19	19	100	86
Somalia	638	544	544	100	85
Botswana	584	584	584	100	100
Namibia	982	904	904	100	92
Morocco	403	349	349	100	87
Zimbabwe	384	384	381	99	99
Algeria	2,318	415	410	99	18
Mali	1,253	671	641	96	51
Burkina Faso	274	274	260	95	95
South Africa	1,222	1,207	1,129	93	92
Chad	1,165	733	682	93	59
Sudan	2,487	1,711	1,568	92	63
Senegal	198	198	175	88	88
Kenya	583	583	505	87	87
Swaziland	17	17	13	78	78
Ethiopia	1,251	1,246	925	74	74
Tanzania	944	944	576	61	61
Benin	115	115	64	55	55
Lesotho	30	30	16	55	55
Malawi	119	119	63	52	52
Mozambique	785	785	411	52	52
Nigeria	1,184	911	468	51	39
Zambia	754	754	363	48	48
Angola	1,253	1,249	462	37	37
Ghana	240	240	65	27	27
Uganda	243	243	61	25	25
Rwanda	25	25	5	19	19
Cameroon	464	464	78	17	17
Togo	58	58	9	15	15
CAR	619	619	72	12	12
Burundi	27	27	1	5	5
Guinea	246	246	7	3	3
Zaire	2,334	2,334	65	3	3
Côte d'Ivoire	321	321	0	0	0
Guinea-Bissau	33	33	0	0	0
Liberia	91	91	0	0	0
Sierra Leone	73	73	0	0	0
Congo	345	345	0	0	0
Equatorial Guinea	26	26	0	0	0
Gabon	262	262	0	0	0
TOTAL for Africa	29,300	21,375	13,097	61	45

PL IS ALL LAND EXCEPT LAND IN THE HYPER-ARID ZONE
PLVD IS THE SUM OF LAND IN THE ARID, SEMI-ARID, AND DRY SUB-HUMID ZONES.
BASED ON CORBETT AND KRUSKA, 1994.

TABLE 8. POPULATION IN PRODUCTIVE LAND (PLPOP) AND PRODUCTIVE LAND VULNERABLE TO DESERTIFICATION (PLVDPPOP) FOR AFRICA (HIGH RESOLUTION DATA). (Population numbers are in thousands).

	TOTALPOP	PLPOP	PLVDPPOP	PLVDPPOP/PLPOP (%)	PLVDPPOP/TOTALPOP
Egypt	54,371	5,650	5,650	100	10
Libya	5,110	3,454	3,454	100	68
Tunisia	8,393	8,219	8,219	100	98
Gambia	849	849	849	100	100
Mauritania	2,184	1,587	1,587	100	73
Niger	8,783	8,578	8,578	100	98
Djibouti	436	423	423	100	97
Somalia	9,551	8,760	8,760	100	92
Botswana	1,503	1,503	1,503	100	100
Namibia	1,522	1,487	1,487	100	98
Morocco	27,011	26,461	26,421	100	98
Burkina Faso	10,173	10,173	9,892	97	97
Zimbabwe	11,113	11,113	10,796	97	97
Algeria	27,120	25,345	24,087	95	89
Mali	9,740	9,526	9,020	95	93
Sudan	27,621	24,059	22,745	95	82
Senegal	7,678	7,678	6,968	91	91
Chad	6,279	6,131	5,174	84	82
South Africa	40,382	40,343	31,711	79	79
Swaziland	854	854	632	74	74
Tanzania	28,135	28,135	17,240	61	61
Lesotho	1,945	1,945	1,159	60	60
Malawi	10,453	10,453	5,921	57	57
Mozambique	16,852	16,852	9,141	54	54
Zambia	8,798	8,798	4,641	53	53
Ethiopia	56,717	56,686	23,556	42	42
Kenya	25,503	25,503	10,002	39	39
Benin	3,420	3,420	1,323	39	39
Nigeria	95,977	95,977	36,139	38	38
Angola	11,618	11,612	3,620	31	31
Ghana	12,364	12,364	3,074	25	25
Togo	3,925	3,925	944	24	24
Cameroon	13,649	13,649	3,117	23	23
Uganda	18,125	18,125	2,782	15	15
Rwanda	7,868	7,868	808	10	10
CAR	3,159	3,159	271	9	9
Burundi	5,938	5,938	236	4	4
Zaire	40,908	40,908	744	2	2
Guinea	6,206	6,206	90	1	1
Côte d'Ivoire	13,288	13,288	0	0	0
Guinea-Bissau	1,018	1,018	0	0	0
Liberia	2,661	2,661	0	0	0
Sierra Leone	4,478	4,478	0	0	0
Congo	2,522	2,522	0	0	0
Equatorial Guinea	355	355	0	0	0
Gabon	1,365	1,365	0	0	0

TOTAL for Africa **657,921** **599,401** **312,763** **52** **48**

PL IS ALL LAND EXCEPT LAND IN THE HYPER-ARID ZONE.

PLVD IS THE SUM OF LAND IN THE ARID, SEMI-ARID, AND DRY SUB-HUMID ZONES.

BASED ON CORBETT AND KRUSKA, 1994; AND TOBLER, 1995.


***As improved data
become available,
more reliable
conclusions can
be generated to
support informed
decision making in
the area of dryland
management.***

Limitations of Population Data for Assessing Desertification Vulnerability

In isolation, population may be misleading as an indicator of desertification risk. Political and socioeconomic factors are often the main drivers of land degradation, irrespective of population density. Indeed, recent studies show that given the right incentives and opportunities, rural dryland populations can intensify production and reduce, or even reverse, natural resource degradation (Tiffen et al., 1994).

Under certain conditions, population levels in the drylands may serve as a gross indicator of desertification risk. Traditionally, it has been assumed that if all other environmental and management factors are equal, then natural resources in an area with high population will be under greater stress than in an area with lower population. This assumption is based on the existence of an inherent carrying capacity for a given land type with a given land use.

The present study was not intended to provide information on the population's precise location and dominant livelihoods, essential factors for assessing risk. The study assumes that people are evenly distributed across a given administrative district. The reality is that populations congregate in economic centers (e.g., along transportation routes, close to water sources) in such a manner that their impact on natural resources is localized and intensified. On the other hand, large urban centers affect human behavior and land use over extended areas by exerting a powerful demand for fuelwood, food, water, and other resources.

5. CONCLUSIONS

This study has led to two main results. First, newly available climate data and improved data interpolation methods were used to generate more precise and accurate aridity zones at the country level than were previously available. The mapping of aridity zones by country shows which countries have a preponderance of drylands, as defined by the CCD. Second, to address the human dimension, an assessment of population levels in these aridity zones was performed, by region and sub-region for the world, and at the country level for Africa. In the future, these results can assist in building a drought and desertification vulnerability index. The study not only produces regional and country level statistics, but it links bio-physical (aridity) and socioeconomic (population) factors that are indispensable for understanding the causes and effects of desertification.

Seen in a larger context, this study is the latest step in a continuous process of data improvement and analytic refinement that started with the delineation of world aridity zones and continued with the production of the World Atlas of Desertification. As improved data become available, more reliable conclusions can be generated to support informed decision making in the area of dryland management.

UNSO will continue to work, together with concerned organizations and countries, to improve on the monitoring and assessment of the phenomena of desertification and drought.

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WWW SITES

Data and documentation were downloaded from the following WWW sites:

CIESIN

<http://www.ciesin.org/datasets/gpw/ftpgrid.html> (COUNTRAW)

JRC

<http://www.mtv.jrc.it/projects/mercator/gacmap.html> (Africa land cover image)

NCGIA

<http://ncgia.ucsb.edu/~uwe/pop.html#global> (Global Demography Project)

<http://bbq.ncgia.ucsb.edu:80/~uwe/aspop> (Asia Population Database)

ANNEX 1

AREA PER ARIDITY ZONE BY REGION AND SUB-REGION FOR THE WORLD (LOW RESOLUTION DATA).

(Area numbers are in thousands of square kilometers).

	HYPER-ARID		ARID		SEMI-ARID		DRY SUB-HUMID		MOIST SUB-HUMID + HUMID		COLD		TOTAL
REGION: AFRICA		%		%		%		%		%		%	
SUB-REGION		%		%		%		%		%		%	
Eastern Africa	857	14	1,429	24	1,347	22	594	10	1,806	30	0	0	6,034
Central Africa	0	0	2	0	56	1	130	3	3,771	95	0	0	3,959
Northern Africa	4,303	72	979	16	446	7	134	2	84	1	0	0	5,947
Southern Africa	71	1	682	12	1,657	28	969	16	2,518	43	0	0	5,897
Western Africa	2,868	34	1,960	23	1,567	19	981	12	991	12	0	0	8,367
TOTAL	8,099	27	5,052	17	5,073	17	2,808	9	9,171	30	0	0	30,203
REGION: AMERICAS AND THE CARIBBEAN													
SUB-REGION		%		%		%		%		%		%	
Caribbean	0	0	0	0	0	0	29	17	145	83	0	0	174
Central America	10	0	421	18	696	30	213	9	945	41	0	0	2,284
Northern America	16	0	379	2	3,436	16	2,081	10	4,573	21	11,213	52	21,699
South America	242	1	401	2	2,980	17	2,233	13	11,263	64	364	2	17,483
TOTAL	268	0	1,201	3	7,113	17	4,556	11	16,926	41	11,577	28	41,641
REGION: ASIA													
SUB-REGION		%		%		%		%		%		%	
Asian FSU	0	0	1,549	7	3,682	18	2,241	11	4,137	20	9,383	45	20,992
Eastern Asia	514	5	1,634	14	1,388	12	1,137	10	4,144	37	2,484	22	11,301
Southeastern Asia	0	0	0	0	0	0	101	2	4,040	98	0	0	4,141
Southern Asia	111	1	1,885	25	1,993	26	832	11	2,537	34	215	3	7,572
Western Asia	2,118	50	1,097	26	585	14	278	7	139	3	0	0	4,217
TOTAL	2,744	6	6,164	13	7,649	16	4,588	10	14,997	31	12,082	25	48,223
REGION: AUSTRALIA AND OCEANIA													
SUB-REGION		%		%		%		%		%		%	
Australia/New Zealand	0	0	3,488	41	3,532	42	542	6	929	11	0	0	8,492
Melanesia	0	0	0	0	0	0	454	88	59	12	0	0	514
Micronesia	0	0	0	0	0	0	0	0	4	100	0	0	4
Polynesia	0	0	0	0	0	0	0	0	26	100	0	0	26
TOTAL	0	0	3,488	39	3,532	39	996	11	1,019	11	0	0	9,035
REGION: EUROPE													
SUB-REGION		%		%		%		%		%		%	
Eastern Europe	0	0	0	0	21	3	241	29	559	68	0	0	820
European FSU	0	0	3	0	130	13	416	41	468	46	7	1	1,023
Northern Europe	0	0	0	0	0	0	0	0	1,184	82	265	18	1,450
Southern Europe	0	0	0	0	36	5	99	14	584	80	10	1	729
Western Europe	0	0	3	0	186	11	205	12	1,264	76	7	0	1,665
TOTAL	0	0	5	0	373	7	961	17	4,059	71	289	5	5,687
WORLD TOTAL	11,110	8	15,909	12	23,740	18	13,910	10	46,172	35	23,948	18	134,790

SOURCE DATA: WORLD ATLAS OF DESERTIFICATION (UNEP, 1992)

Asian Former Soviet Union (FSU) includes Kazakhstan, Kyrgyzstan, Russia, Tajikistan, Turkmenistan and Uzbekistan
 Eastern Asia includes China, Hong Kong, Japan, Democratic People's Republic of Korea, Republic of Korea, Macau, Mongolia, Taiwan
 South East Asia includes Brunei, Myanmar, Cambodia, Indonesia, Laos, Malaysia, Philippines, Singapore, Thailand, Vietnam
 European Former Soviet Union (FSU) is comprised of Armenia, Azerbaijan, Belarus, Estonia, Georgia, Latvia, Lithuania, Moldova, and the Ukraine
 Western Asia includes Bahrain, Cyprus, Gaza Strip, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, Turkey, United Arab Emirates, West Bank, and Yemen
 Northern Africa includes Algeria, Egypt, Libya, Morocco, Tunisia and Western Sahara
 Western Africa includes Benin, Burkina Faso, Chad, Cote d'Ivoire, Gambia, Ghana, Guinea, Guinea-Gissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, and Togo
 Middle Africa includes Cameroon, CAR, Congo, Equatorial Guinea, Gabon, and Zaire
 Eastern Africa includes Burundi, Djibouti, Ethiopia, Kenya, Rwanda, Somalia, Sudan, Tanzania, and Uganda
 Southern Africa includes Angola, Botswana, Lesotho, Madagascar, Malawi, Mozambique, Namibia, Reunion, South Africa, Swaziland, Zambia, and Zimbabwe
 Caribbean includes Antigua and Barbuda, Bahamas, Barbados, Dominica, Dominican Republic, Grenada, Haiti, Jamaica, Puerto Rico, St. Kitts and Nevis, St. Lucia, and St. Vincent
 Central America includes Belize, Costa Rica, El Salvador, Guatemala, Mexico, Honduras, Nicaragua, and Panama
 Northern America includes USA and Canada
 South America includes Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Suriname, Peru, Uruguay, and Venezuela

ANNEX 2

POPULATION PER ARIDITY ZONE BY REGION AND SUB-REGION FOR THE WORLD (LOW RESOLUTION DATA).

(Population numbers are in thousands).

	HYPER-ARID		ARID		SEMI-ARID		DRY SUB-HUMID		MOIST SUB-HUMID + HUMID		COLD		TOTAL
REGION: AFRICA		%		%		%		%		%		%	
SUB-REGION		%		%		%		%		%		%	
Eastern Africa	2,965	2	21,209	12	22,214	13	18,045	10	111,713	63	0	0	176,146
Central Africa	0	0	84	0	2,445	4	4,159	7	53,568	89	0	0	60,256
Northern Africa	54,580	45	11,309	9	28,559	24	13,168	11	13,645	11	0	0	121,261
Southern Africa	60	0	505	0	10,633	10	31,548	31	58,779	58	0	0	101,525
Western Africa	463	0	7,396	4	53,798	28	42,450	22	88,424	46	0	0	192,531
TOTAL	58,068	9	40,503	6	117,649	18	109,370	17	326,129	50	0	0	651,719
REGION: AMERICAS AND THE CARIBBEAN													
SUB-REGION		%		%		%		%		%		%	
Caribbean	0	0	0	0	224	0	3,015	8	36,370	92	0	0	39,610
Central America	305	0	6,494	6	12,664	11	9,297	8	86,884	75	0	0	115,644
Northern America	204	0	6,257	2	41,013	16	12,030	5	198,741	77	772	0	259,016
South America	3,878	1	6,331	2	46,852	16	33,777	12	188,825	65	9,587	3	289,250
TOTAL	4,387	0	19,081	3	100,753	14	58,120	8	510,820	73	10,359	1	703,520
REGION: ASIA													
SUB-REGION		%		%		%		%		%		%	
Asian FSU	0	0	12,921	7	60,884	31	50,678	26	55,523	28	15,245	8	195,250
Eastern Asia	1,621	0	12,884	0	167,551	12	283,224	20	963,045	67	7,259	0	1,435,584
Southeastern Asia	0	0	0	0	0	0	12,837	3	446,194	97	0	0	459,031
Southern Asia	3,806	0	101,180	8	350,314	29	287,429	24	459,289	38	7,399	0	1,209,417
Western Asia	24,079	16	34,569	23	46,663	32	23,731	16	18,159	12	0	0	147,201
TOTAL	29,506	0	161,554	5	625,411	18	657,899	19	1,942,210	56	29,902	0	3,446,483
REGION: AUSTRALIA AND OCEANIA													
SUB-REGION		%		%		%		%		%		%	
Australia/New Zealand	0	0	275	1	1,342	6	1,279	6	17,813	86	0	0	20,709
Melanesia	0	0	0	0	0	0	4,039	85	709	15	0	0	4,748
Micronesia	0	0	0	0	0	0	0	0	624	100	0	0	624
Polynesia	0	0	0	0	0	0	0	0	1,299	100	0	0	1,299
TOTAL	0	0	275	1	1,342	5	5,318	19	20,445	75	0	0	27,380
REGION: EUROPE													
SUB-REGION		%		%		%		%		%		%	
Eastern Europe	0	0	0	0	1,636	2	45,184	50	43,249	48	0	0	90,068
European FSU	0	0	137	0	9,555	11	35,651	42	39,214	46	470	0	85,027
Northern Europe	0	0	0	0	0	0	0	0	81,629	100	281	0	81,910
Southern Europe	0	0	0	0	5,649	7	8,599	10	70,456	82	1,060	1	85,764
Western Europe	0	0	491	0	11,876	5	21,783	10	182,478	82	6,763	3	223,391
TOTAL	0	0	629	0	28,716	5	111,216	20	417,026	74	8,573	2	566,161
WORLD TOTAL	91,961	2	222,041	4	873,871	16	941,923	17	3,216,630	60	48,835	0	5,395,263

BASED ON: WORLD ATLAS OF DESERTIFICATION (UNEP, 1992), TOBLER ET AL. (1995)

Asian Former Soviet Union (FSU) includes Kazakhstan, Kyrgyzstan, Russia, Tajikistan, Turkmenistan and Uzbekistan

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Western Asia includes Bahrain, Cyprus, Gaza Strip, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, Turkey,

United Arab Emirates, West Bank, and Yemen

Northern Africa includes Algeria, Egypt, Libya, Morocco, Tunisia and Western Sahara

Western Africa includes Benin, Burkina Faso, Chad, Cote d'Ivoire, Gambia, Ghana, Guinea, Guinea-Gissau, Liberia, Mali, Mauritania,

Niger, Nigeria, Senegal, Sierra Leone, and Togo

Middle Africa includes Cameroon, CAR, Congo, Equatorial Guinea, Gabon, and Zaire

Eastern Africa includes Burundi, Djibouti, Ethiopia, Kenya, Rwanda, Somalia, Sudan, Tanzania, and Uganda

Southern Africa includes Angola, Botswana, Lesotho, Madagascar, Malawi, Mozambique, Namibia, Reunion, South Africa, Swaziland, Zambia, and Zimbabwe

Caribbean includes Antigua and Barbuda, Bahamas, Barbados, Dominica, Dominican Republic, Grenada, Haiti, Jamaica, Puerto Rico,

St. Kitts and Nevis, St. Lucia, and St. Vincent

Central America includes Belize, Costa Rica, El Salvador, Guatemala, Mexico, Honduras, Nicaragua, and Panama

Northern America includes USA and Canada

South America includes Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Falkland Islands (Islas Malvinas), Guyana, French Guiana, Paraguay,

Suriname, Peru, Uruguay, and Venezuela

THE OFFICE TO COMBAT DESERTIFICATION AND DROUGHT (UNSO)

The Office to Combat Desertification and Drought (UNSO) promotes Sustainable Human Development (SHD) in the world's drylands. It is the central entity **within the United Nations Development Programme (UNDP)** spearheading the organisation's support to the efforts of affected programme countries to combat desertification and drought.

Working in **the context of the United Nations Convention to Combat Desertification (CCD)**, UNSO supports efforts of the Parties to the Convention to elaborate National and Sub-Regional Action Programmes and establish National Desertification Funds, through participatory processes as stipulated in the CCD.

Among the services provided to governments and other partners, the Office to Combat Desertification and Drought:

- initiates and supports the development of **concepts and practical tools**;
- offers **strategic guidance and advice** for planning and coordinating the required participatory consultation and negotiation processes;
- provides **technical backstopping** in programming and implementation and access to **'state of the art knowledge'**;
- fosters **global advocacy, public information** and training on dryland issues
- facilitates **networking** among partners and the **exchange of experience and best practices**;
- assists in the **mobilization of resources**;
- promotes greater **harmonization and synergy** among institutions and partners.

UNSO draws **on more than 20 years of substantive, "hands-on" experience** in desertification control and drought mitigation in the Sudano-Sahelian region of Africa.

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