

## Environmental Indicators

**D**ata for this chapter were drawn entirely from the World Resources Institute and reflect tables published in their *World Resources 2002–2004: Decisions for Earth: Balance, Voice, and Power*. The chapter 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 Limits to Growth* in 1972, however, issues of natural resource depletion and degradation have received considerable attention in assessing environmental factors and their impact 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 integrate environmental consequences into 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 roundwood production went to industrial uses. To put these figures in perspective, the corresponding figures for Europe are 16 and 84 percent.

Information on freshwater 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 population's health conditions. Almost all Sub-Saharan African countries use a very small fraction of their internal renewable water resources. For example, 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 wood fuel 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, 1990–2000

	Forest area								
	Total forest			Natural forest			Plantation		
	Extent (000 ha)		Annual % change 1990-2000	Extent (000 ha)		Annual % change 1990-2000	Extent (000 ha)		Annual % change 1990-2000
	1990	2000		1990	2000		1990	2000	
SUB-SAHARAN AFRICA	..	..	..	..	..	..	..	..	..
excluding South Africa	..	..	..	..	..	..	..	..	..
excl. S. Africa & Nigeria	..	..	..	..	..	..	..	..	..
Angola	70,998	69,756	-0.2	70,858	69,615	-0.2	140	141	0.1
Benin	3,349	2,650	-2.3	3,248	2,538	-2.5	101	112	1.0
Botswana	13,611	12,427	-0.9	13,610	12,426	-0.9	1	1	4.1
Burkina Faso	7,241	7,089	-0.2	7,220	7,023	-0.3	22	67	11.3
Burundi	241	94	-9.0	189	21	-21.9	52	73	3.4
Cameroon	26,076	23,858	-0.9	25,998	23,778	-0.9	78	80	0.3
Cape Verde	35	85	9.3	0	0	..	35	85	8.9
Central African Republic	23,207	22,907	-0.1	..	22,903	..	..	..	..
Chad	13,509	12,692	-0.6	13,498	12,678	-0.6	11	14	2.5
Comoros	12	8	-4.3	11	7	-5.3	1	2	3.9
Congo, Dem. Rep. of	22,235	22,060	-0.4	140,435	135,110	-0.4	96	97	0.1
Congo, Rep. of	140,531	135,207	-0.1	22,209	21,977	-0.1	26	83	11.5
Côte d'Ivoire	9,766	7,117	-3.1	9,629	6,933	-3.3	137	184	2.9
Djibouti	6	6	0.0	..	..	..	..	..	..
Equatorial Guinea	1,858	1,752	-0.6	..	..	..	..	..	..
Eritrea	1,639	1,585	-0.3	1,639	1,563	-0.5	0	22	..
Ethiopia	4,996	4,593	-0.8	4,800	4,377	-0.9	196	216	1.0
Gabon	21,927	21,826	0.0	..	21,790	..	..	36	..
Gambia, The	436	481	1.0	..	479	..	..	..	..
Ghana	7,535	6,335	-1.7	7,476	6,259	-1.8	59	76	2.5
Guinea	7,276	6,929	-0.5	7,264	6,904	-0.5	12	25	7.4
Guinea-Bissau	2,403	2,187	-0.9	..	2,186	..	..	2	..
Kenya	18,027	17,096	-0.5	17,816	16,865	-0.5	212	232	0.9
Lesotho	14	14	0.0	14	0	..	0	14	..
Liberia	4,241	3,481	-2.0	4,124	3,363	-2.0	118	119	0.1
Madagascar	12,901	11,727	-0.9	12,608	11,378	-1.0	294	350	1.7
Malawi	3,269	2,562	-2.4	3,173	2,450	-2.6	96	112	1.5
Mali	14,179	13,186	-0.7	13,172	14,172	-0.7	8	15	6.6
Mauritania	415	317	-2.7	415	293	-3.5	0	25	..
Mauritius	17	16	-0.6	4	3	-3.4	13	13	0.2
Mozambique	31,238	30,601	-0.2	31,195	30,551	-0.2	43	50	1.5
Namibia	8,774	8,040	-0.9	..	8,040	..	..	0	..
Niger	1,945	1,328	-3.7	1,898	1,256	-4.1	48	73	4.2
Nigeria	17,501	13,517	-2.6	17,038	12,824	-2.8	463	693	4.0
Rwanda	457	307	-3.9	211	46	-15.2	246	261	0.6
São Tomé and Príncipe	27	27	0.0	..	..	..	..	..	..
Senegal	6,655	6,205	-0.7	6,501	5,942	-0.9	154	263	5.3
Seychelles	30	30	0.0	..	25	..	..	5	..
Sierra Leone	1,416	1,055	-2.9	..	1,049	..	..	6	..
Somalia	8,284	7,515	-1.0	..	7,512	..	..	3	..
South Africa	8,997	8,917	-0.1	7,563	7,363	-0.3	1,434	1,554	0.8
Sudan	71,216	61,627	-1.4	70,876	60,987	-1.5	341	641	..
Swaziland	464	522	1.2	..	362	..	..	161	..
Tanzania	39,724	38,811	-0.2	..	38,676	..	..	135	..
Togo	719	510	-3.4	687	472	-3.8	32	38	1.7
Uganda	5,103	4,190	-2.0	5,073	4,147	-2.0	30	43	3.6
Zambia	39,755	31,246	-2.4	39,699	31,171	-2.4	56	75	2.9
Zimbabwe	22,239	19,040	-1.5	22,120	18,899	-1.6	119	141	1.7
NORTH AFRICA	..	..	..	..	..	..	..	..	..
Algeria	1,879	2,145	1.3	1,456	1,427	-0.2	424	718	5.3
Egypt, Arab Rep.	52	72	3.3	0	0	0.0	52	72	3.3
Libya	311	358	1.4	190	190	0.0	..	..	..
Morocco	3,037	3,025	0.0	2,599	2,491	-0.4	438	534	2.0
Tunisia	499	510	0.2	436	308	-3.5	63	202	11.7
ALL AFRICA	702,272	649,641	-0.7	586,950	640,826	0.9	5,644	7,856	3.9

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, 1990-99

	Forest resources, 1998												
	Land area (000 ha) 1998	Closed forests				Forest ecosystems (1990-99)							
		Original Forest as a % of land area <sup>a</sup>	Forests as a % of original forest		Percent frontier forests threatened <sup>c</sup> 1996	Forest ecosystems (1990-99)							
			Current forests <sup>b</sup> 1996	Frontier forests <sup>c</sup> 1996		Mangroves		Tropical forests		Nontropical forests		Sparse trees and parkland	
						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	11,262	16	4	0	0	0	0	1,516	18	0	0	585	2
Botswana	58,173	2	100	0	0	0	0	12,123	2	0	0	0	0
Burkina Faso	27,400	0	0	0	0	0	0	0	0	0	0	5,667	16
Burundi	2,783	46	3	0	0	0	0	219	18	0	0	139	3
Cameroon	47,544	80	42	8	97	227	2	20,009	6	0	0	2,416	22
Cape Verde	403	..	..	..	..	..	..	..	..	..	..	..	..
Central African Republic	62,298	52	16	4	100	0	0	17,101	20	0	0	1,451	48
Chad	128,400	0	0	0	0	0	0	3,516	4	0	0	2,857	1
Comoros	223	50	0	0	0	..	..	..	..	..	..	..	..
Congo, Dem. Rep. of	234,486	83	60	16	70	22	0	135,071	7	0	0	172	40
Congo, Rep. of	34,200	100	68	29	65	19	76	24,321	4	0	0	0	0
Côte d'Ivoire	32,246	75	10	2	100	0	0	2,702	23	0	0	625	18
Djibouti	2,320	2	0	0	0	0	0	33	0	0	0	0	0
Equatorial Guinea	2,805	96	38	0	0	25	0	1,749	0	0	0	0	0
Eritrea	11,760	..	..	..	..	0	0	1	0	0	0	0	0
Ethiopia	110,430	25	17	0	0	0	0	11,937	19	0	0	4,804	21
Gabon	26,767	100	90	32	100	147	3	21,481	4	0	0	0	0
Gambia, The	1,130	39	62	0	0	51	5	188	5	0	0	244	2
Ghana	23,854	66	9	0	0	0	0	1,694	7	0	0	336	17
Guinea	24,586	76	5	0	0	316	0	3,073	1	0	0	2,723	1
Guinea-Bissau	3,612	100	34	0	0	317	0	1,141	0	0	0	550	0
Kenya	58,037	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	11,137	100	44	0	0	0	0	3,149	3	0	0	1	0
Madagascar	58,704	93	13	0	0	310	0	6,940	6	0	0	0	0
Malawi	11,848	12	0	0	0	0	0	3,830	9	0	0	0	0
Mali	124,019	0	0	0	0	0	0	6,132	2	0	0	336	0
Mauritania	102,552	0	0	0	0	..	..	..	..	..	..	..	..
Mauritius	204	..	..	..	..	..	..	..	..	..	..	..	..
Mozambique	80,159	33	14	0	0	565	4	20,863	7	0	0	14,414	7
Namibia	82,429	0	95	0	0	0	0	3,436	11	0	0	0	0
Niger	126,700	0	0	0	0	0	0	27	16	0	0	0	0
Nigeria	92,377	45	11	1	100	1,145	0	11,634	7	0	0	10,588	4
Rwanda	2,634	36	16	0	0	0	0	291	77	0	0	162	2
São Tomé and Príncipe	96	33	71	0	0	0	0	30	0	0	0	0	0
Senegal	19,672	14	16	0	0	158	3	2,076	7	0	0	8,816	13
Seychelles	45	..	..	..	..	..	..	..	..	..	..	..	..
Sierra Leone	7,174	100	10	0	0	176	1	260	20	0	0	104	0
Somalia	63,766	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	250,581	1	0	0	0	0	0	12,288	12	0	0	5,870	9
Swaziland	1,736	22	0	0	0	0	0	286	3	0	0	0	0
Tanzania	94,509	22	9	0	0	323	0	14,356	16	0	0	583	3
Togo	5,679	33	7	0	0	0	0	224	3	0	0	91	9
Uganda	24,104	70	4	0	0	0	0	3,772	17	0	0	1,850	65
Zambia	75,261	7	70	0	0	0	0	21,989	32	0	0	39	14
Zimbabwe	39,076	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, Arab Rep.	100,145	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	44,655	22	7	0	0	0	0	0	0	1,862	3	0	0
Tunisia	16,361	18	5	0	0	0	0	0	0	300	2	0	0
ALL AFRICA	3,004,279	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 8,000 years ago given current climate conditions.

b. Includes frontier and nonfrontier forests.

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

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

## 14-3. Wood production and trade, 2000–02

	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 <sup>a</sup>
	Cubic meters (000)	Percent change since 1990-92	Cubic meters (000)	Percent change since 1990-92	Cubic meters (000)	Percent change since 1990-92	Cubic meters (000)	Percent change since 1990-92	Metric tons (000)	Percent change since 1990-92	Value (million US\$)	Value (million US\$)	
	2002	1990-92	2000-02	1990-92	2000-02	1990-92	2000-02	1990-92	2000-02	1990-92	2000-02	2000-02	
SUB-SAHARAN AFRICA	..	..	..	..	..	..	..	..	..	..	..	..	..
excluding South Africa	..	..	..	..	..	..	..	..	..	..	..	..	..
excl. S. Africa & Nigeria	..	..	..	..	..	..	..	..	..	..	..	..	..
Angola	4,436	33	3320	34	1,116	28	11	0	0	..	2	1	..
Benin	6,298	6	5,966	6	332	14	..	..	..	..	14	1	7
Botswana	750	8	645	6	105	21	..	..	..	..	15	0	1
Burkina Faso	11,994	8	11,400	6	594	45	..	..	..	..	8	1	3
Burundi	8,428	25	8,095	21	333	553	..	..	..	..	1	0	3
Cameroon	10,526	-2	9,256	17	1,270	-52	98	23	0	..	22	314	1
Cape Verde	..	..	..	..	..	..	..	..	..	..	2	0	4
Central African Republic	3,058	-14	2,000	-36	..	..	4	50	..	..	0	48	0
Chad	6,880	28	6,119	28	761	29	..	..	..	..	2	1	1
Comoros	9	..	..	..	9	..	..	..	..	..	0	0	1
Congo, Dem. Rep. of	70,938	40	67,285	41	3,653	18	3	-90	3	50	1	2	0
Congo, Rep. of	2,437	3	1,186	19	1,251	-9	25	-59	..	..	2	249	0
Côte d'Ivoire	11,581	8	8,581	9	3,000	7	323	53	..	..	38	183	1
Djibouti	0	..	0	..	0	..	..	..	..	..	5	0	..
Equatorial Guinea	811	33	447	0	364	121	15	67	..	..	0	97	0
Eritrea	2,325	..	2,324	..	2	..	..	..	..	..	3	0	6
Ethiopia	92,660	20	90,202	20	2,458	43	22	130	11	100	30	0	7
Gabon	3,104	59	520	13	2,584	73	251	137	..	..	4	367	0
Gambia, The	..	..	620	29	..	..	..	..	..	..	0	0	0
Ghana	21,782	52	20,678	60	1,104	-20	391	464	..	..	20	149	1
Guinea	12,188	23	11,537	24	651	16	0	..	..	..	5	6	1
Guinea-Bissau	592	4	422	0	170	15	..	..	..	..	0	1	0
Kenya	21,979	15	20,002	15	1,977	11	52	0	129	8	16	7	1
Lesotho	2,034	54	2,034	54	..	..	..	..	..	..	0	0	0
Liberia	5,470	23	5,133	49	337	-65	30	275	..	..	0	289	0
Madagascar	10,299	17	10,202	28	97	-88	5	0	3	-40	0	0	0
Malawi	5,549	-2	5,029	-3	520	18	18	20	..	..	0	0	0
Mali	5,259	18	4,846	18	413	16	..	..	..	..	0	0	0
Mauritania	1,508	24	1,502	24	6	20	..	..	..	..	0	0	0
Mauritius	17	-15	9	29	8	-38	0	..	..	..	0	0	0
Mozambique	18,043	12	16,724	11	1,319	39	3	-25	0	..	0	0	0
Namibia	..	..	..	..	..	..	..	..	..	..	0	0	0
Niger	8,601	8	8,190	6	411	30	..	..	..	..	0	0	0
Nigeria	69,482	15	60,064	15	9,418	14	95	-10	19	-39	0	0	0
Rwanda	7,836	158	7,500	150	336	918	0	..	..	..	0	0	0
São Tomé and Príncipe	..	..	..	..	..	..	..	..	..	..	0	0	0
Senegal	5,972	10	5,178	8	794	21	..	..	..	..	0	0	0
Seychelles	..	..	..	..	..	..	..	..	..	..	0	0	0
Sierra Leone	5,497	16	5,374	16	124	-2	..	..	..	..	0	0	0
Somalia	9,937	45	9,827	45	110	13	0	..	..	..	0	0	..
South Africa	30,616	19	12,000	-2	18,616	37	476	40	2,267	17	0	0	0
Sudan	19,241	5	17,068	3	2,173	22	2	0	3	0	0	0	0
Swaziland	890	-42	560	0	330	-66	8	0	..	..	0	0	0
Tanzania	23,439	11	21,125	10	2,314	12	4	-69	25	0	0	0	0
Togo	5,808	18	5,600	18	208	33	..	..	..	..	0	0	0
Uganda	38,317	19	35,142	16	3,175	72	5	25	3	0	0	0	0
Zambia	8,053	10	7,219	9	834	14	18	-50	4	100	0	0	0
Zimbabwe	9,108	31	8,115	30	992	43	77	32	..	-7	0	0	0
NORTH AFRICA	..	..	..	..	..	..	..	..	..	..	0	0	..
Algeria	7,513	21	7,305	24	208	-39	50	0	41	-55	332	0	2
Egypt, Arab Rep.	16,752	15	16,484	14	268	133	131	93	..	..	622	51	9
Libya	..	..	..	..	..	..	..	..	..	..	0	0	..
Morocco	926	-87	400	-93	526	-36	35	-38	129	8	0	0	0
Tunisia	2,329	12	2,116	10	214	30	104	5	94	27	0	0	0
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.

a. Exports values are from Table 5-1.

## 14-4. Freshwater resources and withdrawals, 1977–2004

	Annual freshwater resources and withdrawals, 1970-2001										
	Annual internal renewable water resources		Annual river flows		Annual withdrawals				Sectoral withdrawals (percent)		
	Total (cubic km)	Per capita 2004 (cubic meters)	From other countries (cubic km)	To other countries (cubic km)	Year of data	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	13,070	..	..	1987	0.34	0.2	28	22	16	61
Benin	25	3,585	15.5	..	1994	0.25	2.4	40	15	11	74
Botswana	14	8,022	11.8	..	1992	0.14	4.8	81	38	19	43
Burkina Faso	13	933	..	..	1992	0.78	6.2	66	11	0	88
Burundi	4	509	..	..	1987	0.23	6.5	37	17	1	82
Cameroon	286	17,520	0.0	0.0	1987	0.99	0.4	65	18	8	74
Cape Verde	0	634	..	..	..	0.03	9.3	64	15	3	83
Central African Republic	144	36,912	..	..	1987	0.02	0.0	6	77	19	4
Chad	43	4,857	28.0	..	1990	0.23	1.6	30	19	1	80
Comoros	1	1,519	..	..	..	..	..	..	..	..	..
Congo, Dem. Rep. of	1,283	..	84.0	..	1994	0.36	0.0	7	52	16	31
Congo, Rep. of	832	217,915	610.0	..	1987	0.04	0.0	11	59	30	10
Côte d'Ivoire	81	4,794	1.0	..	1987	0.93	1.2	59	23	12	65
Djibouti	0	421	..	..	..	0.01	2.6	12	11	0	89
Equatorial Guinea	26	51,282	0.0	..	1987	0.11	0.4	232	83	16	1
Eritrea	6	1,466	6.0	..	..	0.30	10.8	82	4	1	95
Ethiopia	110	1,519	0.0	..	1987	2.65	2.4	40	1	6	93
Gabon	164	121,392	0.0	..	1987	0.13	0.1	102	48	11	40
Gambia, The	8	5,472	5.0	..	1990	0.03	1.1	..	..	..	..
Ghana	53	2,489	22.9	..	1970	0.52	1.7	27	37	15	48
Guinea	226	26,218	0.0	..	1987	1.52	0.7	187	8	2	90
Guinea-Bissau	31	20,156	11.0	..	1991	0.11	0.7	81	9	1	91
Kenya	30	932	10.0	..	1990	1.58	7.8	52	30	6	64
Lesotho	3	1,678	0.0	..	1987	0.05	1.0	30	40	41	19
Liberia	232	66,533	32.0	..	1987	0.11	0.1	36	28	15	56
Madagascar	337	18,826	0.0	..	1990	14.97	4.4	937	3	2	96
Malawi	17	1,401	1.1	..	1994	1.01	6.2	88	15	5	81
Mali	100	7,458	40.0	..	1987	6.93	11.5	582	1	0	99
Mauritania	11	3,826	11.0	..	1990	1.70	424.5	642	9	3	88
Mauritius	2	..	..	..	..	0.61	27.7	..	25	14	60
Mozambique	216	11,266	116.0	..	1992	0.64	0.6	36	11	2	87
Namibia	18	8,921	39.3	..	1990	0.27	4.4	142	33	5	63
Niger	34	2,710	29.0	..	1990	2.19	62.5	204	4	1	95
Nigeria	286	2,252	59.0	..	1990	8.00	3.6	70	21	10	69
Rwanda	5	613	..	..	1993	0.08	1.5	10	48	14	39
São Tomé and Príncipe	2	13,212	..	..	..	..	..	..	..	..	..
Senegal	39	3,811	13.0	..	1990	1.59	6.0	169	6	4	90
Seychelles	..	..	..	..	..	..	..	..	..	..	..
Sierra Leone	160	30,960	0.0	..	1987	0.38	0.2	86	5	2	93
Somalia	14	1,309	9.7	..	1987	3.30	55.0	378	0	0	100
South Africa	50	1,106	5.2	..	1990	15.31	34.2	348	17	10	73
Sudan	65	1,879	119.0	..	1995	37.31	124.4	1187	3	1	97
Swaziland	3	4,164	..	..	..	0.83	31.4	795	3	6	92
Tanzania	91	2,416	9.0	..	1994	2.00	2.4	57	6	1	93
Togo	15	2,930	0.5	..	1987	0.17	1.4	36	45	8	47
Uganda	66	2,472	27.0	..	1970	0.30	0.8	13	45	15	39
Zambia	105	9,630	35.8	..	1994	1.74	2.2	167	16	8	76
Zimbabwe	20	1,547	5.9	..	1987	2.61	18.5	207	10	5	86
NORTH AFRICA	..	..	..	..	..	..	..	..	..	..	..
Algeria	..	443	0.4	0.4	1990	6.07	43.7	201	22	13	65
Egypt, Arab Rep.	58	794	56.0	0.0	1993	68.65	3,814.0	1013	8	14	78
Libya	1	106	0.0	0.0	1995	4.81	801.9	919	8	3	89
Morocco	29	934	0.0	0.2	1991	12.76	44.0	438	8	2	90
Tunisia	5	459	0.6	0.0	1996	2.73	65.7	286	16	2	82
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
	marine catch <sup>a</sup>		freshwater catch <sup>b</sup>		aquaculture production				balance of trade <sup>c</sup>			food supply from
	(000	%	(000	%	1999-01 (metric tons)				1995-97 (million US\$)			fish and seafood
	metric	change	metric	change	Marine	Dia- dromous	Fresh- water	Mollusks & Crus- taceans	Fish	Mollusks &	Fish	Total
	tons)	since	tons)	since								
	2000-02	1990-92	2000-02	1990-92								(kg)
SUB-SAHARAN AFRICA	..	..	..	..	..	..	..	..	..	..	..	..
excluding South Africa	..	..	..	..	..	..	..	..	..	..	..	..
excl. S. Africa & Nigeria	..	..	..	..	..	..	..	..	..	..	..	..
Angola	245	115	6	-14	..	..	..	..	-8	3	..	17
Benin	8	14	18	-5	..	..	7	..	-5	2	..	8
Botswana	..	..	0	-100	..	..	..	..	-5	0	0	5
Burkina Faso	..	..	9	29	..	..	5	..	-3	0	..	2
Burundi	..	..	12	-43	..	..	100	..	0	0	..	1
Cameroon	57	16	58	164	..	..	330	..	-22	2	0	14
Cape Verde	9	29	..	..	..	..	..	..	..	..	..	23
Central African Republic	..	..	15	15	..	..	..	..	..	..	..	..
Chad	..	..	84	20	..	..	..	..	..	0	..	7
Comoros	13	8	..	..	..	..	..	..	..	..	..	17
Congo, Dem. Rep. of	5	67	210	25	..	..	..	..	-27	7	..	6
Congo, Rep. of	23	15	20	-20	..	..	..	..	-50	..	..	..
Côte d'Ivoire	61	-12	14	-22	..	..	806	..	35	4	0	15
Djibouti	0	..	..	..	..	..	..	..	..	..	..	1
Equatorial Guinea	3	0	..	..	..	..	..	..	0	0	..	..
Eritrea	10	..	0	..	..	..	..	..	0	0	..	2
Ethiopia	0	..	14	250	..	..	..	..	0	..	..	0
Gabon	34	70	10	400	..	..	83	..	-9	7	..	42
Gambia, The	34	79	3	0	..	..	..	..	1	3	..	25
Ghana	349	4	75	32	..	..	6,000	..	64	2	..	29
Guinea	96	109	4	0	..	..	..	..	8	5	0	12
Guinea-Bissau	5	0	0	..	..	..	..	..	6	3	..	1
Kenya	7	-13	168	-6	..	123	675	0	33	5	0	4
Lesotho	..	..	0	..	..	..	8	..	..	..	..	0
Liberia	8	100	4	0	..	..	14	..	-2	0	..	5
Madagascar	106	43	30	7	..	..	2,400	5,399	13	77	0	8
Malawi	..	..	42	-39	..	4	638	..	0	0	0	4
Mali	..	..	103	49	..	..	1,008	..	-1	..	..	8
Mauritania	77	26	5	-17	..	..	..	..	22	105	..	10
Mauritius	10	-41	..	..	2	..	20	25	..	..	..	22
Mozambique	25	-14	10	150	..	..	77	..	-5	74	..	2
Namibia	586	57	2	100	..	..	15	..	..	..	..	14
Niger	..	..	20	567	..	..	40	..	-1	0	..	1
Nigeria	300	50	158	80	..	..	30,663	..	-208	20	..	7
Rwanda	..	..	7	133	..	..	612	..	..	..	..	1
São Tomé and Príncipe	4	33	..	..	..	..	..	..	..	..	..	..
Senegal	373	18	23	5	..	..	22	50	206	73	3	28
Seychelles	50	614	..	..	..	..	..	282	..	..	..	62
Sierra Leone	64	28	14	0	..	..	..	..	13	10	..	15
Somalia	19	-21	0	..	..	..	..	..	4	..	..	..
South Africa	719	25	1	0	15	..	..	..	102	43	-37	..
Sudan	5	150	..	..	..	..	1,600	..	0	0	..	2
Swaziland	..	..	0	..	..	..	..	6	..	..	..	6
Tanzania	52	-7	279	-7	..	..	630	..	52	9	0	7
Togo	17	113	..	..	..	..	1,025	..	-23	5	..	10
Uganda	..	..	221	-9	..	..	4,915	..	38	..	..	7
Zambia	..	..	66	0	..	..	4,200	..	0	0	0	7
Zimbabwe	..	..	13	-43	..	..	2,213	0	-15	-1	-1	1
NORTH AFRICA	..	..	..	..	..	..	..	..	..	..	..	..
Algeria	127	43	..	..	68	33	344	..	-7	2	..	4
Egypt, Arab Rep.	132	63	241	40	116,023	1	..	9	-108	0	..	15
Libya	33	22	..	..	..	..	..	..	21	0	..	7
Morocco	957	68	2	100	718	127	520	0	270	437	2	9
Tunisia	96	10	1	..	1,304	9	558	0	8	77	0	11
ALL AFRICA	..	..	..	..	..	..	..	..	..	..	..	..

Source: Food and Agriculture Organization of the United Nations.

Notes: a. Includes marine fish and diadromous fish caught in marine areas, as well as mollusks and crustaceans.

b. Includes freshwater fish and diadromous fish caught in inland waters or low-salinity marine areas, as well as mollusks and crustaceans.

c. 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) <sup>a</sup>	% change since 1989	Per capita (kg oil equivalent) 1999	Solid fuels (000 metric toe) <sup>a</sup>	Liquid fuels (000 metric toe) <sup>a</sup>	Gaseous fuels (000 metric toe) <sup>a</sup>	Nuclear fuels (000 metric toe) <sup>a</sup>	Other sources (000 metric toe) <sup>a</sup>	(000 metric toe) <sup>a</sup>	% change since 1997		
											1999	1999
SUB-SAHARAN AFRICA	..	..	..	..	..	..	..	..	..	..	..	
excluding South Africa	..	..	..	..	..	..	..	..	..	..	..	
excl. S. Africa & Nigeria	..	..	..	..	..	..	..	..	..	..	..	
Angola	43,644	61	3,421	0	37,627	457	0	0	95	37		
Benin	1,781	4	292	0	45	0	0	0	4	92		
Botswana	..	..	..	..	..	..	..	..	..	..		
Burkina Faso	..	..	..	..	..	..	..	..	..	..		
Burundi	..	..	..	..	..	..	..	..	..	..		
Cameroon	12,109	-4	832	0	6,945	0	0	0	269	25		
Cape Verde	..	..	..	..	..	..	..	..	..	..		
Central African Republic	..	..	..	..	..	..	..	..	..	..		
Chad	..	..	..	..	..	..	..	..	..	..		
Comoros	..	..	..	..	..	..	..	..	..	..		
Congo, Dem. Rep. of	14,860	25	300	58	1,075	0	0	0	517	11		
Congo, Rep. of	14,079	58	4,805	0	13,500	0	0	0	37	53		
Côte d'Ivoire	6,023	82	384	0	493	1,267	0	0	276	55		
Djibouti	..	..	..	..	..	..	..	..	..	..		
Equatorial Guinea	..	..	..	..	..	..	..	..	..	..		
Eritrea	467	..	132	0	0	0	0	..	..	..		
Ethiopia	17,176	26	280	0	0	0	0	0	115	50		
Gabon	17,842	60	14,881	0	16,813	68	0	0	87	13		
Gambia, The	..	..	..	..	..	..	..	..	..	..		
Ghana	5,640	32	299	0	0	0	0	0	529	26		
Guinea	..	..	..	..	..	..	..	..	..	..		
Guinea-Bissau	..	..	..	..	..	..	..	..	..	..		
Kenya	12,051	19	401	0	0	0	0	0	364	60		
Lesotho	..	..	..	..	..	..	..	..	..	..		
Liberia	..	..	..	..	..	..	..	..	..	..		
Madagascar	..	..	..	..	..	..	..	..	..	..		
Malawi	..	..	..	..	..	..	..	..	..	..		
Mali	..	..	..	..	..	..	..	..	..	..		
Mauritania	..	..	..	..	..	..	..	..	..	..		
Mauritius	..	..	..	..	..	..	..	..	..	..		
Mozambique	7,067	2	394	11	0	0	0	0	86	199		
Namibia	270	..	156	0	0	0	0	..	..	..		
Niger	..	..	..	..	..	..	..	..	..	..		
Nigeria	183,796	25	1,658	36	106,759	5,888	0	0	1,305	35		
Rwanda	..	..	..	..	..	..	..	..	..	..		
São Tomé and Príncipe	..	..	..	..	..	..	..	..	..	..		
Senegal	1,684	27	183	0	1	5	0	0	108	52		
Seychelles	..	..	..	..	..	..	..	..	..	..		
Sierra Leone	..	..	..	..	..	..	..	..	..	..		
Somalia	..	..	..	..	..	..	..	..	..	..		
South Africa	143,993	26	3,368	126,253	348	1,518	3,345	0	17,866	38		
Sudan	16,631	93	547	0	3,512	0	0	0	169	43		
Swaziland	..	..	..	..	..	..	..	..	..	..		
Tanzania	14,267	24	416	3	0	0	0	0	166	52		
Togo	1,022	35	233	0	0	0	0	..	..	..		
Uganda	..	..	..	..	..	..	..	..	..	..		
Zambia	5,770	22	566	112	0	0	0	0	689	-8		
Zimbabwe	8,723	11	703	2,983	0	0	0	0	628	15		
NORTH AFRICA	..	..	..	..	..	..	..	..	..	..		
Algeria	144,363	46	4,852	0	66,870	77,400	0	0	1,865	70		
Egypt, Arab Rep.	58,460	10	877	0	42,029	13,816	0	0	4,958	52		
Libya	70,462	15	13,616	0	66,079	4,246	0	0	1,563	17		
Morocco	615	-19	21	72	10	33	0	231	1,129	64		
Tunisia	7,120	10	761	0	4,161	1,727	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 Consumption by Economic Sector (% of total consumption)													
	Industry				Transportation						Agriculture			
	All industries		Iron and steel		Total		Air		Road		Agriculture		Commercial and public services	
	1990	1999	1990	1999	1990	1999	1990	1999	1990	1999	1990	1999	1990	1999
SUB-SAHARAN AFRICA	..	..	..	..	..	..	..	..	..	..	..	..	..	..
excluding South Africa	..	..	..	..	..	..	..	..	..	..	..	..	..	..
excl. S. Africa & Nigeria	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Angola	41	12	0	0	41	12	21	5	21	7	1	0	7	5
Benin	16	3	0	0	67	19	16	2	51	17	0	0	0	8
Botswana	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Burkina Faso	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Burundi	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Cameroon	15	17	0	0	55	11	5	1	50	10	0	0	2	1
Cape Verde	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Central African Republic	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Chad	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Comoros	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Congo, Dem. Rep. of	24	21	3	0	26	2	9	1	17	1	0	0	0	0
Congo, Rep. of	12	2	0	0	70	20	13	5	57	16	0	0	0	0
Côte d'Ivoire	21	8	0	0	49	15	9	2	35	11	6	2	9	13
Djibouti	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Equatorial Guinea	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Eritrea	..	4	..	0	..	14	..	2	..	13	..	0	..	12
Ethiopia	24	2	0	0	54	3	20	0	34	3	4	0	2	0
Gabon	22	22	0	0	51	18	18	6	29	10	0	0	4	1
Gambia, The	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Ghana	16	12	0	0	13	13	1	1	12	11	1	1	0	0
Guinea	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Guinea-Bissau	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Kenya	26	11	0	0	53	12	13	5	39	7	3	7	1	1
Lesotho	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Liberia	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Madagascar	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Malawi	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Mali	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Mauritania	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Mauritius	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Mozambique	13	23	0	0	28	4	11	0	17	3.6	9	0	35	0
Namibia	..	6	..	0	..	47	..	5	..	38	..	15	..	0
Niger	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Nigeria	19	11	1	0	53	7	4	1	48	7	0	0	2	0
Rwanda	..	..	..	..	..	..	..	..	..	..	..	..	..	..
São Tomé and Príncipe	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Senegal	18	18	0	0	61	24	24	8	34	14.1	9	3	1	1
Seychelles	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Sierra Leone	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Somalia	..	..	..	..	..	..	..	..	..	..	..	..	..	..
South Africa	51	46	16	10	21	24	2	3	19	21	3	3	5	4
Sudan	14	5	0	0	73	12	2	0	72	12	1	0	1	2
Swaziland	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Tanzania	21	12	0	0	47	2	11	0	36	2	1	3	4	0
Togo	8	6	0	0	13	12	2	2	11	10	0	0	1	1
Uganda	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Zambia	41	23	1	0	17	5	3	1	14	4	2	1	6	2
Zimbabwe	48	12	12	3	22	9	3	1	13	7	12	9	8	3
NORTH AFRICA	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Algeria	25	25	4	3	38	21 #	3	2	33	14	0	0	0	0
Egypt, Arab Rep.	48	44	2	2	21	22 #	2	2	19	20	1	1	0	3
Libya	37	34	0	0	32	39	3	4	29	36	0	0	0	0
Morocco	28	27	0	0	13	12	5	4	8	5	1	1	2	2
Tunisia	39	25	2	1	30	27	6	6	23	22	7	6	7	7
ALL AFRICA	..	..	..	..	..	..	..	..	..	..	..	..	..	..

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, 1999

	CO <sub>2</sub> emissions (000 metric tons)						Per capita carbon dioxide emissions (kilograms) 1999	
	Solid fuels 1999	Liquid fuels 1999	Gaseous fuels 1999	Gas flaring 1998	Cement manufacturing 1998	Total 1990	Total 1998	Total contribution Since 1950 <sup>a</sup>
SUB-SAHARAN AFRICA	..	..	..	..	..	..	..	..
excluding South Africa	..	..	..	..	..	..	..	..
excl. S. Africa & Nigeria	..	..	..	..	..	..	..	..
Angola	0	3,740	1,070	1,738	174	4,650	5,925	145,552
Benin	0	1,180	0	0	259	564	732	14,762
Botswana	..	..	..	9	0	2,415	3,778	51,505
Burkina Faso	..	..	..	0	20	1,008	1,009	14,682
Burundi	..	..	..	0	0	194	231	3,975
Cameroon	0	2,580	0	0	224	1,488	1,763	86,507
Cape Verde	..	..	..	0	0	84	121	..
Central African Republic	..	..	..	0	0	198	249	5,866
Chad	..	..	..	0	0	143	110	5,027
Comoros	..	..	..	0	0	66	70	..
Congo, Dem. Rep. of	880	1,570	0	0	60	4,096	2,434	142,475
Congo, Rep. of	0	370	0	167	0	2,037	1,820	40,161
Côte d'Ivoire	0	1,730	2,960	0	324	9,907	13,199	185,109
Djibouti	..	..	..	0	0	352	366	..
Equatorial Guinea	..	..	..	0	0	117	253	2,862
Eritrea	0	620	0	..	..	..	1,990	..
Ethiopia	0	2,930	0	0	411	2,964	2,820	66,509
Gabon	0	1,330	160	0	98	6,112	227	135,432
Gambia, The	..	..	..	0	0	191	4,357	4,481
Ghana	0	4,390	0	0	997	3,539	1,225	109,271
Guinea	..	..	..	0	130	1,011	231	32,445
Guinea-Bissau	..	..	..	0	0	209	9,131	4,477
Kenya	170	7,480	0	0	598	5,822	353	180,020
Lesotho	..	..	..	..	..	..	1,251	..
Liberia	..	..	..	0	5	465	747	33,189
Madagascar	..	..	..	0	60	945	485	37,860
Malawi	..	..	..	0	87	601	2,916	18,184
Mali	..	..	..	0	5	421	1,726	12,025
Mauritania	..	..	..	0	25	2,634	1,332	40,648
Mauritius	..	..	..	0	0	1,151	10	..
Mozambique	0	1,070	0	0	144	997	1,110	89,149
Namibia	10	2,200	0	0	10	..	78,455	..
Niger	..	..	..	0	18	1,048	2,231	20,863
Nigeria	140	25,950	12,300	40,203	1,345	88,665	511	1,944,327
Rwanda	..	..	..	2	7	528	7	9,167
São Tomé and Príncipe	..	..	..	0	0	66	77	..
Senegal	0	3,270	10	0	498	2,895	3,298	76,142
Seychelles	..	..	..	0	0	114	198	..
Sierra Leone	..	..	..	0	50	333	523	19,844
Somalia	..	..	..	0	0	18	0	13,747
South Africa	316,120	26,640	3,550	0	4,734	291,108	343,716	8,541,575
Sudan	0	5,390	0	0	150	3,459	3,597	137,001
Swaziland	..	..	..	0	0	425	399	..
Tanzania	8	0	7	0	150	2,272	2,227	61,694
Togo	0	880	0	0	281	689	882	17,023
Uganda	..	..	..	0	105	846	1,281	32,837
Zambia	400	1,490	0	0	199	2,444	1,559	111,151
Zimbabwe	9,520	4,130	0	0	548	16,646	14,072	369,232
NORTH AFRICA	..	..	..	..	..	..	..	..
Algeria	2,040	20,890	45,260	13,332	3,887	80,443	106,613	1,725,913
Egypt, Arab Rep.	3,140	76,200	30,920	0	9,569	75,434	105,753	1,856,890
Libya	0	32,930	8,460	3,520	1,495	37,772	36,448	855,830
Morocco	8,590	19,350	80	0	3,588	23,486	32,035	558,859
Tunisia	360	10,210	6,150	259	2,287	13,260	22,364	318,035
ALL AFRICA	..	..	..	..	..	..	..	..

Sources: International Energy Agency (IEA), Carbon Dioxide Information Analysis Center (CDIAC).

Notes: Estimates are of the carbon dioxide emitted, 3.664 times the carbon it contains.

a. Data are for 1998.

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

## 14-9. Globally threatened species: mammals, birds, and higher plants, 1992–2004

	Mammals				Birds				Higher plants			
	Total number of known species			No. of species per 10,000 km <sup>2a</sup>	Total number of known species			No. of species per 10,000 km <sup>2a</sup>	Total number of known species			No. of species per 10,000 km <sup>2a</sup>
	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	296	7	19	56	930	17	15	13	5,185	1,260	19	1,055
Benin	159	0	8	85	485	0	2	1	2,500	..	11	990
Botswana	169	0	6	43	570	3	7	7	2,151	17	..	563
Burkina Faso	129	0	7	49	452	0	2	1	1,100	..	2	369
Burundi	116	0	6	76	597	4	7	6	2,500	..	2	1,783
Cameroon	322	15	40	114	936	9	15	14	8,260	156	155	2,310
Cape Verde	26	0	3	7	160	4	2	3	774	86	2	..
Central African Republic	187	3	14	53	663	1	3	2	3,602	100	10	921
Chad	104	1	17	27	531	0	5	3	1,600	..	2	322
Comoros	15	2	2	20	138	19	9	6	721	136	5	..
Congo, Dem. Rep. of	450	26	40	74	345	24	28	26	11,007	1,100	55	1,818
Congo, Rep. of	200	3	15	62	130	0	3	3	6,000	1,200	33	1,870
Côte d'Ivoire	229	1	19	73	702	0	12	12	3,660	62	101	1,163
Djibouti	106	0	4	46	312	2	5	3	826	6	2	..
Equatorial Guinea	153	2	16	131	418	4	5	4	3,250	66	23	2,312
Eritrea	70	0	12	50	537	3	7	3	..	..	3	..
Ethiopia	288	34	35	54	839	24	16	20	6,603	1,000	22	1,398
Gabon	166	3	15	64	632	0	5	4	6,651	..	71	2,248
Gambia, The	117	0	3	112	535	0	..	1	..	..	..	935
Ghana	249	1	14	78	729	0	8	10	3,725	43	115	1,308
Guinea	215	0	12	66	640	0	10	12	3,000	88	21	1,043
Guinea-Bissau	101	0	3	71	459	0	..	1	1,000	12	4	655
Kenya	407	22	51	94	1,103	17	24	24	6,506	265	98	1,703
Lesotho	59	0	3	23	311	4	7	5	1,591	2	1	1,103
Liberia	183	0	17	87	576	1	11	13	2,200	103	46	993
Madagascar	165	102	50	37	262	111	27	28	9,505	6,500	162	2,479
Malawi	207	0	8	86	658	3	11	9	3,765	49	13	1,665
Mali	134	1	13	28	624	1	4	6	1,741	11	6	355
Mauritania	94	1	10	13	521	0	2	3	1,100	..	..	239
Mauritius	14	1	3	7	137	42	9	10	750	325	87	..
Mozambique	228	3	14	42	685	2	16	14	5,692	219	36	1,340
Namibia	192	3	15	58	619	5	11	8	3,174	687	5	942
Niger	123	0	11	27	493	0	3	2	1,460	..	2	238
Nigeria	290	4	27	62	899	4	9	9	4,715	205	119	1,059
Rwanda	206	0	9	110	665	2	9	6	2,288	26	3	1,664
São Tomé and Príncipe	8	..	3	17	..	25	9	9	895	134	27	..
Senegal	191	1	12	72	612	1	4	6	2,086	26	7	780
Seychelles	25	2	4	17	238	22	10	9	250	182	43	..
Sierra Leone	197	0	12	77	626	0	10	12	2,090	74	43	1,091
Somalia	182	9	19	43	642	13	10	8	3,028	500	17	768
South Africa	320	33	42	52	829	27	28	16	23,420	..	45	4,797
Sudan	302	12	23	43	952	3	6	9	3,137	50	17	507
Swaziland	124	0	4	39	490	4	5	6	2,715	4	3	..
Tanzania	375	16	42	70	1,056	29	33	30	10,008	1,122	235	2,231
Togo	175	..	9	110	565	0	..	1	3,085	..	9	1,739
Uganda	360	..	20	118	1,015	7	13	10	4,900	..	33	1,891
Zambia	255	..	11	56	770	5	11	10	..	..	8	1,141
Zimbabwe	222	..	11	81	661	0	10	9	..	..	14	1,325
NORTH AFRICA	..	..	..	..	..	..	..	..	..	..	..	..
Algeria	100	2	13	15	372	1	6	8	3,164	250	2	520
Egypt, Arab Rep.	118	7	13	21	481	4	7	11	2,076	70	2	454
Libya	..	..	..	14	..	..	..	2	..	..	..	331
Morocco	129	4	16	30	430	1	9	11	3,675	625	2	1,049
Tunisia	78	..	11	31	..	0	5	6	2,196	..	..	873
ALL AFRICA	..	..	..	..	..	..	..	..	..	..	..	..

Source: United Nations Environment Programme—World Conservation Monitoring Centre (UNEP-WCMC), International Union for Conservation of Nature and Natural Resources (IUCN).

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, 1992–2004

	Reptiles				Amphibians				Freshwater fish	
	Total number of known species			No. of species per 10,000 km <sup>2a</sup>	Total number of known species			No. of species per 10,000 km <sup>2a</sup>	Total number of known species	
	All species	Endemic species	Threatened species		All species	Endemic species	Threatened species		All species	Threatened species <sup>b</sup>
SUB-SAHARAN AFRICA	..	..	..	..	..	..	..	..	..	..
excluding South Africa	..	..	..	..	..	..	..	..	..	..
excl. S. Africa & Nigeria	..	..	..	..	..	..	..	..	..	..
Angola	235	20	4	..	85	22	..	..	108	..
Benin	99	0	1	..	12	0	..	..	84	..
Botswana	133	4	..	41	28	0	..	10	1	..
Burkina Faso	44	2	1	..	11	0	..	..	..	..
Burundi	80	0	..	..	26	2	..	..	5	..
Cameroon	211	23	1	51	192	72	1	53	138	27
Cape Verde	20	12	..	16	..	..	..	0	132	1
Central African Republic	131	3	1	33	29	3	..	12	..	..
Chad	53	1	1	1	10	0	..	..	1	..
Comoros	28	9	2	36	..	..	..	3	164	1
Congo, Dem. Rep. of	304	32	2	62	208	53	..	13	101	1
Congo, Rep. of	149	1	1	..	51	1	..	..	79	1
Côte d'Ivoire	131	4	2	..	54	8	1	..	111	..
Djibouti	85	0	..	27	6	0	..	2	166	1
Equatorial Guinea	92	7	2	..	31	1	1	..	83	..
Eritrea	88	4	6	38	9	0	..	8	102	..
Ethiopia	205	12	1	40	76	29	..	13	13	..
Gabon	130	3	1	..	41	4	..	..	104	1
Gambia, The	..	2	1	45	14	0	..	29	102	1
Ghana	135	5	2	..	72	4	..	..	90	..
Guinea	95	2	1	..	48	4	1	..	121	..
Guinea-Bissau	47	4	1	..	13	1	..	..	110	1
Kenya	261	22	5	50	76	13	..	23	314	18
Lesotho	40	0	..	..	7	0	..	..	2	1
Liberia	80	1	2	28	42	5	..	17	86	..
Madagascar	383	332	18	95	226	202	2	47	390	14
Malawi	108	10	..	55	56	4	..	31	163	..
Mali	107	2	1	3	32	2	..	..	2	1
Mauritania	74	4	2	..	3	0	..	..	117	..
Mauritius	35	12	4	19	2	0	..	0	430	1
Mozambique	195	12	5	39	59	0	..	15	524	4
Namibia	215	36	3	58	40	4	1	12	107	3
Niger	60	2	..	..	8	0	..	..	2	..
Nigeria	155	7	2	30	73	2	..	24	95	2
Rwanda	97	1	..	..	31	1	..	..	19	..
São Tomé and Príncipe	15	..	1	35	9	8	..	20	221	..
Senegal	92	3	6	37	32	0	..	1	150	1
Seychelles	38	16	4	103	12	11	4	33	480	..
Sierra Leone	69	1	3	..	46	3	..	..	99	..
Somalia	222	40	2	49	32	4	..	7	331	3
South Africa	364	106	19	65	119	52	9	22	629	29
Sudan	162	7	2	..	15	1	..	..	130	..
Swaziland	111	1	..	85	41	0	..	33	1	..
Tanzania	335	74	5	64	132	51	..	30	331	17
Togo	108	1	2	..	19	3	..	..	82	..
Uganda	165	2	..	52	52	2	..	17	49	27
Zambia	143	4	..	35	66	2	..	16	8	..
Zimbabwe	180	4	..	46	40	4	..	36	4	..
NORTH AFRICA	..	..	..	..	..	..	..	..	..	..
Algeria	97	3	2	13	13	0	..	2	100	1
Egypt, Arab Rep.	107	6	6	18	11	1	..	1	284	..
Libya	..	..	..	10	..	..	..	1	..	..
Morocco	102	23	2	26	14	1	..	3	136	1
Tunisia	70	..	3	25	8	0	..	3	99	..
ALL AFRICA	..	..	..	..	..	..	..	..	..	..

Source: United Nations Environment Programme—World Conservation Monitoring Centre (UNEP-WCMC), International Union for Conservation of Nature and Natural Resources (IUCN).

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, 2003–2004

	All protected areas (IUCN categories I–V)					Number of Marine Protected Areas <sup>a</sup> (IUCN Categories I–VI)		
	Number	Area (000 ha)	Percent of land area	No. of Areas at least:		Total	Littoral	Marine
				100,000 ha in size	1 million ha in size			
SUB-SAHARAN AFRICA	..	..	..	..	..	..	..	..
excluding South Africa	..	..	..	..	..	..	..	..
excl. S. Africa & Nigeria	..	..	..	..	..	..	..	..
Angola	13	5,271	4.2	8	2	4	4	3
Benin	2	778	6.7	10	..	..	..	..
Botswana	12	10,499	18.1	31	3	..	..	..
Burkina Faso	12	3,135	11.5	8	1	..	..	..
Burundi	13	146	5.4	..	..	..	1	1
Cameroon	18	3,456	7	12	..	2	1	2
Cape Verde	..	..	..	..	..	..	2	..
Central African Republic	13	7,321	11.8	17	4	..	..	..
Chad	9	11,494	9.0	11	2	..	..	..
Comoros	..	..	..	..	..	1	..	..
Congo, Dem. Rep. of	15	11,868	5	23	7	1	1	0
Congo, Rep. of	9	4,860	14.1	8	2	..	1	1
Côte d'Ivoire	11	1,953	6.1	12	1	3	3	1
Djibouti	..	10	0.5	..	..	2	2	..
Equatorial Guinea	0	455	16.8	1	..	3	4	0
Eritrea	3	501	4	2	..	..	..	..
Ethiopia	21	5,518	4.9	28	3	..	..	..
Gabon	5	80	0.3	3	..	2	4	1
Gambia, The	6	..	..	..	..	..	5	3
Ghana	10	1,104	4.6	4	..	..	..	..
Guinea	3	51	0	1	..	..	0	1
Guinea-Bissau	0	..	..	..	..	..	2	1
Kenya	50	3,485	6.0	14	1	11	13	10
Lesotho	1	7	0.2	..	..	..	..	..
Liberia	1	129	1.3	5	..	1	..	..
Madagascar	40	1,404	2	3	..	7	3	1
Malawi	9	1,059	8.9	4	..	..	..	..
Mali	13	4,532	3.6	8	2	..	..	..
Mauritania	9	250	0.2	1	..	5	5	2
Mauritius	..	7	29.8	..	..	16	14	..
Mozambique	11	3,285	4	6	2	6	7	6
Namibia	20	3,214	3.9	5	1	4	4	0
Niger	6	9,694	8.2	4	2	..	..	..
Nigeria	27	3,254	3.6	19	..	..	..	..
Rwanda	6	194	7.7	..	..	..	..	..
São Tomé and Príncipe	..	..	..	..	..	..	..	..
Senegal	12	2,096	11	3	..	7	6	6
Seychelles	..	4	12.0	..	..	10	15	..
Sierra Leone	2	145	2.0	..	..	..	..	..
Somalia	2	180	0.3	1	..	1	2	2
South Africa	390	..	..	..	..	..	17	8
Sudan	11	8,616	3.5	13	4	1	0	2
Swaziland	..	35	2	..	..	..	..	..
Tanzania	39	13,787	14.6	69	6	8	8	8
Togo	9	429	7.5	2	..	..	0	1
Uganda	37	1,763	7.3	12	1	..	..	..
Zambia	35	6,366	8.4	58	4	..	..	..
Zimbabwe	48	3,103	7.9	14	1	..	..	..
NORTH AFRICA	..	..	..	..	..	..	..	..
Algeria	18	11,864	5.1	2	2	4	6	3
Egypt, Arab Rep.	16	4,536	4.6	9	1	17	16	6
Libya	8	..	..	..	..	..	2	3
Morocco	12	326	0.8	2	..	4	9	3
Tunisia	7	28	0.2	..	..	2	5	4
ALL AFRICA	..	..	..	..	..	..	..	..

Source: United Nations Environment Programme—World Conservation Monitoring Centre (UNEP-WCMC). International Union for Conservation of Nature and Natural Resources (IUCN).

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, 2004

	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	..	..	..	..	..	..
Benin	2	2,928	1	0	2	139
Botswana	..	..	1	0	1	6,864
Burkina Faso	2	365	..	..	3	299
Burundi	..	..	..	..	1	1
Cameroon	3	931	1	1	..	..
Cape Verde	..	..	..	..	..	..
Central African Republic	2	1,640	1	1,740	..	..
Chad	..	..	..	..	2	1,843
Comoros	..	..	..	..	1	0
Congo, Dem. Rep. of	3	298	5	6,855	2	866
Congo, Rep. of	2	172	..	..	1	439
Côte d'Ivoire	2	1,480	3	1,484	1	19
Djibouti	..	..	..	..	1	3
Equatorial Guinea	..	..	..	..	1	23
Eritrea	..	..	..	..	..	..
Ethiopia	..	..	7	22	..	..
Gabon	1	15	..	..	3	1,080
Gambia, The	..	..	..	0	1	20
Ghana	1	8	2	0	6	178
Guinea	4	1,065	1	13	12	4,779
Guinea-Bissau	1	110	..	..	1	39
Kenya	5	1,335	3	305	4	91
Lesotho	..	..	..	..	..	..
Liberia	..	..	..	..	1	76
Madagascar	3	1,016	2	152	3	776
Malawi	1	45	1	9	1	225
Mali	1	771	3	400	3	162
Mauritania	..	..	2	1,200	3	1,231
Mauritius	1	4	..	..	1	0
Mozambique	..	..	1	0	..	..
Namibia	..	..	..	..	4	630
Niger	2	8,464	2	7,956	4	715
Nigeria	1	1	1	0	1	58
Rwanda	..	15	..	..	..	..
São Tomé and Príncipe	..	..	..	..	..	..
Senegal	..	1,094	4	929	4	100
Seychelles	..	..	2	35	..	..
Sierra Leone	..	..	..	..	1	295
Somalia	..	..	..	..	..	..
South Africa	..	..	..	..	..	..
Sudan	..	1,901	..	..	..	..
Swaziland	..	..	..	..	..	..
Tanzania	..	2,428	6	6,860	3	4,272
Togo	..	..	..	..	2	194
Uganda	..	220	3	132	1	15
Zambia	..	..	1	4	2	333
Zimbabwe	..	..	5	680	2	13
NORTH AFRICA	..	..	..	..	..	..
Algeria	4	7,332	7	8,000	26	2,791
Egypt, Arab Rep.	2	2,577	6	0	2	106
Libya	..	..	..	..	..	..
Morocco	2	9,754	7	0	4	14
Tunisia	..	32	8	13	..	..
ALL AFRICA	..	..	..	..	..	..

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 the technical notes for each table as presented in *World Resources 2002–2004*. They have been edited and shortened for this volume. Readers are urged to consult the original source for details.

**Table 14-1. Forest resources, 1990–2000.** *Total forest* comprises 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.

*Plantation* refers to a forest stand 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.

*Annual percentage change* is shown as a percentage of the exponential growth rate. If negative, 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 includes 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, 1990–99.** *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 roughly the past 10 years (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, and so forth, 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 International Union for Conservation of Nature

and Natural Resources' (IUCN'S) management categories I–V.

**Table 14-3. Wood production and trade, 2000–02.**

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

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

*Wood based panels* includes sawn wood and panels.

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

*Trade in forest products* is the percentage of total exports of forest products to the total merchandise exports.

**Table 14-4. Freshwater resources and withdrawals, 1977–2004.**

*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 2004 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 catches* 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 three-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, and mackerels. *Diadromous fish* include sturgeons, river eels, salmons, and trouts. *Freshwater fish* include carps, perch, catfish, and tilapias, among others. Mollusks include freshwater mollusks, 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 three-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 (f.o.b.) 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 mollusks and crustaceans that are fresh, chilled, smoked, or derived products. Trade in *fish meal* includes meals, solubles, and so on.

*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 three-year averages.

**Table 14-6. Energy production by source.** All energy data are shown 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 1 Gwh = 86 toe.

**Table 14-7. Energy consumption by economic sector.** The *industry* sector includes energy consumption by the iron and steel industry, chemical industry, nonferrous 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.

The *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.

The *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. CO<sub>2</sub> emissions from industrial processes, 1999.** This table includes data on industrial additions to the carbon dioxide flux from solid fuels, liquid fuels, gas fuels, gas flaring, and cement manufacturing. The International Energy Agency (IEA) annually calculates emissions of carbon

dioxide (CO<sub>2</sub>) from the burning of fossil fuels for most of the countries of the world. The IEA presents data in four categories.

*Total carbon dioxide emissions.* These data include emissions from combustion of all fossil fuels (whether solid, liquid, or gaseous) used by a country. Values are reported in thousand metric tons of CO<sub>2</sub>.

*Emissions from solid fuels.* This shows the mass of CO<sub>2</sub> released in the combustion of all coal and coal-based products. Both primary (hard coal and lignite) and derived fuels (patent fuel, coke oven coke, gas coke, BKB, coke oven gas, gasworks gas, and blast furnace gas) are included. Peat is also included in this category.

*Liquid fuels.* This represents emissions from combustion of crude oil, natural gas liquids, motor gasoline, gas/diesel oil, aviation gasoline, jet fuels, kerosene, refinery feedstocks, additives, refinery gas, ethane, LPG, heavy fuel oil, naphtha, white spirit, lubricants, bitumen, paraffin waxes, petroleum coke and other petroleum products.

*Gaseous fuels.* This shows emissions from combustion of natural gases (excluding natural gas liquids) occurring in underground deposits, consisting mainly of methane.

*Per capita CO<sub>2</sub> emissions.* These are the amounts of CO<sub>2</sub> emitted, on average, from all sources for each person living in the specified country. These estimates do not include bunker fuels used for international transportation due to the difficulty of apportioning these fuels among the countries benefiting from that transport. Emissions are calculated by WRI using data from the IEA and population data from the Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat.

Values for CO<sub>2</sub> emissions by source are calculated by the IEA using the methods and emission factors in the Revised 1996 IPC Guidelines for National Greenhouse Gas Inventories (available at [www.ipc-nggip.iges.or.jp/public/gl/invs1.htm](http://www.ipc-nggip.iges.or.jp/public/gl/invs1.htm)). The figures provided here are based on the reference approach, which calculates emissions from the carbon content of fuels supplied to a country's economy.

The reference approach captures refining, flaring, and other "fugitive emissions" that do not result directly from end-use fossil fuel combustion. Apparent consumption of fuel is calculated as production

minus exports plus imports. Net stock changes are either added or subtracted. International marine and aviation bunkers (fuel used for international transport) are subtracted from national totals as well, as these figures are accounted for separately. The production of secondary fuels is not accounted for because the carbon contained in those fuels is already included in the primary fuel. However, imports and exports of secondary fuels are included in calculations. Stored carbon from fuels used for non-energy purposes is subtracted from the total carbon emissions. Emissions from biomass fuels are not included in these because the IPCC assumes that such emissions are equal sequestration during regrowth.

The Carbon Dioxide Information Analysis Center (CDIAC) calculates emissions of CO<sub>2</sub> from the burning of fossil fuels and the manufacture of cement in most of the countries of the world. During cement manufacture, cement is calcined to produce calcium oxide. In the process, 0.498 metric tons of CO<sub>2</sub> are released for each metric ton of cement produced.

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

**Table 14-9. Globally threatened species: mammals, birds, and higher plants, 1992–2004.** 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, 1992–2004.** 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, 2003–2004.** 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 and 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 providing 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, 2004.** 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 it pertains to waterfowl habitat—agrees to respect the site’s integrity and to establish wetland reserves and 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.