

## Environmental Indicators

**T**his chapter was drawn entirely from the World Resources Institute and reflects tables published in their *World Resources 2000*. It includes data on natural resources—their use by sector and the trends in their use—protected resources and those in danger of extinction, commercial energy production and its components, globally threatened species and protection and management programs.

Until the early 1970s, environmental issues were mainly focused on problems of industrial countries and on such issues as water and air pollution, acid rain, and greenhouse gas emissions. Since the publication of the Club of Rome's *The Limit to Growth* in 1972, however, issues of natural resource depletion and degradation have received considerable attention in assessing environmental factors and their impacts on the development prospects of developing nations. At the national level, environmental concerns revolve around population expansion, desertification, deforestation, and the by-products of energy consumption.

Environmental destruction is not, however, confined by geographic borders. For instance, global warming, said to be caused by greenhouse gas emissions, has become a major global environmental concern. The issue of the greenhouse effect may be subject to controversy at the theoretical level and difficult to prove at the practical level. The fact that industrial wastes generated in one country cross-frontiers and cause

environmental damage to other nations is, however, widely acknowledged. Common interests, therefore, compel the international community to jointly work toward a common goal of preserving the environment.

Increasing emphasis on the links between the environment and development, both at the national and international levels, is reflected in the growing number of scientific and analytical studies. Challenging the hegemony of the SNA national income accounting convention, numerous scholarly endeavors are under way to internalize environmental consequences in national income calculations. The argument is made that the SNA methodology overstates national income levels for two reasons. First, it does not account for both the direct and indirect costs of drawing down natural resources. Second, it counts expenditure on resources for environmental protection activities as income. The changes both in methodology and emphasis have created an urgent demand for physical data. The information in this chapter aims to meet this growing demand, notwithstanding the limitations in data coverage and reliability.

The rate of deforestation is of particular concern because the cost of deforestation goes far beyond the losses of forest products, such as timber and fuelwood. There are equally significant indirect costs, including soil erosion; the substitution of animal and agricultural residues for cooking, which would otherwise be

used for fertilizer; and climate changes. Deforestation is caused by many factors, including increased demand for settlement area, cultivation, fuelwood, or a combination thereof. The information in this chapter provides an empirical framework for assessing policy alternatives in reversing the continuing depletion of natural resources.

Data on roundwood production and consumption are important in monitoring the causes of deforestation. In addition, since roundwood is a primary source of energy in developing nations, data on roundwood consumption is essential in analyzing air pollution. For instance, for 1985–87, Africa used close to 88 percent of its roundwood production for fuel and charcoal production, while approximately 12 percent of the roundwood production went to industrial uses. To put these figures in perspective, the corresponding figures for Europe are 16 and 84 percent.

Information on fresh water resources available and on the extent and the methods of their uses can provide a partial basis for analyzing Africa's agricultural performance, its potential hydroelectric power, and its populations' health conditions. Almost all

Sub-Saharan African countries use a very small fraction of their internal renewable water resources. For instance, Ethiopia, a nation that has suffered from repeated droughts, uses only 2 percent of its water resources. The major problem rests in the uneven geographic distribution of water resources with respect to population density and the state of freshwater drawing technology. The quality of water is as important as the quantity of water available. Water-related disease accounts for 80 percent of all sicknesses and for 90 percent of the 15 million deaths in developing countries each year.

Data on energy production are shown because of related environmental consequences. Biomass fuel, comprising woodfuel and animal and agricultural residues, accounts for 40 to 90 percent of total energy used in Sub-Saharan Africa.

Data on protected areas and endangered species indicate the intentions of countries to safeguard the environment and protect the use of natural resources for future generations.

## 14-1. Forest resources, 1990-95

	Total forest			Forest area			Plantation		
	Extent (000 ha)		Annual % change 1990-95	Natural forest		Annual % change 1990-95	Extent (000 ha)		Annual % change 1990-95
	1990	1995		1990	1995		1990	1995	
<b>SUB-SAHARAN AFRICA</b>	..	..	..	..	..	..	..	..	..
excluding South Africa	..	..	..	..	..	..	..	..	..
excl. S. Africa & Nigeria	..	..	..	..	..	..	..	..	..
Angola	23,285	22,200	-1.0	23,265	22,080	-1.0	120	160	5.8
Benin	4,923	4,625	-1.2	4,909	4,611	-1.3	14	30	15.2
Botswana	14,271	13,917	-0.5	14,270	13,916	-0.5	1	..	..
Burkina Faso	4,431	4,271	-0.7	4,411	4,251	-0.7	20	28	6.7
Burundi	324	317	-0.4	232	225	-0.6	92	120	5.3
Cameroon	20,244	19,598	-0.6	20,228	19,582	-0.6	16	23	7.3
Cape Verde	..	..	..	..	..	..	..	..	..
Central African Republic	30,571	29,930	-0.4	30,565	29,924	-0.4	6	..	..
Chad	11,496	11,025	-0.8	11,492	11,021	-0.8	4	8	13.9
Comoros	..	..	..	..	..	..	..	..	..
Congo, Dem. Rep. of	112,946	109,245	-0.7	112,904	109,203	-0.7	42	60	7.1
Congo, Rep. of	19,745	19,537	-0.2	19,708	19,500	-0.2	37	64	11.0
Côte d'Ivoire	5,623	5,469	-0.6	5,560	5,403	-0.6	63	98	8.8
Djibouti	..	..	..	..	..	..	..	..	..
Equatorial Guinea	1,829	1,781	-0.5	1,826	1,778	-0.5	3	..	..
Eritrea	282	282	0.0	233	233	0.0	..	..	..
Ethiopia	13,891	13,579	-0.5	13,751	13,439	-0.5	189	220	3.0
Gabon	18,314	17,859	-0.5	18,293	17,838	-0.5	21	30	7.1
Gambia, The	95	91	-0.9	94	90	-0.9	1	2	8.1
Ghana	9,608	9,022	-1.3	9,555	8,969	-1.3	53	19	-20.5
Guinea	6,741	6,367	-1.1	6,737	6,363	-1.1	4	11	19.5
Guinea-Bissau	2,361	2,309	-0.4	2,360	2,308	-0.4	1	..	..
Kenya	1,309	1,292	-0.3	1,191	1,174	-0.3	118	240	14.2
Lesotho	6	6	0.0	0	0	0.0	7	6	0.0
Liberia	4,641	4,507	-0.6	4,635	4,501	-0.6	6	8	5.8
Madagascar	15,756	15,106	-0.8	15,539	14,889	-0.9	217	335	8.7
Malawi	3,612	3,339	-1.6	3,486	3,213	-1.6	126	122	-0.6
Mali	12,154	11,585	-1.0	12,140	11,571	-1.0	14	40	21.0
Mauritania	556	556	0.0	554	554	0.0	2	8	27.7
Mauritius	..	..	..	..	..	..	..	..	..
Mozambique	17,443	16,862	-0.7	17,415	16,834	-0.7	28	45	9.5
Namibia	12,584	12,574	-0.3	12,584	12,574	-0.3	0	1	..
Niger	2,562	2,562	0.0	2,550	2,550	0.0	12	60	32.2
Nigeria	14,387	13,780	-0.9	14,236	13,629	-0.9	151	250	10.1
Rwanda	252	250	-0.2	164	162	-0.2	88	247	20.6
São Tomé and Príncipe	..	..	..	..	..	..	..	..	..
Senegal	7,629	7,381	-0.7	7,517	7,269	-0.7	112	216	13.1
Seychelles	..	..	..	..	..	..	..	..	..
Sierra Leone	1,522	1,309	-3.0	1,516	1,303	-3.0	6	8	5.8
Somalia	760	754	-0.2	756	750	-0.2	4	6	8.1
South Africa	8,574	8,499	-0.2	7,279	7,204	-0.2	965	1,429	7.8
Sudan	43,376	41,613	-0.8	43,173	41,410	-0.8	203	425	14.8
Swaziland	..	..	..	..	..	..	..	..	..
Tanzania	34,123	32,510	-1.0	33,969	32,356	-1.0	154	200	5.2
Togo	1,338	1,245	-1.4	1,317	1,224	-1.5	17	34	14.0
Uganda	6,400	6,104	-0.9	6,380	6,084	-1.0	20	26	5.2
Zambia	32,720	31,398	-0.8	32,677	31,355	-0.8	48	44	-1.9
Zimbabwe	8,960	8,710	-0.6	8,876	8,626	-0.6	84	110	5.4
<b>NORTH AFRICA</b>	..	..	..	..	..	..	..	..	..
Algeria	1,978	1,861	-1.2	1,493	1,376	-1.6	485	972	13.9
Egypt	34	34	0.0	0	0	0	34	..	..
Libya	1,686	1,544	-1.8	1,607	1,465	-2	79	..	..
Morocco	400	400	0.0	190	190	0.0	210	..	..
Tunisia	3,894	3,835	-0.3	3,573	3,514	-0.3	321	565	11.3
<b>ALL AFRICA</b>	538,978	520,237	-0.7	534,226	515,455	-0.7	4,416	..	4.4

Sources: Food and Agriculture Organization of the United Nations and the United Nations Economic Commission for Europe.

Notes: 0 = zero or less than half the unit of measure; negative numbers indicate reduction in forest area; .. = not available.

## 14-2. Forest ecosystems, 1996

	Closed forests					Forest ecosystems (1996)								
	Land area (000 hectares)	Forests as a % of original forest		Percent frontier forests c/ threatened 1996	Forest ecosystems (1996)								Sparse trees and parkland	
		Original Forest as a % of land area a/	Current forests b/ 1996		Frontier forests c/ 1996	Mangroves		Tropical forests		Nontropical forests				
						Area (000 ha)	Percent protected	Area (000 ha)	Percent protected	Area (000 ha)	Percent protected	Area (000 ha)	Percent protected	
SUB-SAHARAN AFRICA	..	..	..	..	..	..	..	..	..	..	..	..	..	
excluding South Africa	..	..	..	..	..	..	..	..	..	..	..	..	..	
excl. S. Africa & Nigeria	..	..	..	..	..	..	..	..	..	..	..	..	..	
Angola	124,670	20	15	0	111	0	0	37,564	3	0	0	0	0	
Benin	11,062	16	4	0	0	0	0	1,516	18	0	0	585	2	
Botswana	56,673	2	100	0	0	0	0	12,123	2	0	0	0	0	
Burkina Faso	27,360	0	0	0	0	0	0	0	0	0	0	5,667	16	
Burundi	2,568	46	3	0	0	0	0	219	18	0	0	139	3	
Cameroon	46,540	80	42	8	97	227	2	20,009	6	0	0	2,416	22	
Cape Verde	..	..	..	..	..	..	..	..	..	..	..	..	..	
Central African Republic	62,298	52	16	4	100	0	0	17,101	20	0	0	1,451	48	
Chad	125,920	0	0	0	0	0	0	3,516	4	0	0	2,857	1	
Comoros	..	..	..	..	..	..	..	..	..	..	..	..	..	
Congo, Dem. Rep. of	226,705	83	60	16	70	22	0	135,071	7	0	0	172	40	
Congo, Rep. of	34,150	100	68	29	65	19	76	24,321	4	0	0	0	0	
Côte d'Ivoire	31,800	75	10	2	100	0	0	2,702	23	0	0	625	18	
Djibouti	..	..	..	..	..	..	..	..	..	..	..	..	..	
Equatorial Guinea	2,805	96	38	0	0	25	0	1,749	0	0	0	0	0	
Eritrea	..	..	..	..	..	0	0	1	0	0	0	0	0	
Ethiopia	110,000	25	17	0	0	0	0	11,937	19	0	0	4,804	21	
Gabon	25,767	100	90	32	100	147	3	21,481	4	0	0	0	0	
Gambia, The	1,000	39	62	0	0	51	5	188	5	0	0	244	2	
Ghana	22,754	66	9	0	0	0	0	1,694	7	0	0	336	17	
Guinea	24,572	76	5	0	0	316	0	3,073	1	0	0	2,723	1	
Guinea-Bissau	2,812	100	34	0	0	317	0	1,141	0	0	0	550	0	
Kenya	56,914	17	19	0	0	0	0	3,423	8	0	0	2,754	3	
Lesotho	3,035	2	0	0	0	0	0	89	9	0	0	0	0	
Liberia	9,632	100	44	0	0	0	0	3,149	3	0	0	1	0	
Madagascar	58,154	93	13	0	0	310	0	6,940	6	0	0	0	0	
Malawi	9,408	12	0	0	0	0	0	3,830	9	0	0	0	0	
Mali	122,019	0	0	0	0	0	0	6,132	2	0	0	336	0	
Mauritania	102,522	0	0	0	0	..	..	..	..	..	..	..	..	
Mauritius	203	..	..	..	..	..	..	..	..	..	..	..	..	
Mozambique	78,409	33	14	0	0	565	4	20,863	7	0	0	14,414	7	
Namibia	82,329	0	95	0	0	0	0	3,436	11	0	0	0	0	
Niger	126,670	0	0	0	0	0	0	27	16	0	0	0	0	
Nigeria	91,077	45	11	1	100	1,145	0	11,634	7	0	0	10,588	4	
Rwanda	2,467	36	16	0	0	0	0	291	77	0	0	162	2	
São Tomé and Príncipe	..	..	..	..	..	..	..	..	..	..	..	..	..	
Senegal	19,253	14	16	0	0	158	3	2,076	7	0	0	8,816	13	
Seychelles	..	..	..	..	..	..	..	..	..	..	..	..	..	
Sierra Leone	7,162	100	10	0	0	176	1	260	20	0	0	104	0	
Somalia	62,734	4	0	0	0	0	0	11,800	1	0	0	1,530	1	
South Africa	122,104	13	0	0	0	0	0	10,333	5	52	26	0	0	
Sudan	237,600	1	0	0	0	0	0	12,288	12	0	0	5,870	9	
Swaziland	1,720	22	0	0	0	0	0	286	3	0	0	0	0	
Tanzania	88,359	22	9	0	0	323	0	14,356	16	0	0	583	3	
Togo	5,439	33	7	0	0	0	0	224	3	0	0	91	9	
Uganda	19,965	70	4	0	0	0	0	3,772	17	0	0	1,850	65	
Zambia	74,339	7	70	0	0	0	0	21,989	32	0	0	39	14	
Zimbabwe	38,685	7	67	0	0	0	0	15,397	12	0	0	0	0	
NORTH AFRICA	..	..	..	..	..	..	..	..	..	..	..	..	..	
Algeria	238,174	5	12	0	0	0	0	0	0	2,694	4	1	83	
Egypt	99,545	1	0	0	0	0	0	134	0	4	0	0	0	
Libya	175,954	1	0	0	0	0	0	0	0	53	0	0	0	
Morocco	44,630	22	7	0	0	0	0	0	0	1,862	3	0	0	
Tunisia	15,536	18	5	0	0	0	0	0	0	300	2	0	0	
ALL AFRICA	2,963,468	23	34	8	77	3,801	1	448,197	9	8,249	2	69,710	11	

Source: Food and Agriculture Organization of the United Nations.

Notes: a. Original forest is that estimated to have covered the planet 8000 years ago given current climate conditions.

b. Includes frontier and nonfrontier forests.

c. Frontier forests are large, relatively undisturbed forest ecosystems.

d. = zero or less than half of the unit of measure; .. = not available.

## 14-3. Wood production and trade, 1986-98

	Average annual roundwood production						Average annual forest products production				Trade in forest products		
	Total roundwood		Wood fuel		Industrial roundwood		Wood-based panels		Paper and paperboard		Import	Export	Percent of total exports
	Cubic meters	Percent change	Cubic meters	Percent change	Cubic meters	Percent change	Cubic meters	Percent change	Metric tons	Percent change	Value (million US\$)	Value (million US\$)	
	1996-98	1986-88	1996-98	1986-88	1996-98	1986-88	1996-98	1986-88	1996-98	1986-88	1996-98	1996-98	
<b>SUB-SAHARAN AFRICA</b>	..	..	..	..	..	..	..	..	..	..	..	..	..
excluding South Africa excl. S. Africa & Nigeria	..	..	..	..	..	..	..	..	..	..	..	..	..
Angola	6,272	37	5,220	38	1,052	32	11	-55	0	0	5	1	0
Benin	5,839	32	5,507	32	552	36	0	0	0	0	2	2	0
Botswana	1,641	33	1,540	33	101	33	0	0	0	0	0	0	..
Burkina Faso	10,506	32	10,022	32	484	32	0	0	0	0	2	0	0
Burundi	1,669	37	1,487	27	182	287	0	0	0	0	3	0	0
Cameroon	15,191	29	11,869	32	3,323	20	124	42	2	-67	22	427	17
Cape Verde	..	..	..	..	..	..	..	..	..	..	..	..	..
Central African Republic	3,388	-1	2,660	-12	728	80	1	-67	0	0	0	27	13
Chad	1,871	37	1,147	36	724	38	0	0	0	0	2	0	0
Comoros	..	..	..	..	..	..	..	..	..	..	..	..	..
Congo, Dem. Rep. of	3,985	30	2,456	33	1,529	25	54	-5	0	0	1	147	8
Congo, Rep. of	48,372	41	44,814	42	3,557	28	21	-47	3	13	6	63	4
Côte d'Ivoire	12,983	21	9,970	33	3,013	-6	306	42	0	0	37	280	6
Djibouti	..	..	..	..	..	..	..	..	..	..	..	..	..
Equatorial Guinea	811	27	447	0	364	92	9	13	0	0	1	57	13
Eritrea	..	..	2,110	..	..	..	0	0	0	0	9	0	0
Ethiopia	48,990	..	46,522	..	2,468	..	13	..	9	..	16	0	0
Gabon	5,144	62	2,491	33	2,653	104	36	-80	0	0	4	288	9
Gambia, The	813	29	700	18	113	208	0	0	0	0	1	0	0
Ghana	21,931	61	20,678	64	1,253	23	136	112	0	0	16	145	9
Guinea	8,643	138	7,977	154	666	32	0	0	0	0	6	9	1
Guinea-Bissau	586	4	422	0	164	18	0	0	0	0	0	3	6
Kenya	28,813	33	26,879	34	1,934	19	52	26	129	41	30	1	0
Lesotho	1,556	27	1,556	27	0	0	0	0	0	0	0	0	0
Liberia	2,936	-19	2,700	0	236	-75	45	644	0	0	1	12	..
Madagascar	9,254	20	8,878	28	376	-53	5	20	4	-62	9	6	1
Malawi	9,449	25	8,950	24	499	45	18	213	0	0	4	2	0
Mali	6,284	24	5,890	24	394	21	0	0	0	0	5	1	0
Mauritania	15	29	9	29	6	29	0	0	0	0	2	0	0
Mauritius	..	..	..	..	..	..	..	..	..	..	..	..	..
Mozambique	17,973	18	16,724	17	1,249	37	3	-64	0	-100	1	10	2
Namibia	..	..	..	..	..	..	..	..	..	..	..	..	0
Niger	6,260	39	5,873	39	386	39	0	0	0	0	2	0	0
Nigeria	95,993	18	87,001	18	8,992	14	38	-80	59	-28	80	30	0
Rwanda	3,020	-48	3,000	-46	20	-92	0	-100	0	0	2	0	0
São Tomé and Príncipe	..	..	..	..	..	..	..	..	..	..	..	..	..
Senegal	4,785	30	4,029	30	756	28	0	0	0	0	24	0	0
Seychelles	..	..	..	..	..	..	..	..	..	..	..	..	..
Sierra Leone	3,215	16	3,092	18	124	-12	0	0	0	0	2	1	1
Somalia	7,616	8	7,513	8	102	5	0	-100	0	0	0	0	..
South Africa	32,906	46	14,467	36	18,439	55	653	64	1988	19	482	1025	3
Sudan	9,289	23	7,207	23	2,082	23	2	0	3	-69	34	0	0
Swaziland	..	..	..	..	..	..	..	..	..	..	..	..	..
Tanzania	38,193	35	35,947	35	2,246	28	4	-67	25	32	6	5	0
Togo	1,156	41	872	33	284	73	0	0	0	0	3	2	0
Uganda	15,236	30	13,080	30	2,156	33	5	47	3	50	3	0	0
Zambia	8,051	31	7,219	29	832	58	18	-20	3	-2	5	1	0
Zimbabwe	8,192	8	6,260	2	1,932	34	68	148	74	-7	29	22	1
<b>NORTH AFRICA</b>	..	..	..	..	..	..	..	..	..	..	..	..	..
Algeria	2,676	34	2,239	27	437	79	50	0	62	-48	337	0	0
Egypt	2,776	24	2,647	24	129	23	81	27	263	70	949	8	0
Libya	650	2	536	0	114	11	0	0	6	0	46	0	..
Morocco	1,324	-7	539	-31	785	21	35	-75	108	2	336	60	1
Tunisia	2,770	23	2,559	20	211	65	104	16	97	58	203	17	0
<b>ALL AFRICA</b>	..	..	..	..	..	..	..	..	..	..	..	..	..

Source: Food and Agriculture Organization of the United Nations.

Notes: 0 = zero or less than half of the unit of measure; .. = not available.

## 14-4. Freshwater resources and withdrawals, 1970-2000

	Annual internal renewable water resources		Annual river flows		Year of data	Annual withdrawals			Sectoral withdrawals (percent)		
	Total (cubic km)	Per capita 2000 (cubic meters)	From other countries (cubic km)	To other countries (cubic km)		Total (cubic km)	Percentage of water resources	Per capita (cubic meters)	Domestic	Industrial	Agricultural
SUB-SAHARAN AFRICA	..	..	..	..	..	..	..	..	..	..	..
excluding South Africa	..	..	..	..	..	..	..	..	..	..	..
excl. S. Africa & Nigeria	..	..	..	..	..	..	..	..	..	..	..
Angola	184	14,288	..	..	1987	0.48	0.3	57	14	10	76
Benin	10	1,689	15.5	..	1994	0.15	1.4	28	23	10	67
Botswana	3	1,788	11.8	..	1992	0.11	3.8	81	32	20	48
Burkina Faso	18	1,466	..	..	1992	0.38	2.1	39	19	0	81
Burundi	4	538	..	..	1987	0.10	2.8	20	36	0	64
Cameroon	268	17,766	0.0	0.0	1987	0.40	0.1	38	46	19	35
Cape Verde	..	..	..	..	..	..	..	..	..	..	..
Central African Republic	141	39,001	..	..	1987	0.07	0.0	26	21	6	73
Chad	15	1,961	28.0	..	1990	0.19	1.3	33	16	2	82
Comoros	..	..	..	..	..	..	..	..	..	..	..
Congo, Dem. Rep. of	935	18,101	84.0	..	1994	0.36	0.0	8	61	16	23
Congo, Rep. of	222	75,387	610.0	..	1987	0.04	0.0	20	62	27	11
Côte d'Ivoire	77	5,187	1.0	..	1987	0.70	0.9	66	22	11	67
Djibouti	..	..	..	..	..	..	..	..	..	..	..
Equatorial Guinea	30	66,275	0.0	..	1987	0.01	0.0	30	81	13	6
Eritrea	3	727	6.0	..	..	..	..	..	..	..	..
Ethiopia	110	1,758	0.0	..	1987	2.20	2.0	50	11	3	86
Gabon	164	133,754	0.0	..	1987	0.06	0.0	70	72	22	6
Gambia, The	3	2,298	5.0	..	1990	0.03	1.0	33	7	2	91
Ghana	30	1,499	22.9	..	1970	0.30	1.0	35	35	13	52
Guinea	226	30,416	0.0	..	1987	0.74	0.3	141	10	3	87
Guinea-Bissau	16	13,189	11.0	..	1991	0.02	0.1	17	60	4	36
Kenya	20	672	10.0	..	1990	2.05	10.1	87	20	4	76
Lesotho	5	2,430	0.0	..	1987	0.05	1.0	31	22	22	56
Liberia	200	63,412	32.0	..	1987	0.13	0.1	54	27	13	60
Madagascar	337	21,139	0.0	..	1990	19.70	5.8	1694	1	0	99
Malawi	18	1,605	1.1	..	1994	0.94	5.4	98	10	3	86
Mali	60	5,341	40.0	..	1987	1.36	2.3	164	2	1	97
Mauritania	0	150	11.0	..	1990	16.30	4,075.0	8046	6	2	92
Mauritius	..	..	..	..	..	..	..	..	..	..	..
Mozambique	100	5,081	116.0	..	1992	0.61	0.6	40	9	2	89
Namibia	6	3,592	39.3	..	1990	0.25	4.0	185	29	3	68
Niger	4	326	29.0	..	1990	0.50	14.3	65	16	2	82
Nigeria	221	1,982	59.0	..	1990	4.00	1.8	46	31	15	54
Rwanda	6	815	..	..	1993	0.77	12.2	134	5	1	94
São Tomé and Príncipe	..	..	..	..	..	..	..	..	..	..	..
Senegal	26	2,784	13.0	..	1990	1.50	5.7	205	5	3	92
Seychelles	..	..	..	..	..	..	..	..	..	..	..
Sierra Leone	160	32,960	0.0	..	1987	0.37	0.2	98	7	4	89
Somalia	6	594	9.7	..	1987	0.81	13.5	115	3	0	97
South Africa	45	1,110	5.2	..	1990	13.30	29.7	391	17	11	72
Sudan	35	1,187	119.0	..	1995	17.80	50.9	669	5	1	94
Swaziland	..	..	..	..	..	..	..	..	..	..	..
Tanzania	80	2,387	9.0	..	1994	1.17	1.5	40	9	2	89
Togo	12	2,484	0.5	..	1987	0.09	0.8	28	62	13	25
Uganda	39	1,791	27.0	..	1970	0.20	0.5	20	32	8	60
Zambia	80	8,747	35.8	..	1994	1.71	2.1	214	16	7	77
Zimbabwe	14	1,208	5.9	..	1987	1.22	8.7	136	14	7	79
NORTH AFRICA	..	..	..	..	..	..	..	..	..	..	..
Algeria	14	442	0.4	0.4	1990	4.50	32.4	180	25	15	60
Egypt	2	34	56.0	0.0	1993	55.10	2,395.7	920	6	8	86
Libya	1	143	0.0	0.0	1995	3.89	486.3	783	9	4	87
Morocco	30	1,058	0.0	0.2	1991	11.05	36.8	454	5	3	92
Tunisia	4	367	0.6	0.0	1996	2.83	80.4	312	13	2	86
ALL AFRICA	..	..	..	..	..	..	..	..	..	..	..

Source: Food and Agriculture Organization of the United Nations.

Notes: 0 = zero or less than half of the unit of measure; .. = not available.

## 14-5. Marine and freshwater catches, aquaculture, balance of trade, and fish consumption

	Average annual		Average annual		Average annual				Average annual			Per capita annual food supply from fish and seafood Total 1997 (kg)
	marine catch a/		freshwater catch a/		aquaculture production				balance of trade b/			
	metric	%	metric	%	1995-97 (metric tons)				1995-97 (million US\$)			
	1995-97	1985-87	1995-97	1985-87	Marine fish	Dia- dromous fish	Fresh- water fish	Molluscs & Crus- taceans	Fish	Molluscs & crustaceans	Fish meal	
SUB-SAHARAN AFRICA	..	..	..	..	..	..	..	..	..	..	..	..
excluding South Africa	..	..	..	..	..	..	..	..	..	..	..	..
excl. S. Africa & Nigeria	..	..	..	..	..	..	..	..	..	..	..	..
Angola	73	15	6.0	-23	..	..	..	..	-7.9	3.1	..	6.6
Benin	9	2	25.0	-6	..	..	..	..	-5.3	1.8	..	9.4
Botswana	..	..	2.0	20	..	..	..	..	-4.9	-0.3	-0.1	5.7
Burkina Faso	..	..	8.0	5	..	..	25	..	-3.1	0.0	..	1.2
Burundi	..	..	14.8	26	..	..	23	..	-0.1	0.0	..	3.2
Cameroon	64	24	23.0	15	..	..	55	..	-22.3	1.8	-0.3	9.2
Cape Verde	..	..	..	..	..	..	..	..	..	..	..	..
Central African Republic	..	..	12.7	-2	..	..	370	..	..	..	..	3.9
Chad	..	..	91.7	49	..	..	..	..	..	0.0	..	6.8
Comoros	..	..	..	..	..	..	..	..	..	..	..	..
Congo, Dem. Rep. of	4	93	157.4	3	..	..	750	..	-26.6	7.0	..	25.3
Congo, Rep. of	19	-1	23.9	67	..	..	115	..	-50.4	..	..	5.7
Côte d'Ivoire	56	-28	11.3	-54	..	..	655	..	35.4	4.5	0.1	11.1
Djibouti	..	..	..	..	..	..	..	..	..	..	..	..
Equatorial Guinea	3	9	0.7	76	..	..	..	..	0.2	0.1	..	22.6
Eritrea	3	..	0.0	..	..	..	..	..	0.1	0.0	..	0.3
Ethiopia	0	..	8.5	..	..	..	46	..	-0.1	..	..	0.2
Gabon	33	89	8.8	365	..	..	53	..	-8.9	6.5	..	44.6
Gambia, The	26	211	2.5	-7	..	..	3	..	0.9	2.6	..	23.7
Ghana	352	29	67.9	35	..	..	500	..	64.4	2.1	..	22.5
Guinea	77	154	3.2	26	..	..	3	..	8.4	4.7	0.0	16.0
Guinea-Bissau	5	94	0.3	188	..	..	..	..	5.7	2.9	..	2.7
Kenya	4	-20	172.1	53	..	71	506	0	33.2	5.1	-0.5	4.8
Lesotho	..	..	0.0	..	..	4	10	..	..	..	..	..
Liberia	4	-62	4.0	0	..	..	0	..	-1.9	-0.1	..	4.9
Madagascar	71	101	30.0	-21	..	0	4,153	2,146	13.4	76.8	0.4	7.6
Malawi	..	..	57.9	-22	..	..	227	2	0.0	0.1	-0.4	5.7
Mali	..	..	114.8	102	..	..	73	..	-0.6	..	..	9.5
Mauritania	52	14	5.8	-3	..	..	..	..	22.1	104.6	..	14.2
Mauritius	..	..	..	..	..	..	..	..	..	..	..	..
Mozambique	13	-47	8.0	129	..	..	14	..	-5.4	73.5	..	2.0
Namibia	282	1,466	1.3	51	..	..	5	43	..	..	..	12.4
Niger	..	..	4.7	112	..	..	20	..	-0.9	0.0	..	0.8
Nigeria	224	46	106.0	14	..	24	17,014	..	-208.4	19.6	..	5.8
Rwanda	..	..	3.1	134	..	..	47	..	..	..	..	0.6
São Tomé and Príncipe	..	..	..	..	..	..	..	..	..	..	..	..
Senegal	352	66	54.4	262	..	..	49	22	205.9	73.2	3.4	36.3
Seychelles	..	..	..	..	..	..	..	..	..	..	..	..
Sierra Leone	48	38	14.7	-9	..	..	28	..	13.1	9.9	..	13.4
Somalia	15	-9	0.3	-26	..	..	..	..	4.1	..	..	1.3
South Africa	497	-50	0.8	4	3	870	101	2,616	101.8	42.7	-37.1	7.8
Sudan	5	382	40.8	64	..	..	1,000	24	0.0	0.0	..	1.7
Swaziland	..	..	..	..	..	..	..	..	..	..	..	..
Tanzania	43	5	310.7	13	..	..	217	..	51.7	8.9	0.0	10.3
Togo	9	-24	5.0	43	..	..	21	..	-22.5	4.8	..	17.3
Uganda	..	..	207.3	11	..	..	205	..	38.5	..	..	9.8
Zambia	..	..	64.6	-2	..	..	4,550	1	-0.3	0.1	-0.2	8.2
Zimbabwe	..	..	16.9	-8	..	100	63	15	-14.7	-1.2	-0.9	3.3
NORTH AFRICA	..	..	..	..	..	..	..	..	..	..	..	..
Algeria	99	42	0.0	-100	37	18	256	27	-7.2	2.1	..	3.5
Egypt	82	99	215.1	67	19,799	..	50,569	..	-108.4	-0.5	..	10.0
Libya	34	108	0.0	0	..	..	100	..	21.4	-0.1	..	6.0
Morocco	663	39	1.7	30	972	155	767	229	269.6	437.0	2.2	7.8
Tunisia	70	-10	0.7	..	886	138	380	111	7.5	76.9	-0.1	9.1
ALL AFRICA	..	..	..	..	..	..	..	..	..	..	..	..

Source: Food and Agriculture Organization of the United Nations.

Notes: a. Aquaculture production is included in country totals.

b. Exports minus imports.

0 = zero or less than half of the unit of measure; .. = not available.

## 14-6. Energy production by source

	Energy production								Total electricity generated	
	From all sources			From non-renewable energy sources						
	(000 metric toe) (a)	% change since 1987	Per capita (kg oil equivalent) 1997	Solid fuels (000 metric toe) (a) 1997	Liquid fuels (000 metric toe) (a) 1997	Gaseous fuels (000 metric toe) (a) 1997	Nuclear fuels (000 metric toe) (a) 1997	Other sources (000 metric toe) (a) 1997	(000 metric toe) (a) 1997	% change since 1987
SUB-SAHARAN AFRICA	..	..	..	..	..	..	..	..	..	..
excluding South Africa	..	..	..	..	..	..	..	..	..	..
excl. S. Africa & Nigeria	..	..	..	..	..	..	..	..	..	..
Angola	41,430	89	3,537	0	35,700	465	0	0	95	37
Benin	1,897	8	337	0	67	0	0	0	4	92
Botswana	..	..	..	..	..	..	..	..	..	..
Burkina Faso	..	..	..	..	..	..	..	..	..	..
Burundi	..	..	..	..	..	..	..	..	..	..
Cameroon	11,250	-7	808	0	6,357	0	0	0	269	25
Cape Verde	..	..	..	..	..	..	..	..	..	..
Central African Republic	..	..	..	..	..	..	..	..	..	..
Chad	..	..	..	..	..	..	..	..	..	..
Comoros	..	..	..	..	..	..	..	..	..	..
Congo, Dem. Rep. of	14,364	29	299	56	1,315	0	0	0	517	11
Congo, Rep. of	13,540	89	4,998	0	12,638	3	0	0	37	53
Côte d'Ivoire	4,908	31	349	0	803	0	0	0	276	55
Djibouti	..	..	..	..	..	..	..	..	..	..
Equatorial Guinea	..	..	..	..	..	..	..	..	..	..
Eritrea	..	..	..	..	..	..	..	..	..	..
Ethiopia	16,316	27	280	0	0	0	0	0	115	50
Gabon	19,786	129	17,403	0	18,794	68	0	0	87	13
Gambia, The	..	..	..	..	..	..	..	..	..	..
Ghana	5,843	48	313	0	361	0	0	0	529	26
Guinea	..	..	..	..	..	..	..	..	..	..
Guinea-Bissau	..	..	..	..	..	..	..	..	..	..
Kenya	11,651	20	410	0	0	0	0	0	364	60
Lesotho	..	..	..	..	..	..	..	..	..	..
Liberia	..	..	..	..	..	..	..	..	..	..
Madagascar	..	..	..	..	..	..	..	..	..	..
Malawi	..	..	..	..	..	..	..	..	..	..
Mali	..	..	..	..	..	..	..	..	..	..
Mauritania	..	..	..	..	..	..	..	..	..	..
Mauritius	..	..	..	..	..	..	..	..	..	..
Mozambique	6,994	-1	379	0	0	0	0	0	86	199
Namibia	..	..	..	..	..	..	..	..	..	..
Niger	..	..	..	..	..	..	..	..	..	..
Nigeria	191,034	55	1,839	86	117,249	4,429	0	0	1,305	35
Rwanda	..	..	..	..	..	..	..	..	..	..
São Tomé and Príncipe	..	..	..	..	..	..	..	..	..	..
Senegal	1,654	32	189	0	0	20	0	0	108	52
Seychelles	..	..	..	..	..	..	..	..	..	..
Sierra Leone	..	..	..	..	..	..	..	..	..	..
Somalia	..	..	..	..	..	..	..	..	..	..
South Africa (a)	142,139	27	3,667	124,678	401	1,543	3,296	0	17,866	38
Sudan	9,881	18	356	0	259	0	0	0	169	43
Swaziland	..	..	..	..	..	..	..	..	..	..
Tanzania	13,529	23	431	3	0	0	0	0	166	52
Togo	..	..	..	..	..	..	..	..	..	..
Uganda	..	..	..	..	..	..	..	..	..	..
Zambia	5,556	16	647	106	0	0	0	0	689	-8
Zimbabwe	8,152	9	727	2,712	0	0	0	0	628	15
NORTH AFRICA	..	..	..	..	..	..	..	..	..	..
Algeria	125,576	37	4,272	0	61,670	63,381	0	0	1,865	70
Egypt	57,997	9	896	0	44,640	11,070	0	0	4,958	52
Libya	78,942	43	15,151	0	73,067	5,750	0	0	1,563	17
Morocco	836	3	31	211	242	23	0	231	1,129	64
Tunisia	6,655	2	723	0	4,013	1,466	0	0	686	75
ALL AFRICA	..	..	..	..	..	..	..	..	..	..

Source: International Energy Agency (IEA)

Notes: a. Tons of oil equivalent. See technical notes for more information on toe.

0 = zero or less than half of the unit of measure; .. = not available or indeterminate.



## 14-7. Energy consumption by economic sector

	Energy Consumpt on by Econom c Sector (% of total consumpt on)															
	Industry				Transportat on											
	All industries		Iron and steel		Total		Air		Road		Agriculture		Commercial and public services		Residential	
	198/	199/	198/	199/	198/	199/	198/	199/	198/	199/	198/	199/	198/	199/	198/	199/
<b>SUB-SAHARAN AFRICA</b>	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
excluding South Africa	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
excl. S. Africa & Nigeria	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Angola	..	11.6	..	0.0	..	12.3	..	6.1	..	6.2	..	..	..	0.0	..	75.6
Benin	..	17.1	..	0.0	..	12.6	..	2.4	..	10.1	..	..	..	0.0	..	70.3
Botswana	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Burkina Faso	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Burundi	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Cameroun	..	17.0	..	0.0	..	11.6	..	1.0	..	10.6	..	..	..	0.5	..	69.7
Cape Verde	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Central African Republic	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Chad	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Comoros	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Congo, Dem. Rep. of	..	21.8	..	0.1	..	5.4	..	1.2	..	4.2	..	..	..	0.0	..	70.9
Congo, Rep. of	..	14.2	..	0.0	..	18.4	..	6.3	..	12.1	..	..	..	0.0	..	65.7
Côte d'Ivoire	..	7.0	..	0.0	..	16.0	..	3.1	..	12.5	..	1.2	..	12.1	..	62.0
Djibouti	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Equatorial Guinea	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Eritrea	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Ethiopia	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Gabon	..	23.2	..	0.0	..	19.6	..	6.7	..	11.0	..	..	..	0.9	..	51.5
Gambia, The	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Ghana	16.0	14.1	0.0	0.0	11.0	13.2	1.4	1.2	9.0	11.4	0.7	1.0	0.5	0.7	69.8	69.9
Guinea	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Guinea-Bissau	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Kenya	..	11.4	..	0.0	..	12.6	..	4.5	..	7.7	..	6.5	..	0.7	..	67.7
Lesotho	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Liberia	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Madagascar	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Malawi	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Mali	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Mauritania	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Mauritius	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Mozambique	..	7.8	..	0.0	..	1.5	..	0.4	..	1.1	..	0.6	..	3.4	..	85.0
Namibia	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Niger	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Nigeria	..	10.9	..	0.1	..	6.7	..	0.7	..	5.9	..	..	..	0.3	..	79.7
Rwanda	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
São Tomé and Príncipe	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Senegal	..	17.0	..	0.0	..	24.0	..	10.0	..	12.6	..	2.3	..	0.6	..	55.3
Seychelles	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Sierra Leone	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Somalia	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
South Africa	48.4	36.6	17.6	7.8	21.0	23.5	1.3	2.5	17.9	19.2	2.6	3.4	4.1	5.2	19.3	21.3
Sudan	..	7.4	..	0.0	..	17.8	..	1.0	..	16.9	..	0.1	..	2.0	..	70.9
Swaziland	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Tanzania	..	11.7	..	0.0	..	1.7	..	0.3	..	1.4	..	3.2	..	0.3	..	79.1
Togo	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Uganda	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Zambia	..	23.6	..	0.1	..	5.1	..	0.9	..	4.2	..	0.7	..	2.0	..	66.6
Zimbabwe	..	12.2	..	2.0	..	10.0	..	1.5	..	8.3	..	9.2	..	3.6	..	61.8
<b>NORTH AFRICA</b>	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Algeria	21.2	20.6	4.3	2.3	39.1	18.7	3.3	2.2	34.9	12.2	0.3	0.0	1.5	0.0	23.0	29.2
Egypt	49.6	47.8	0.7	0.5	19.8	20.6	2.9	3.6	16.9	16.9	0.5	0.6	0.0	0.0	23.2	22.9
Libya	32.5	33.8	0.0	0.0	36.8	38.0	6.1	3.4	30.7	34.6	0.0	0.0	0.0	0.0	7.2	9.5
Morocco	31.4	23.7	0.1	0.0	28.0	11.8	5.2	3.7	19.7	5.7	4.9	0.7	6.5	2.4	25.7	24.7
Tunisia	31.7	22.7	1.2	0.6	33.1	28.0	5.8	5.7	21.9	21.9	5.5	6.2	7.5	7.7	22.0	32.9
<b>ALL AFRICA</b>	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..

Source: International Energy Agency (IEA).

Notes: 0 = zero or less than half of the unit of measure; .. = not available or indeterminate.

## 14-8. CO<sub>2</sub> emissions from industrial processes, 1996

	Carbon dioxide (CO <sub>2</sub> ) emissions (000 metric tons)							Per capita carbon emissions (kilograms) 1996
	Solid fuels 1996	Liquid fuels 1996	Gaseous fuels 1996	Gas flaring 1996	Cement manufacturing 1996	Total 1990	Total 1996	Total contribution Since 1950
SUB-SAHARAN AFRICA	..	..	..	..	..	..	..	..
excluding South Africa	..	..	..	..	..	..	..	..
excl. S. Africa & Nigeria	..	..	..	..	..	..	..	..
Angola	0	2,151	344	2,465	149	4,650	5,108	145,552
Benin	0	465	0	0	189	564	656	14,762
Botswana	6,383	12,579	4	9	691	2,415	19,665	51,505
Burkina Faso	0	967	0	0	0	1,008	967	14,682
Burundi	18	202	0	0	0	194	220	3,975
Cameroon	4	3,213	0	0	299	1,488	3,517	86,507
Cape Verde	..	..	..	..	..	..	..	..
Central African Republic	0	234	0	0	0	198	234	5,866
Chad	0	99	0	0	0	143	99	5,027
Comoros	..	..	..	..	..	..	..	..
Congo, Dem. Rep. of	854	1,436	0	0	5	4,096	2,294	142,475
Congo, Rep. of	0	4,741	7	167	50	2,037	4,961	40,161
Côte d'Ivoire	0	12,817	0	0	249	9,907	13,066	185,109
Djibouti	..	..	..	..	..	..	..	..
Equatorial Guinea	0	143	0	0	0	117	143	2,862
Eritrea	..	..	..	..	..	..	..	..
Ethiopia	0	3,048	0	0	320	2,964	3,367	66,509
Gabon	0	2,041	1,587	0	65	6,112	3,690	135,432
Gambia, The	0	216	0	0	0	191	216	4,481
Ghana	7	3,342	0	0	698	3,539	4,045	109,271
Guinea	0	1,092	0	0	0	1,011	1,092	32,445
Guinea-Bissau	0	231	0	0	0	209	231	4,477
Kenya	267	5,760	0	0	747	5,822	6,775	180,020
Lesotho	..	..	..	..	..	..	..	..
Liberia	0	326	0	0	0	465	326	33,189
Madagascar	44	1,121	0	0	30	945	1,198	37,860
Malawi	44	616	0	0	70	601	733	18,184
Mali	0	462	0	0	10	421	473	12,025
Mauritania	15	2,876	0	0	60	2,634	2,950	40,648
Mauritius	..	..	..	..	..	..	..	..
Mozambique	158	821	0	0	15	997	997	89,149
Namibia	..	..	..	..	..	..	..	..
Niger	458	649	0	0	15	1,048	1,121	20,863
Nigeria	150	21,596	8,596	51,494	1,495	88,665	83,330	1,944,327
Rwanda	0	484	0	2	5	528	491	9,167
São Tomé and Príncipe	..	..	..	..	..	..	..	..
Senegal	0	2,770	0	0	294	2,895	3,063	76,142
Seychelles	..	..	..	..	..	..	..	..
Sierra Leone	0	447	0	0	0	333	447	19,844
Somalia	0	0	0	0	15	18	15	13,747
South Africa (a)	227,707	56,821	3,532	0	4,684	291,108	292,746	8,541,575
Sudan	0	3,283	0	0	189	3,459	3,473	137,001
Swaziland	..	..	..	..	..	..	..	..
Tanzania	15	2,030	0	0	399	2,272	2,444	61,694
Togo	0	575	0	0	174	689	751	17,023
Uganda	0	986	0	0	50	846	1,033	32,837
Zambia	773	1,499	0	0	174	2,444	2,444	111,151
Zimbabwe	13,623	4,217	0	0	573	16,646	18,412	369,232
NORTH AFRICA	..	..	..	..	..	..	..	..
Algeria	3,188	22,651	50,567	14,400	3,488	80,443	94,297	1,725,913
Egypt	3,419	57,778	27,707	0	8,969	75,434	97,873	1,856,890
Libya	15	25,348	9,966	3,482	1,769	37,772	40,579	855,830
Morocco	6,225	18,426	40	0	3,189	23,486	27,879	558,859
Tunisia	238	9,167	4,250	254	2,276	13,260	16,184	318,035
ALL AFRICA	..	..	..	..	..	..	..	..

Sources: Carbon Dioxide Information Analysis Center.

Notes: Estimates are of the carbon dioxide emitted, 3.664 times the carbon it contains.  
0 = zero or less than half the unit of measure, .. = not available.

## 14-9. Globally threatened species: mammals, birds, and higher plants, late 1990s

	Mammals				Birds				Higher plants			
	Total number of known species			No. of species per 10,000 km <sup>2</sup> a/	Total number of known species			No. of species per 10,000 km <sup>2</sup> a/	Total number of known species			No. of species per 10,000 km <sup>2</sup> a/
	All species	Endemic species	Threatened species		Breeding species	Endemic species	Threatened species		All species b/	Endemic species	Threatened species	
SUB-SAHARAN AFRICA	..	..	..	..	..	..	..	..	..	..	..	..
excluding South Africa	..	..	..	..	..	..	..	..	..	..	..	..
excl. S. Africa & Nigeria	..	..	..	..	..	..	..	..	..	..	..	..
Angola	276	7	17	56	765	12	13	156	5,000	1,260	20	1,055
Benin	188	0	9	85	307	0	1	138	2,000	..	2	990
Botswana	164	0	5	43	386	1	7	101	..	17	0	563
Burkina Faso	147	0	6	49	335	0	1	112	1,100	..	..	369
Burundi	107	0	5	76	451	0	6	322	2,500	..	0	1,783
Cameroon	409	14	32	114	690	8	14	193	8,000	156	67	2,310
Cape Verde	..	..	..	..	..	..	..	..	..	..	..	..
Central African Republic	209	2	11	53	537	1	2	137	3,600	100	1	921
Chad	134	1	14	27	370	0	3	75	1,600	..	5	322
Comoros	..	..	..	..	..	..	..	..	..	..	..	..
Congo, Dem. Rep. of	450	28	38	74	929	24	26	153	2,867	1,100	69	1,818
Congo, Rep. of	200	2	10	62	449	0	3	140	4,350	1,200	2	1,870
Côte d'Ivoire	230	0	16	73	535	2	12	170	3,517	62	42	1,163
Djibouti	..	..	..	..	..	..	..	..	..	..	..	..
Equatorial Guinea	184	1	12	131	273	3	4	194	3,000	66	6	2,312
Eritrea	112	0	6	50	319	0	3	140	..	..	..	..
Ethiopia	255	31	35	54	626	28	20	133	6,500	1,000	125	1,398
Gabon	190	3	12	64	466	1	4	157	6,500	..	78	2,248
Gambia, The	117	0	4	112	280	0	1	269	966	..	0	935
Ghana	222	1	13	78	529	0	10	186	3,600	43	22	1,308
Guinea	190	1	11	66	409	0	12	142	3,000	88	29	1,043
Guinea-Bissau	108	0	4	71	243	0	1	159	1,000	12	..	655
Kenya	359	23	43	94	847	9	24	221	6,000	265	130	1,703
Lesotho	33	0	2	23	58	0	5	40	1,576	2	0	1,103
Liberia	193	0	11	87	372	1	13	168	2,200	103	1	993
Madagascar	141	93	46	37	202	105	28	53	9,000	6,500	255	2,479
Malawi	195	0	7	86	521	0	9	230	3,600	49	46	1,665
Mali	137	0	13	28	397	0	6	81	1,741	11	5	355
Mauritania	61	1	14	13	273	0	3	59	1,100	..	2	239
Mauritius	..	..	..	..	..	..	..	46	..	..	..	..
Mozambique	179	2	13	42	498	0	14	117	5,500	219	57	1,340
Namibia	250	3	11	58	469	3	8	109	3,978	687	14	942
Niger	131	0	11	27	299	0	2	60	1,170	..	..	238
Nigeria	274	4	26	62	681	2	9	153	4,614	205	16	1,059
Rwanda	151	0	9	110	513	0	6	373	2,288	26	0	1,664
São Tomé and Príncipe	..	..	..	..	..	..	..	..	..	..	..	..
Senegal	192	0	13	72	384	0	6	144	2,062	26	15	780
Seychelles	..	..	..	..	..	..	..	..	..	..	..	..
Sierra Leone	147	0	9	77	466	1	12	243	2,090	74	8	1,091
Somalia	171	12	18	43	422	11	8	107	3,000	500	57	768
South Africa	255	35	33	52	596	8	16	122	23,000	..	1,875	4,797
Sudan	267	11	21	43	680	1	9	110	3,132	50	2	507
Swaziland	..	..	..	..	..	..	..	303	..	..	..	..
Tanzania	316	15	33	70	827	24	30	183	10,000	1,122	326	2,231
Togo	196	0	8	110	391	0	1	220	2,484	..	0	1,739
Uganda	338	6	18	118	830	3	10	290	5,000	..	8	1,891
Zambia	233	3	11	56	605	2	10	145	4,600	211	5	1,141
Zimbabwe	270	0	9	81	532	0	9	159	4,200	95	73	1,325
NORTH AFRICA	..	..	..	..	..	..	..	..	..	..	..	..
Algeria	92	2	15	15	192	1	8	32	3,100	250	125	520
Egypt	98	7	15	21	153	0	11	33	2,066	70	59	454
Libya	76	5	11	14	91	0	2	17	1,800	134	41	331
Morocco	105	4	18	30	210	0	11	60	3,600	625	182	1,049
Tunisia	78	1	11	31	173	0	6	69	2,150	..	6	873
ALL AFRICA	..	..	..	..	..	..	..	..	..	..	..	..

Source: World Conservation Monitoring Centre (WCMC).

Notes: a. Values are standardized using a species-area curve.

b. Flowering plants only.

.. = not available.

## 14-10. Globally threatened species: reptiles, amphibians, and fish, late 1990s

	Reptiles				Amphibians				Freshwater fish	
	Total number of known species			No. of species per 10,000 km <sup>2</sup> a/	Total number of known species			No. of species per 10,000 km <sup>2</sup> a/	Total number of known species	
	All species	Endemic species	Threatened species		All species	Endemic species	Threatened species		All species	Threatened species b/
SUB-SAHARAN AFRICA	..	..	..	..	..	..	..	..	..	..
excluding South Africa	..	..	..	..	..	..	..	..	..	..
excl. S. Africa & Nigeria	..	..	..	..	..	..	..	..	..	..
Angola	..	19	5	..	..	22	0	..	..	0
Benin	..	1	2	..	..	0	0	..	150	0
Botswana	157	2	0	41	38	0	0	10	92	0
Burkina Faso	..	3	1	..	..	0	0	..	..	0
Burundi	..	0	0	..	..	2	0	..	..	0
Cameroon	183	21	3	51	190	66	1	53	354	26
Cape Verde	..	..	..	..	..	..	..	..	..	..
Central African Republic	129	0	1	33	47	0	0	12	..	0
Chad	5	1	1	1	..	0	0	..	..	0
Comoros	..	..	..	..	..	..	..	..	..	..
Congo, Dem. Rep. of	377	35	3	62	80	53	0	13	..	1
Congo, Rep. of	..	1	2	..	..	1	0	..	..	0
Côte d'Ivoire	..	3	4	..	..	3	1	..	..	0
Djibouti	..	..	..	..	..	..	..	..	..	..
Equatorial Guinea	..	4	2	..	..	2	1	..	..	0
Eritrea	85	1	3	38	19	2	0	8	..	0
Ethiopia	188	9	1	40	62	24	0	13	150	0
Gabon	..	3	3	..	..	4	0	..	..	0
Gambia, The	47	1	1	45	30	0	0	29	79	0
Ghana	..	1	4	..	..	4	0	..	..	0
Guinea	..	3	3	..	..	3	1	..	..	0
Guinea-Bissau	..	2	3	..	..	1	0	..	..	0
Kenya	190	18	5	50	88	10	0	23	..	20
Lesotho	..	2	0	..	..	0	0	..	8	1
Liberia	62	2	3	28	38	4	1	17	..	0
Madagascar	363	259	17	95	179	155	2	47	121	13
Malawi	124	7	0	55	69	3	0	31	..	0
Mali	16	4	1	3	..	1	0	..	..	0
Mauritania	..	1	3	..	..	0	0	..	..	0
Mauritius	..	..	..	..	..	..	..	..	..	..
Mozambique	167	5	5	39	62	1	0	15	..	2
Namibia	250	25	3	58	51	2	1	12	114	3
Niger	..	0	1	..	..	0	0	..	..	0
Nigeria	135	7	4	30	109	1	0	24	260	0
Rwanda	..	1	0	..	..	1	0	..	..	0
São Tomé and Príncipe	..	..	..	..	..	..	..	..	..	..
Senegal	100	1	7	37	2	1	0	1	79	0
Seychelles	..	..	..	..	..	..	..	..	..	..
Sierra Leone	..	1	3	..	..	2	0	..	..	0
Somalia	193	49	2	49	27	3	0	7	..	3
South Africa	315	97	19	65	108	49	9	22	94	27
Sudan	..	8	3	..	..	1	0	..	..	0
Swaziland	..	..	..	..	..	..	..	..	..	..
Tanzania	289	61	4	64	133	49	0	30	..	19
Togo	..	1	3	..	..	3	0	..	..	0
Uganda	149	2	1	52	50	1	0	17	291	28
Zambia	145	3	0	35	65	1	0	16	106	0
Zimbabwe	153	2	0	46	120	3	0	36	112	0
NORTH AFRICA	..	..	..	..	..	..	..	..	..	..
Algeria	81	4	1	13	10	0	0	2	..	1
Egypt	83	0	6	18	6	0	0	1	70	0
Libya	56	1	3	10	3	0	0	1	..	0
Morocco	90	11	2	26	11	1	0	3	..	1
Tunisia	62	1	2	25	7	0	0	3	..	0
ALL AFRICA	..	..	..	..	..	..	..	..	..	..

Source: World Conservation Monitoring Centre (WCMC).

Notes: a. Values are standardized using a species-area curve.

b. Threatened species include a few marine species.

..= not available.

# 14-11. National protection of natural areas, 1999

	All protected areas (IUCN categories I-V)					Number of Marine Protected Areas (a) (IUCN Categories I-VI)		
	Number	Area (000 ha)	Percent of land area	No. of Areas at least:		Total	Littoral	Marine
				100,000	1 million			
				ha in Size	ha in Size			
<b>SUB-SAHARAN AFRICA</b>	..	..	..	..	..	..	..	..
excluding South Africa	..	..	..	..	..	..	..	..
excl. S. Africa & Nigeria	..	..	..	..	..	..	..	..
Angola	13	8,181	6.6	9	2	4	4	3
Benin	2	778	6.9	2	0	..	..	..
Botswana	12	10,499	18.0	7	3	..	..	..
Burkina Faso	12	2,855	10.4	6	1	..	..	..
Burundi	13	146	5.3	0	0	1	1	1
Cameroon	18	2,098	4.4	8	0	2	1	2
Cape Verde	..	..	..	..	..	..	..	..
Central African Republic	13	5,110	8.2	11	2	..	..	..
Chad	9	11,494	9.0	9	2	..	..	..
Comoros	..	..	..	..	..	..	..	..
Congo, Dem. Rep. of	15	10,191	4.3	9	4	1	1	0
Congo, Rep. of	9	1,545	4.5	5	0	1	1	1
Côte d'Ivoire	11	1,986	6.2	4	1	3	3	1
Djibouti	..	..	..	..	..	..	..	..
Equatorial Guinea	0	0	0.0	0	0	4	4	0
Eritrea	3	501	4.3	2	0	..	..	..
Ethiopia	21	5,518	5.0	14	0	..	..	..
Gabon	5	723	2.7	1	0	4	4	1
Gambia, The	6	23	2.0	0	0	5	5	3
Ghana	10	1,104	4.6	3	0	..	..	..
Guinea	3	164	0.7	1	0	1	0	1
Guinea-Bissau	0	0	0.0	0	0	2	2	1
Kenya	50	3,507	6.0	7	1	14	13	10
Lesotho	1	7	0.2	0	0	..	..	..
Liberia	1	129	1.2	1	0	..	..	..
Madagascar	40	1,121	1.9	1	0	3	3	1
Malawi	9	1,059	8.9	3	0	..	..	..
Mali	13	4,532	3.7	8	2	..	..	..
Mauritania	9	1,746	1.7	3	1	5	5	2
Mauritius	..	..	..	..	..	..	..	..
Mozambique	11	4,779	6.0	7	1	7	7	6
Namibia	20	10,616	12.9	7	3	4	4	0
Niger	6	9,694	7.7	4	2	..	..	..
Nigeria	27	3,021	3.3	9	0	..	..	..
Rwanda	6	362	13.8	1	0	..	..	..
São Tomé and Príncipe	..	..	..	..	..	..	..	..
Senegal	12	2,181	11.1	3	0	7	6	6
Seychelles	..	..	..	..	..	..	..	..
Sierra Leone	2	82	1.1	0	0	..	..	..
Somalia	2	180	0.3	1	0	2	2	2
South Africa	390	6,619	5.4	6	1	20	17	8
Sudan	11	8,642	3.4	6	2	2	0	2
Swaziland	..	..	..	..	..	..	..	..
Tanzania	39	13,817	14.6	19	3	9	8	8
Togo	9	429	7.6	2	0	1	0	1
Uganda	37	1,913	7.9	6	0	..	..	..
Zambia	35	6,366	8.5	11	1	..	..	..
Zimbabwe	48	3,071	7.9	6	1	..	..	..
<b>NORTH AFRICA</b>	..	..	..	..	..	..	..	..
Algeria	18	5,891	2.5	2	2	8	6	3
Egypt	16	794	0.8	1	0	18	16	6
Libya	8	173	0.1	1	0	5	2	3
Morocco	12	317	0.7	1	0	10	9	3
Tunisia	7	45	0.3	0	0	7	5	4
<b>ALL AFRICA</b>	..	..	..	..	..	..	..	..

Source: World Conservation Monitoring Centre (WCMC).

Notes: a. Includes areas with substantial terrestrial components that reach the shore. An area can be both, marine and littoral (see technical notes).  
0 = zero or less than half the unit of measure. .. = not available or indeterminate.

## 14-12. International protected areas, 1999

	International protection systems					
	Biosphere reserves		World heritage sites		Wetlands of international importance	
	Number	Area (000 ha)	Number	Area (000 ha)	Number	Area (000 ha)
SUB-SAHARAN AFRICA	..	..	..	..	..	..
excluding South Africa	..	..	..	..	..	..
excl. S. Africa & Nigeria	..	..	..	..	..	..
Angola	0	..	0	0	0	..
Benin	1	880	0	0	0	..
Botswana	0	..	0	0	1	6,864
Burkina Faso	1	16	0	0	3	299
Burundi	0	..	0	0	0	..
Cameroon	3	850	1	526	0	..
Cape Verde	..	..	..	..	..	..
Central African Republic	2	1,640	1	1,740	0	..
Chad	0	..	0	0	1	195
Comoros	..	..	..	..	..	..
Congo, Dem. Rep. of	3	298	5	6,855	2	866
Congo, Rep. of	2	172	0	0	0	..
Côte d'Ivoire	2	1,480	3	1,484	1	19
Djibouti	..	..	..	..	..	..
Equatorial Guinea	0	..	0	0	0	..
Eritrea	0	..	0	0	0	..
Ethiopia	0	..	1	22	0	..
Gabon	1	15	0	0	3	1,080
Gambia, The	0	..	0	0	1	20
Ghana	1	8	0	0	6	178
Guinea	2	133	1	13	6	225
Guinea-Bissau	1	110	0	0	1	39
Kenya	5	1,335	0	0	2	49
Lesotho	0	..	0	0	0	..
Liberia	0	..	0	0	0	..
Madagascar	1	140	1	152	0	..
Malawi	0	..	1	9	1	225
Mali	1	771	1	400	3	162
Mauritania	0	..	1	1,200	2	1,189
Mauritius	1	4	0	0	0	..
Mozambique	0	..	0	0	0	..
Namibia	0	..	0	0	4	630
Niger	1	728	2	7,956	1	220
Nigeria	1	0	0	0	0	..
Rwanda	1	15	0	0	0	..
São Tomé and Príncipe	..	..	..	..	..	..
Senegal	3	1,094	2	929	4	100
Seychelles	..	..	..	..	..	..
Sierra Leone	0	..	0	0	0	..
Somalia	0	..	0	0	0	..
South Africa	0	..	0	0	15	486
Sudan	2	1,901	0	0	0	..
Swaziland	0	..	0	0	0	..
Tanzania	2	2,338	4	7,380	0	..
Togo	0	..	0	0	2	194
Uganda	1	220	2	132	1	15
Zambia	0	..	1	4	2	333
Zimbabwe	0	..	2	1,095	0	..
NORTH AFRICA	..	..	..	..	..	..
Algeria	2	7,276	1	..	2	5
Egypt	2	2,577	0	0	2	106
Libya	0	..	0	0	0	..
Morocco	0	..	0	0	4	11
Tunisia	4	32	1	13	1	13
ALL AFRICA	46	24,033	30	29,910	72	13,522

Source: World Conservation Monitoring Centre (WCMC), United Nations Educational, Scientific, and Cultural Organization (UNESCO), and Ramsar Convention Bureau, Switzerland.

Notes: 0 = zero or less than half the unit of measure. .. = not available or indeterminate.

## Technical notes

### Tables

These notes are based on technical notes for each table as presented in WRI 2000. They have been edited and shortened for this volume. Readers are urged to consult the original source for details.

**Table 14-1. Forest resources, 1990–95.** Total forest consists of all forest area for temperate countries and the sum of natural forest and plantation area categories.

FAO defines a *natural forest* as a forest composed primarily of indigenous (native) tree species. Natural forests include closed forest, where trees cover a high proportion of the ground and where grass does not form a continuous layer on the forest floor (e.g., broad-leaved forests, coniferous forests, and bamboo forests), and open forest, which FAO defines as mixed forest/grasslands with at least 10 percent tree cover and a continuous grass layer on the forest floor. Natural forests encompass all stands except plantations and include stands that have been degraded to some degree by agriculture, fire, logging, and other factors.

*Plantations* refer to forest stands established artificially by afforestation and reforestation for industrial and nonindustrial usage. Reforestation does not include regeneration of old tree crops (through either natural regeneration or forest management), although some countries may report regeneration as reforestation. Many trees are also planted for nonindustrial uses, such as village wood lots. Reforestation data often exclude this component. The data presented here reflect plantation survival rates as estimated by FAO.

*Average annual percent change* is shown as a percentage of the exponential growth rate. If negative (in parentheses), these figures reflect net deforestation, which is defined as the clearing of forest lands for all forms of agricultural uses (shifting cultivation, permanent agriculture, and ranching) and for other land uses such as settlements, other infrastructure, and mining. In tropical countries, this entails clearing that reduces tree crown cover to less than 10 percent. Deforestation, as defined here, does not reflect changes within the forest stand or site, such as selective logging (unless the forest cover is permanently reduced to less than 10 percent).

**Table 14-2. Forest ecosystems, 1996.** *Closed forests* exclude some woodlands and wooded savanna.

*Original forest as a percentage of land area* refers to the estimate of the percentage of land that would have been covered by closed forest about 8,000 years ago, assuming current climatic conditions, before large-scale disturbance by human society began.

*Current forests* refer to estimated closed forest cover within the past 10 years or so (this varies by country). Only closed moist forests are given for Africa.

*Frontier forests* are large, relatively intact forest ecosystems. They represent undisturbed forest areas that are large enough to maintain all of their biodiversity, including viable populations of wide-ranging species associated with each forest type.

*Percentage of frontier forests threatened* refers to frontier forests where ongoing or planned human activities such as logging, mining, and other large-scale disturbances will eventually degrade the ecosystem

through species decline or extinction, drastic changes in the forest's age structure, etc., and would result, if continued, in the violation of one of the above-mentioned criteria.

*Tropical forests* include all forests located between the Tropics of Cancer and Capricorn. All other forests are put into the *nontropical* category.

*Percentage protected* includes forest areas that fall within the protected areas in the world that are listed as the World Conservation Union's (IUCN) management categories I-V.

**Table 14-3. Wood production and trade, 1986–98.**

*Total roundwood production* refers to all wood in the rough, whether destined for industrial or fuelwood uses.

*Industrial roundwood production* comprises all roundwood products other than fuelwood and charcoal.

*Processed wood production* includes sawnwood and panels.

*Paper and paper board* includes newsprint, printing and writing paper, and other paper and paperboard.

*Trade in forest products* is the balance of imports minus exports.

**Table 14-4. Freshwater resources and withdrawals, 1970–2000.**

Annual internal renewable water resources refer to the average annual flow of rivers and groundwater generated from endogenous precipitation. Caution should be used when comparing different countries because these estimates are based on differing sources and dates. These annual averages also disguise large seasonal, inter-annual, and long-term variations. When data for annual river flows from and to other countries are not shown, the internal renewable water resources figure may include these flows. Per capita annual internal renewable water resource data were calculated using 1999 population estimates.

Annual withdrawals as a percentage of water resources refer to total water withdrawals, not counting evaporative losses from storage basins, as a percentage of internal renewable water resources and river flows from other countries. Water withdrawals also include water from desalination plants in countries where that source is a significant part of all water withdrawals.

Per capita annual withdrawals were calculated using national population data for the year of data shown for withdrawals.

Sectoral withdrawals are classified as domestic (drinking water, homes, commercial establishments, public services [for example, hospitals], and municipal use or provision); industry (including water withdrawn to cool thermoelectric plants); and agriculture (irrigation and livestock).

**Table 14-5. Marine and freshwater catches, aquaculture, balance of trade, and fish consumption.**

*Marine and freshwater catch* data refer to marine and freshwater fish, killed, caught, trapped, collected, bred, or cultivated for commercial, industrial, and subsistence use (catches from recreational activities are included where available). Crustaceans and mollusks are included. Statistics for mariculture, aquaculture, and other kinds of fish farming are included in the country totals. Figures are the national totals averaged over a 3-year period; they include fish caught by a country's fleet anywhere in the world. Catches of freshwater species caught in low-salinity seas are included in the statistics of the appropriate marine area. Marine catch includes catches of diadromous (migratory between saltwater and freshwater) species.

Data are represented as nominal catches, which are the landings converted to a live-weight basis, that is, the weight when caught.

Landings for some countries are identical to catches.

*Aquaculture* is defined by FAO as "the farming of aquatic organisms, including fish, mollusks, crustaceans, and aquatic plants. Farming implies some form of intervention in the rearing process to enhance production, such as regular stocking, feeding, and protection from predators, etc. [It] also implies ownership of the stock being cultivated. . . ." Aquatic organisms that are exploitable by the public as a common property resource are included in the harvest of fisheries.

*Marine fish* include a variety of species groups such as mullets, sea basses, groupers, snappers, tunas, mackerels, etc. *Diadromus fish* include surgeons, river eels, salmons, trouts, etc. *Freshwater fish* include



carps, perches, catfish, and tilapias, among others. Mollusks include freshwater molluscs, oysters, mussels, scallops, clams, abalones, and cephalopods. *Crustaceans* include, among others, freshwater crustaceans, crabs, lobsters, shrimps, and prawns. Data on whales and other marine mammals are excluded from this table.

*Balance of trade* is defined as exports minus imports. Figures are the national totals averaged over a 3-year period in millions of U.S. dollars. Imports are usually on a cost, insurance, and freight basis (c.i.f.) (i.e., insurance and freight costs added in). Exports are generally on a free-on-board basis (FOB) (i.e., not including insurance or freight costs). A surplus of imports over exports is shown in parentheses. Trade in *fish* includes fish that is fresh, frozen, chilled, salted, or smoked as well as fish products and preparations. Trade in *mollusks and crustaceans* includes molluscs and crustaceans that are fresh, chilled, smoked, derived products, etc. Trade in *fish meal* includes meals, solubles, etc.

*Per capita annual food supply from fish and seafood* is the quantity of both freshwater and marine fish, seafood, and derived products available for human consumption. Data on aquatic plants and whale meat are excluded from the totals. The amount of fish and seafood actually consumed may be lower than the figures provided, depending on how much is lost during storage, preparation, and cooking, and on how much is discarded. Data are presented in kilograms per capita. Years shown are 3-year averages.

**Table 14-6. Energy production by source.** All energy data in a common unit of 1,000 metric tons of oil equivalent (toe) to facilitate comparisons of energy sourcing, consumption, substitution, and conservation. A toe is defined as 41.868 gigajoules.

*Energy production from all sources* is the amount of energy from all sources produced by each country in the year specified. In addition to solid, liquid, and gaseous fuels and nuclear electricity, the total also includes hydropower, geothermal, solar, wind, tidal, wave, combustible renewables and waste, and indigenous heat production from heat pumps. *Per capita* shows the amount produced per person for that country.

Energy production from *solid fuels* is the energy produced from all types of primary coal (i.e., hard coal or lignite). Peat is also included in the category.

Energy production from *liquid fuels* is energy produced from liquid fuels such as crude oil or natural gas liquids.

Energy production from *gaseous fuels* is the amount of energy produced from natural gas.

Energy production from *nuclear fuels* shows the primary heat equivalent of the electricity produced by nuclear power plants. Heat-to-electricity conversion efficiency is assumed to be 33 percent.

*Total electricity generated* is the toe equivalent of the electrical energy produced by thermal, nuclear, geothermal, hydropower (excluding pumped storage production), and other power plants. Electricity generated is not a primary energy source and should not be mistakenly added to the energy production from primary sources presented in this table. These data were converted from gigawatt-hours to toe using a conversion rate of 1Gwh = 86 toe.

**Table 14-7. Energy consumption by economic sector.** *Industry* sector includes energy consumption by the iron and steel industry, chemical industry, non-ferrous metals basic industries, nonmetallic mineral products (glass, ceramic, cement, etc.), transport equipment, machinery, mining and quarrying, food and tobacco, paper, pulp and print, wood and wood products, construction, textile and leather, and any nonspecified industry.

*Iron and steel* consumption is the energy consumed by the iron and steel industry as a percentage of the total energy consumed by the country.

*Transportation* sector includes all fuel for air, road, and water transport except fuel used for international marine bunkers and for ocean, coastal, and inland fishing. *Air* transportation includes both international and domestic civil aviation. *Road* transportation includes all human and cargo transport along national road networks.

*Agriculture* refers to all agricultural and forestry activity, including ocean, coastal, and inland fishing.

*Commercial and public services* refer to service sectors such as stores, repair shops, and restaurants.

*Residential* sector includes household energy use.

The IEA reports that it can be difficult to distinguish accurately between the agriculture, commercial, and public services sectors and that a figure for “total energy use” is more accurate than totals for the individual sectors.

**Table 14-8. Carbon dioxide emissions from industrial processes, 1996.** This table includes data on industrial additions to the carbon dioxide flux from solid fuels, liquid fuels, gas fuels, gas flaring, and cement manufacture. The Carbon Dioxide Information Analysis Center (CDIAC) annually calculates emissions of CO<sub>2</sub> from the burning of fossil fuels and the manufacture of cement for most of the countries of the world. Estimates of total and per capita national emissions do not include bunker fuels used in international transport because of the difficulty of apportioning these fuels among countries benefiting from that transport. Emissions from bunker fuels are shown separately for the country where the fuel was delivered.

Emissions of CO<sub>2</sub> are often calculated and reported in terms of their content of elemental carbon. CDIAC reports them that way. For this table, CDIAC’s figures were converted to the actual mass by 3.664 (the ratio of the mass of carbon to that of CO<sub>2</sub>).

Solid, liquid, and gas fuels are primarily, but not exclusively, coals, petroleum products, and natural gas. Gas flaring is the practice of burning off gas released in the process of petroleum extraction, a practice that is declining. During cement manufacture, cement is calcined to produce calcium oxide. In the process, 0.498 metric ton of CO<sub>2</sub> is released for each metric ton of cement produced. Total emissions consist of the sum of the CO<sub>2</sub> produced during the consumption of solid, liquid, and gas fuels, and from gas flaring and the manufacture of cement.

Combustion of different fossil fuels releases CO<sub>2</sub> at different rates for the same level of energy production. Burning oil releases about 1.5 times the amount of CO<sub>2</sub> released from burning natural gas; burning coal releases about twice as much CO<sub>2</sub> as natural gas.

**Table 14-9. Globally threatened species: mammals, birds, and higher plants, late 1990s.** The total number of known species may include introductions in

some instances. Data on mammals exclude cetaceans (whales and porpoises), except where otherwise indicated. Threatened bird species are listed for countries included within their breeding or wintering ranges. Higher plants refer to numbers of native vascular plant species, as totals are of full species only, rather than of species and subspecies. The number of endemic species refers to those species known to be found only within the countries listed. Figures are not necessarily comparable among countries because taxonomic concepts and the extent of knowledge vary (for the latter reason, country totals of species and endemics may be underestimates). In general, numbers of mammals and birds are fairly well known, while plants have not been as well inventoried.

The World Conservation Union classifies threatened and endangered species in six categories.

*Endangered.* “Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating.”

*Vulnerable.* “Taxa believed likely to move into the endangered category in the near future if the causal factors continue operating.”

*Rare.* “Taxa with world populations that are not at present endangered or vulnerable, but are at risk.”

*Indeterminate.* “Taxa known to be endangered, vulnerable, or rare but where there is not enough information to say which of the three categories is appropriate.”

*Out of danger.* “Taxa formerly included in one of the above categories, but which are now considered relatively secure because effective conservation measures have been taken or the previous threat to their survival has been removed.”

*Insufficiently known.* “Taxa that are suspected but not definitely known to belong to any of the above categories.”

The number of threatened species listed for all countries includes full species that are endangered, vulnerable, rare, indeterminate, and insufficiently known, but excludes introduced species or those known to be extinct.

Number of species per 10,000 square kilometers provides a relative estimate for comparing numbers of species among countries of differing size. Because the relationship between area and species number is

nonlinear (that is, as the area sampled increases, the number of new species located decreases), a species-area curve has been used to standardize these species numbers.

**Table 14-10. Globally threatened species: reptiles, amphibians, and fish, late 1990s.** Threatened marine turtles and marine fish are excluded from country totals. Endangered fish species numbers do not include approximately 250 haplochromine and 2 tilapiine species of Lake Victoria cichlids, since the ranges of these species are undetermined.

The number of species per 10,000 square kilometers provides a relative estimate for comparing numbers of species among countries of differing size.

**Table 14-11. National protection of natural areas, 1999.** All protected areas combine natural areas in five World Conservation Union (formerly the International Union for Conservation of Nature and Natural Resources, IUCN), management categories (areas at least 1,000 hectares).

Totally protected areas are maintained in a natural state and are closed to extractive uses. They encompass the following three management categories: *category I*, scientific reserves and strict nature reserves; *category II*, national parks and provincial parks; and *category III*, natural monuments and natural landmarks.

Partially protected areas are areas that may be managed for specific uses, such as recreation or tourism, or areas that provide optimum conditions for certain species or communities of wildlife. Some extractive use within these areas is allowed. They encompass two management categories: *category IV*, managed nature reserves wildlife sanctuaries; and *category V*, protected landscapes and seascapes.

Protected areas between at least 100,000 hectares and 1 million hectares in size refer to all IUCN category I–V protected areas that fall within these two classifications.

IUCN has an additional management category, category VI, which includes areas “managed mainly for the sustainable use of natural ecosystems.” These areas contain predominantly unmodified natural systems, managed to ensure long-term protection and maintenance of biological diversity, while also pro-

viding a sustainable flow of natural products and services to meet community needs.

*Marine protected areas* include protected areas in any of the IUCN categories (I–VI) that are marine or have a marine component IUCN defines a “marine protected area” as “any area of intertidal or subtidal terrain, together with its overlying water and associated flora and fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment.” Marine protected areas (MPAs) include areas that are fully marine as well as areas that have only a small area of intertidal land. Many of these MPAs have large terrestrial areas. The extent of the marine portion of most protected areas is rarely documented. The degree of protection varies from one country to another, and it may bear little relationship to the legal status of any site. The categories of *marine* and *littoral* are not exclusive. One protected area can be littoral and marine, therefore adding numbers under these two different categories may produce a higher number than the total for MPAs. Littoral is defined as any site that is known to incorporate at least some intertidal area. Such sites can also include marine and/or terrestrial elements. All sites with mangrove and saltmarsh communities are recorded as littoral. Marine is defined as any site that is known to incorporate at least some subtidal area permanently submerged under the ocean. Such sites can also include littoral and terrestrial elements. All sites with coral reefs and seagrasses are recorded as marine.

The values in this table do not include locally or provincially protected sites, or privately owned areas.

**Table 14-12. International protected areas, 1999.** Internationally protected areas usually include sites that are listed under national protection systems.

Biosphere reserves are representative of terrestrial and coastal environments that have been internationally recognized under the Man and the Biosphere Programme of UNESCO.

World heritage sites represent areas of “outstanding universal value” for their natural features, their cultural value, or for both natural and cultural values. The table includes only natural and mixed natural and cultural sites.

Any party to the Convention on Wetlands of International Importance, Especially as Waterfowl Habitat that agrees to respect the site's integrity and to establish wetland reserves can designate wetlands of international importance.

Marine and coastal protected areas refer to all protected areas greater than 1,000 hectares with littoral, coral, island, marine, or estuarine components. The area given is the whole protected area.