3 ENVIRONMENT

If the vision of a world without poverty is to be realized, sustainable development is the key. And whether the world continues to sustain itself depends in large part on proper management of its natural resources. The Millennium Development Goals call for integrating principles of environmental sustainability into country policies and programs and reversing environmental losses. This requires measuring and monitoring the state of the environment and its changes as well as the links between the economy and the environment.

Given the close links between economic activity and environmental change, there is a strong argument for developing indicators that integrate the economy and the environment more closely. One approach that appears to hold much promise is environmental accounting. Aimed at deriving "greener" measures of national income, savings, and wealth, environmental accounting adds natural resources and pollutants to the assets and liabilities measured in the standard national accounts. This approach forms the basis of the United Nations System of Environmental and Economic Accounts (United Nations 1993, 1999; Commission of the European Communities and others 2002). But preparing full-fledged environmental and economic accounts is costly, and not all countries are doing so. In the absence of such integrated accounts, physical indicators and descriptive statistics can provide useful information for monitoring the state of the environment.

Many such indicators are presented here, but despite greater awareness of the importance of environmental issues and efforts to improve environmental data, information on many aspects of the environment remains sparse. The data available are often of uneven quality, relate to different periods, and are sometimes out of date. The lack of adequate data hampers efforts to measure the state of the environment and design sound policies.

Another problem is that many environmental indicators are not meaningful at the national level. Climate change and air and water pollution have impacts that go beyond national boundaries. Other environmental issues are local. So global, regional, or city indicators are often more meaningful than national aggregates (tables 3.11 and 3.13).

Finite land resources

Three of every five people in developing countries—some 3 billion—live in rural areas (table 3.1). In many of these countries agriculture is still the main source of employment. Every $1 earned by a farmer increases incomes in other sectors by as much as $2.60. So the starting point for sustainable development for many developing countries is rural development and growth in sustainable farm and nonfarm activities.

But land resources are finite, fragile, and nonrenewable, so countries must meet their increased need for food and other agricultural products mainly by raising and sustaining crop and livestock yields and by using land more intensively. Low-income and lower-middle-income countries are increasing the land under cereal production, but their use of agricultural machinery lags far behind that in other countries (table 3.2). Low-income countries, where current cereal yields are a third those in high-income countries, will have to expand their arable land—not a strategy that can be sustained for long (table 3.3).

Shrinking forests and threatened biodiversity

Of the world's 1.2 billion extremely poor people—those living on less than $1 a day—90 percent depend on forests and their products for their livelihood. But the forests are shrinking, as is the diversity of the plants and animals they support. With growth and development, forests are being converted to agricultural land and urban areas. At the beginning of the 20th century the earth had about 5 billion hectares of forested area. Now it has less than 4 billion hectares. The loss has been concentrated in developing countries, driven by the growing demand for timber and agricultural land. Low-income countries lost about 8 percent of their forest in the 1990s. By contrast, high-income countries gained about 8 million hectares of forest in the same period (table 3.4).

Closely linked to changes in land use is biodiversity, another important dimension of environmental sustainability. Many countries have an informal goal of protecting about 10 percent of their land area, and crude measures of the extent of protected areas show how close to—or far from—this goal each country is (table 3.4). But even where protected areas are increased, losses of biologically diverse areas cannot be reversed. About 12 percent of the world's nearly 10,000 bird species are vulnerable or in immediate danger of extinction, as are 24 percent of the world's 4,800 mammal species and an estimated 30 percent of all fish species.

A thirsty planet

Water is crucial to economic growth and development—and to the survival of both terrestrial and aquatic systems. But more than 1 billion people lack access to safe water, and more than 430 million live in countries facing chronic and widespread water shortages—with water stress (less than 1,700 cubic meters of freshwater available per person a year) or water scarcity (less than 1,000 cubic meters; table 3.5).

Global per capita water supplies are declining, dropping by a third over the past 25 years. Further growth in population and economic activity will add to the demand for water, and by 2050 the share of the world's population facing water stress could increase by more than fivefold. These trends pose a significant challenge for meeting the Millennium Development Goal of halving the proportion of people without sustainable access to safe drinking water by 2015.

Energy use and its consequences

Economic growth and greater energy use have a direct and positive link, evident in the rapid growth of commercial energy use in low- and middle-income countries. At the highest income levels there are limited signs of declining per capita energy use. In Germany per capita energy use fell from 4,600 kilograms of oil equivalent in 1980 to 4,130 in 2000, and in the United States, despite strong economic growth, it increased by only 0.4 percent a year in the same period. Even so, high-income countries still use more than five times as much as developing countries on a per capita basis, and with only 15 percent of the world's population, they use more than half its commercial energy. The differences in per capita energy use can be striking: the United States uses 16 times as much energy as India, for example. High-income countries are net energy importers; middle-income countries have been their main suppliers (table 3.7).

The use of energy and, even more so, access to electricity are important in raising people's standard of living. But energy use and electricity generation also have significant environmental consequences. Generating energy produces emissions of carbon dioxide, the main greenhouse gas contributing to global warming. Anthropogenic (human caused) carbon dioxide emissions result primarily from fossil fuel combustion and cement manufacturing, with high-income countries contributing half (table 3.8). The extent of environmental damage depends largely on how energy is generated. For example, burning coal releases twice as much carbon dioxide as does burning an equivalent amount of natural gas (see *About the data* for table 3.9).

Urbanization and pollution

Urban areas are home to 47 percent of the world's population—two out of five people in low- and middle-income countries and almost four of five in high-income countries. Most of Latin

America is as urbanized as Europe, with 75 percent of its population living in urban areas. Asia is urbanizing rapidly. Even such traditionally rural countries as China, India, and Indonesia now have hundreds of millions of people living in urban areas, with both the number of people and the share of the population in cities growing rapidly (tables 3.10 and 3.11).

Urbanization can yield important social benefits, improving access to public services such as education, health care, and cultural facilities. But it can also lead to adverse environmental effects that require policy responses. Greater urbanization usually means greater pollution, which can overwhelm the natural capacities of air and water to absorb pollutants. The costs of controlling pollution can be enormous. And pollution exposes people to severe health hazards. Several major urban air pollutants—lead, sulfur dioxide, suspended particulate matter—are known to harm human health. A big source of urban air pollution is vehicles, whose numbers are strongly linked to rising income (tables 3.12 and 3.13).

This edition of *World Development Indicators* introduces a new indicator of air pollution—particulate matter. The print edition includes estimates for selected cities, while the CD-ROM version presents data for some 3,600 cities.

Government commitment to change

Working toward a cleaner environment and better management of environmental resources—whether at the national, regional, or global level—is central to meeting human needs and reducing poverty. But measuring governments' commitment to these goals is difficult. The indicators of government commitment in table 3.14 are imperfect, measuring the existence of policy instruments more than their effectiveness. Still, making a formal commitment is an essential first step toward taking action. The strength of environmental policies in any country reflects the priority its government gives to problems of environmental degradation—and that priority reflects the benefit expected from using scarce resources that have competing uses.

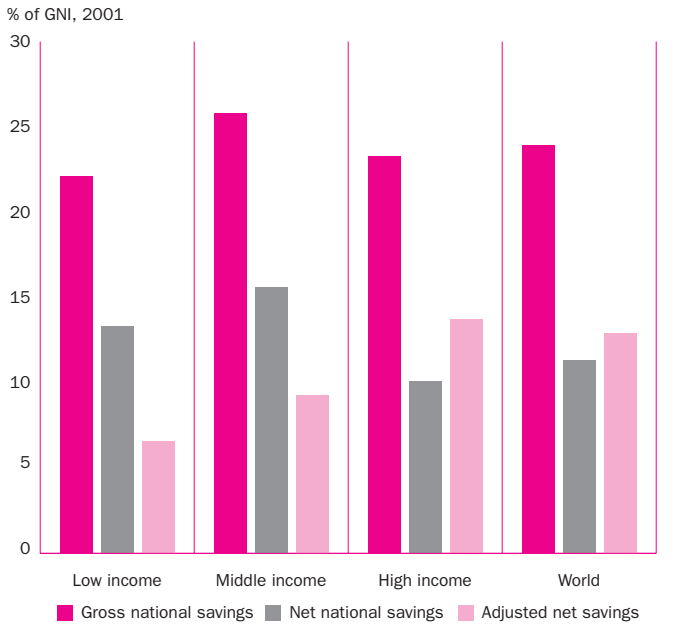
Beyond national environmental problems, governments are increasingly concerned about global environmental issues. To address these issues, countries have reached agreements and signed treaties on areas relating to the quality of life on earth. Many of these agreements resulted from the 1992 United Nations Conference on Environment and Development in Rio de Janeiro, which produced Agenda 21—an array of actions to address environmental challenges. But 10 years after Rio, the World Summit on Sustainable Development recognized that many of the proposed actions have yet to materialize.

Net adjusted savings—an indicator of sustainability

The question of an economy's sustainability can be reduced to whether welfare is expected to decline along the future development path as a result of decisions made today. Because flows of income and well-being are ultimately derived from the stocks of produced, natural, and human assets, a drop in the aggregate value of these stocks must lead eventually to a decline in welfare. One measure of change in total assets is provided by net adjusted savings—a measure of savings that accounts not only for a country's economic surplus but also for its depletion of natural resources, accumulation of pollutants, and investments in human capital.

3a

Adjusted net savings tend to be small in low- and middle-income countries



When estimates of national savings take into account spending on education, depletion of natural resources, and damage from carbon dioxide and particulate emissions, the results are lower than traditional estimates for low- and middle-income countries, where education spending is relatively low and depletion of natural resources is high. This adjusted net savings measure can serve as a proxy for the sustainability of economic activities.

Source: Table 3.15.

The first estimates of such savings appeared in the World Bank's *Expanding the Measure of Wealth* (1997) and have been updated and refined since (table 3.15). The estimation in this edition of the *World Development Indicators* takes into account another source of loss: damage from particulates. Data limitations and the approximations used in calculating net adjusted savings mean that these estimates still must be used with caution (for more details, see *About the data* for table 3.15). But making progress on sustainability indicators is important enough to present these first steps toward a measure of sustainability.

Many developing countries have low or negative adjusted net savings (figure 3a). Broadly speaking, the lowest adjusted savings rates are recorded for countries that depend heavily on resource rents, particularly those endowed with minerals and fossil fuels. These rents account for a sizable share of GDP in many countries, suggesting that managing natural resources and resource revenues should receive even more attention as these countries strive to ensure the sustainability of their economies and the welfare of future generations.

3.1 Rural environment and land use

	Rural population			Rural population density	Land area	Land use					
			average annual % growth	people per sq. km of arable land	thousand sq. km	Arable land % of land area		Permanent cropland % of land area		Other % of land area	
	% of total 1980	% of total 2001	1980–2001	2000	2000	1980	2000	1980	2000	1980	2000
Afghanistan	84	78	2.2	262	652	12.1	12.1	0.2	0.2	87.7	87.6
Albania	66	57	0.1	313	27	21.4	21.1	4.3	4.4	74.4	74.5
Algeria	56	42	1.0	170	2,382	2.9	3.2	0.3	0.2	96.8	96.6
Angola	79	65	2.2	288	1,247	2.3	2.4	0.4	0.2	97.3	97.4
Argentina	17	12	–0.5	17	2,737	9.1	9.1	0.8	0.8	90.1	90.1
Armenia	34	33	0.8	252	28	..	17.6	..	2.3	..	80.1
Australia	14	9	–0.9	4	7,682	5.7	6.5	0.0	0.0	94.2	93.4
Austria	33	33	0.3	190	83	18.6	16.9	1.2	0.9	80.2	82.2
Azerbaijan	47	48	1.4	236	87	..	19.0	..	3.0	..	78.0
Bangladesh	85	74	1.5	1,208	130	68.3	62.5	2.0	2.7	29.6	34.8
Belarus	43	30	–1.5	50	207	..	29.6	..	0.6	..	69.8
Belgium	5	3	–2.5	34	33[a]	23.2[a]	24.8[a]	0.4[a]	0.7[a]	76.4[a]	74.5[a]
Benin	73	57	1.8	186	111	13.6	17.6	0.8	2.4	85.7	80.0
Bolivia	55	37	0.4	161	1,084	1.7	1.8	0.2	0.2	98.1	98.0
Bosnia and Herzegovina	64	57	–0.7	454	51	..	9.8	..	2.9	..	87.3
Botswana	82	51	0.7	231	567	0.7	0.7	0.0	0.0	99.3	99.3
Brazil	33	18	–1.2	60	8,457	4.6	6.3	1.2	1.4	94.2	92.3
Bulgaria	39	33	–1.3	60	111	34.6	40.0	3.2	1.9	62.2	58.1
Burkina Faso	92	83	2.0	248	274	10.0	13.9	0.1	0.2	89.8	85.9
Burundi	96	91	2.2	689	26	36.2	35.0	12.5	14.0	51.3	50.9
Cambodia	88	83	2.5	270	177	11.3	21.0	0.4	0.6	88.3	78.4
Cameroon	69	50	1.2	128	465	12.7	12.8	2.2	2.6	85.1	84.6
Canada	24	21	0.4	14	9,221	4.9	4.9	0.0	0.0	95.0	95.0
Central African Republic	65	58	1.8	113	623	3.0	3.1	0.1	0.1	96.9	96.8
Chad	81	76	2.4	167	1,259	2.5	2.8	0.0	0.0	97.5	97.2
Chile	19	14	0.1	109	749	5.1	2.6	0.3	0.4	94.6	96.9
China[b]	80	63	0.1	653	9,327	10.4	13.3	0.4	1.2	89.3	85.5
Hong Kong, China	9	0	..	..	..	7.0	..	*1.0*	..	*92.0*	..
Colombia	37	25	0.0	376	1,039	3.6	2.7	1.4	1.7	95.0	95.6
Congo, Dem. Rep.	..	..	..	..	2,267	2.9	3.0	0.4	0.5	96.6	96.5
Congo, Rep.	58	34	0.4	597	342	0.4	0.5	0.1	0.1	99.5	99.4
Costa Rica	53	40	1.2	694	51	5.5	4.4	4.4	5.5	90.1	90.1
Côte d'Ivoire	65	56	2.6	306	318	6.1	9.3	7.2	13.8	86.6	76.9
Croatia	50	42	–1.1	127	56	..	26.1	..	2.3	..	71.6
Cuba	32	25	–0.6	76	110	23.9	33.1	6.4	7.6	69.7	59.3
Czech Republic	25	25	0.0	85	77	..	39.9	..	3.1	..	57.1
Denmark	16	15	–0.2	35	42	62.3	53.8	0.3	0.2	37.4	46.1
Dominican Republic	49	34	0.1	264	48	22.1	22.7	7.2	10.3	70.6	67.0
Ecuador	53	37	0.5	297	277	5.6	5.7	3.3	5.2	91.1	89.2
Egypt, Arab Rep.	56	57	2.3	1,298	995	2.3	2.8	0.2	0.5	97.5	96.7
El Salvador	56	39	–0.2	445	21	26.9	27.0	11.7	12.1	61.4	60.9
Eritrea	86	81	2.4	669	101	..	4.9	..	0.0	..	95.0
Estonia	30	31	–0.3	37	42	..	26.5	..	0.3	..	73.2
Ethiopia	90	84	2.4	543	1,000	..	10.0	..	0.7	..	89.3
Finland	40	41	0.5	97	305	7.8	7.2	0.0	0.0	92.2	92.8
France	27	24	0.0	79	550	31.8	33.5	2.5	2.1	65.7	64.4
Gabon	50	18	–2.1	70	258	1.1	1.3	0.6	0.7	98.2	98.1
Gambia, The	80	69	2.8	393	10	15.5	23.0	0.4	0.5	84.1	76.5
Georgia	48	*44*	–0.1	303	69	..	11.4	..	3.9	..	84.7
Germany	17	12	–1.4	87	357	33.7	33.1	1.4	0.6	64.9	66.3
Ghana	69	64	2.5	342	228	8.4	15.9	7.5	9.7	84.2	74.5
Greece	42	40	0.1	154	129	22.5	21.3	7.9	8.6	69.6	70.1
Guatemala	63	60	2.4	505	108	11.7	12.5	4.4	5.0	83.9	82.4
Guinea	81	72	2.0	607	246	2.9	3.6	1.8	2.4	95.4	94.0
Guinea-Bissau	83	68	1.3	274	28	9.1	10.7	1.1	1.8	89.9	87.6
Haiti	76	64	1.1	914	28	19.8	20.3	12.5	12.7	67.7	67.0

Rural environment and land use 3.1

	Rural population			Rural population density	Land area	Land use					
			average annual % growth	people per sq. km of arable land	thousand sq. km	Arable land % of land area		Permanent cropland % of land area		Other % of land area	
	% of total 1980	2001	1980–2001	2000	2000	1980	2000	1980	2000	1980	2000
Honduras	65	46	1.3	284	112	13.3	9.5	2.4	3.2	84.3	87.2
Hungary	43	35	–1.2	78	92	54.4	49.8	3.3	2.2	42.2	48.0
India	77	72	1.6	454	2,973	54.8	54.4	1.8	2.7	43.4	42.9
Indonesia	78	58	0.2	594	1,812	9.9	11.3	4.4	7.2	85.6	81.5
Iran, Islamic Rep.	50	35	0.7	160	1,636	7.9	8.8	0.4	1.2	91.6	90.0
Iraq	34	32	2.6	145	437	12.0	11.9	0.4	0.8	87.6	87.3
Ireland	45	41	0.1	148	69	16.1	15.2	0.0	0.0	83.9	84.7
Israel	11	8	0.8	156	21	15.8	16.1	4.3	4.1	80.0	79.7
Italy	33	33	0.1	239	294	32.2	27.1	10.0	9.7	57.7	63.2
Jamaica	53	43	0.0	649	11	12.5	16.1	9.7	9.2	77.8	74.7
Japan	24	21	–0.2	603	365	13.3	12.3	1.6	1.0	85.1	86.7
Jordan	40	21	1.0	427	89	3.4	2.7	0.4	1.8	96.2	95.5
Kazakhstan	46	44	–0.2	31	2,700	..	8.0	..	0.1	..	92.0
Kenya	84	66	1.8	501	569	6.7	7.0	0.8	0.9	92.5	92.1
Korea, Dem. Rep.	43	39	0.8	521	120	13.4	14.1	2.4	2.5	84.2	83.4
Korea, Rep.	43	18	–3.2	496	99	20.9	17.4	1.4	2.0	77.8	80.6
Kuwait	9	4	–2.2	989	18	0.1	0.4	0.0	0.1	99.9	99.4
Kyrgyz Republic	62	66	1.8	236	192	..	7.1	..	0.3	..	92.5
Lao PDR	88	80	2.1	486	231	3.4	3.8	0.1	0.4	96.5	95.8
Latvia	32	40	0.7	51	62	..	29.7	..	0.5	..	69.8
Lebanon	26	10	–2.8	234	10	20.5	18.6	8.9	13.9	70.6	67.5
Lesotho	87	71	1.0	451	30	9.6	10.7	..	..	..	..
Liberia	65	55	1.7	454	96	3.9	3.9	2.1	2.2	94.0	93.8
Libya	31	12	–1.7	36	1,760	1.0	1.0	0.2	0.2	98.8	98.8
Lithuania	39	31	–0.9	38	65	..	45.3	..	0.9	..	53.8
Macedonia, FYR	47	41	–0.3	149	25	..	21.8	..	1.7	..	76.4
Madagascar	81	70	2.1	377	582	4.4	5.0	0.9	1.0	94.8	94.0
Malawi	91	85	2.2	419	94	16.1	22.3	0.9	1.5	83.0	76.2
Malaysia	58	42	1.1	544	329	3.0	5.5	11.6	17.6	85.4	76.9
Mali	82	69	1.7	163	1,220	1.6	3.8	0.0	0.0	98.3	96.2
Mauritania	72	41	0.0	231	1,025	0.2	0.5	0.0	0.0	99.8	99.5
Mauritius	58	58	1.1	697	2	49.3	49.3	3.4	3.0	47.3	47.8
Mexico	34	25	0.5	101	1,909	12.1	13.0	0.8	1.3	87.1	85.7
Moldova	60	58	0.2	137	33	..	55.3	..	11.2	..	33.5
Mongolia	48	43	1.3	89	1,567	0.8	0.8	0.0	0.0	99.2	99.2
Morocco	59	44	0.6	146	446	16.9	19.6	1.1	2.2	82.0	78.2
Mozambique	87	67	0.7	308	784	3.7	5.0	0.3	0.3	96.0	94.7
Myanmar	76	72	1.4	349	658	14.6	15.1	0.7	0.9	84.8	84.0
Namibia	77	69	2.3	149	823	0.8	1.0	0.0	0.0	99.2	99.0
Nepal	93	88	2.0	701	143	16.0	20.3	0.2	0.5	83.8	79.2
Netherlands	12	10	0.1	184	34	23.3	26.8	0.9	1.0	75.7	72.1
New Zealand	17	14	0.2	35	268	9.8	5.8	3.4	6.4	86.8	87.8
Nicaragua	50	43	2.1	91	121	9.5	20.2	1.5	2.4	89.1	77.4
Niger	87	79	2.8	192	1,267	2.8	3.5	0.0	0.0	97.2	96.4
Nigeria	73	55	1.5	252	911	30.6	31.0	2.8	2.9	66.6	66.1
Norway	29	25	–0.3	129	307	2.7	2.9	..	..	..	..
Oman	68	24	–1.2	3,049	310	0.0	0.1	0.1	0.2	99.9	99.7
Pakistan	72	67	2.2	434	771	25.9	27.6	0.4	0.9	73.7	71.5
Panama	50	43	1.3	250	74	5.8	6.7	1.6	2.1	92.5	91.2
Papua New Guinea	87	82	2.3	2,067	453	0.4	0.5	1.1	1.4	98.5	98.1
Paraguay	58	43	1.4	106	397	4.1	5.8	0.3	0.2	95.6	94.0
Peru	35	27	0.7	191	1,280	2.5	2.9	0.3	0.4	97.2	96.7
Philippines	63	41	0.3	572	298	17.5	18.6	14.8	15.1	67.7	66.3
Poland	42	37	–0.2	104	304	48.0	46.0	1.1	1.1	50.9	52.9
Portugal	71	34	–3.3	179	92	26.5	21.7	7.8	7.8	65.7	70.4
Puerto Rico	33	24	–0.6	2,701	9	8.3	3.9	7.3	5.2	84.3	90.9

3.1 Rural environment and land use

	Rural population			Rural population density	Land area	Land use					
			average annual %	people per sq. km	thousand	Arable land		Permanent cropland		Other	
	% of total		growth	of arable land	sq. km	% of land area		% of land area		% of land area	
	1980	2001	1980–2001	2000	2000	1980	2000	1980	2000	1980	2000
Romania	51	45	–0.6	108	230	42.7	40.7	2.9	2.2	54.4	57.2
Russian Federation	30	27	–0.3	32	16,889	..	7.4	..	0.1	..	92.5
Rwanda	95	94	2.4	887	25	30.8	36.5	10.3	10.1	58.9	53.4
Saudi Arabia	34	13	–0.5	80	2,150	0.9	1.7	0.0	0.1	99.1	98.2
Senegal	64	52	1.7	212	193	12.2	12.3	0.0	0.2	87.8	87.5
Sierra Leone	76	63	1.3	651	72	6.3	6.8	0.7	0.8	93.0	92.3
Singapore	0	0	..	0	1	3.3	1.6	9.8	0.0	86.9	98.4
Slovak Republic	48	42	–0.2	*158*	*48*	..	*30.4*	..	*2.8*	..	*66.8*
Slovenia	52	51	0.1	584	20	..	8.6	..	1.5	..	89.9
Somalia	78	72	1.2	610	627	1.6	1.7	0.0	0.0	98.4	98.3
South Africa	52	42	1.2	125	1,221	10.2	12.1	0.7	0.8	89.1	87.1
Spain	27	22	–0.5	68	499	31.1	26.7	9.9	9.8	59.0	63.5
Sri Lanka	78	77	1.1	1,602	65	13.2	13.8	15.9	15.8	70.9	70.4
Sudan	80	63	1.2	122	2,376	5.2	6.8	0.0	0.1	94.8	93.1
Swaziland	82	73	2.5	432	17	10.8	10.3	0.2	0.7	89.0	89.0
Sweden	17	17	0.3	55	412	7.2	6.6	..	..	..	..
Switzerland	43	33	–0.7	567	40	9.9	10.4	0.5	0.6	89.6	89.0
Syrian Arab Republic	53	48	2.6	173	184	28.5	24.7	2.5	4.4	69.1	70.9
Tajikistan	66	72	2.6	614	141	..	5.2	..	0.9	..	93.9
Tanzania	85	67	1.8	571	884	3.5	4.5	1.0	1.1	95.5	94.4
Thailand	83	80	1.1	331	511	32.3	28.8	3.5	6.5	64.2	64.8
Togo	77	66	2.2	120	54	35.9	46.1	1.6	2.2	62.6	51.6
Trinidad and Tobago	37	26	–0.8	450	5	13.6	14.6	9.0	9.2	77.4	76.2
Tunisia	48	34	0.3	113	155	20.5	18.7	9.7	13.5	69.7	67.7
Turkey	56	34	–0.5	93	770	32.9	31.4	4.1	3.3	63.0	65.3
Turkmenistan	53	55	3.2	179	470	..	3.5	..	0.1	..	96.4
Uganda	91	85	2.4	377	197	20.7	25.7	8.1	9.6	71.2	64.7
Ukraine	38	32	–0.9	49	579	..	56.2	..	1.6	..	42.2
United Arab Emirates	29	13	1.2	644	84	0.2	0.7	0.1	2.2	99.7	97.0
United Kingdom	11	10	–0.1	105	241	28.7	24.4	0.3	0.2	71.0	75.4
United States	26	23	0.4	36	9,159	20.6	19.3	0.2	0.2	79.2	80.5
Uruguay	15	8	–2.3	21	175	8.0	7.4	0.3	0.2	91.7	92.3
Uzbekistan	59	63	2.5	350	414	..	10.8	..	0.9	..	88.3
Venezuela, RB	21	13	0.1	130	882	3.2	2.8	0.9	1.1	95.8	96.1
Vietnam	81	75	1.5	1,037	325	18.2	17.7	1.9	4.9	79.8	77.4
West Bank and Gaza	..	..	..	..	..	..	..	..	..	..	..
Yemen, Rep.	81	75	3.2	853	528	2.6	2.9	0.2	0.2	97.2	96.8
Yugoslavia, Fed. Rep.	54	48	–0.1	..	..	28.0	..	2.9	..	69.1	..
Zambia	60	60	2.8	116	743	6.9	7.1	0.0	0.0	93.1	92.9
Zimbabwe	78	64	1.9	254	387	6.5	8.3	0.3	0.3	93.3	91.3
World	**61 w**	**53 w**	**0.8 w**	**503 w**	**130,178 s**	**10.2 w**	**10.5 w**	**0.9 w**	**1.0 w**	**88.9 w**	**88.5 w**
Low income	76	69	1.6	510	33,031	11.7	13.1	1.0	1.5	87.3	85.4
Middle income	62	48	0.2	541	66,128	8.0	8.6	1.0	1.0	91.0	90.4
Lower middle income	68	54	0.3	575	44,993	9.8	9.4	1.0	0.9	89.2	89.7
Upper middle income	34	23	–0.3	185	21,135	5.8	6.9	1.0	1.2	93.2	91.8
Low & middle income	68	58	0.9	523	99,144	9.4	10.1	1.0	1.2	89.5	88.7
East Asia & Pacific	79	63	0.3	640	15,885	10.0	12.0	1.5	2.6	88.5	85.4
Europe & Central Asia	41	37	–0.2	127	23,722	37.1	11.2	3.1	0.4	59.8	88.4
Latin America & Carib.	35	24	0.0	235	20,062	5.8	6.7	1.1	1.3	93.1	92.1
Middle East & N. Africa	52	42	1.5	586	11,106	4.4	4.8	0.4	0.7	95.2	94.4
South Asia	78	72	1.7	549	4,781	42.5	42.5	1.5	2.1	56.1	55.4
Sub-Saharan Africa	79	68	1.8	359	23,603	5.5	6.6	0.7	0.9	93.8	92.5
High income	27	22	–0.3	193	31,018	12.0	11.6	0.5	0.5	87.5	87.9
Europe EMU	27	22	–0.5	143	2,537	26.2	24.7	4.6	4.4	69.2	70.9

a. Includes Luxembourg. b. Includes Taiwan, China.

Rural environment and land use 3.1

About the data

Indicators of rural development are sparse, as few indicators are disaggregated between rural and urban areas (for some that are, see tables 2.6, 3.5, and 3.10). This table shows indicators of rural population and land use. Rural population is approximated as the midyear nonurban population.

The data in the table show that land use patterns are changing. They also indicate major differences in resource endowments and uses among countries. True comparability of the data is limited, however, by variations in definitions, statistical methods, and the quality of data collection. Countries use different definitions of rural population and land use, for example. The Food and Agriculture Organization (FAO), the primary compiler of these data, occasionally adjusts its definitions of land use categories and sometimes revises earlier data. (In 1985, for example, the FAO began to exclude from cropland the land used for shifting cultivation but currently lying fallow.) And following FAO practice, this year's edition of the *World Development Indicators*, like the previous four, breaks down the category cropland, used in earlier editions, into *arable land* and *permanent cropland*. Because the data reflect changes in data reporting procedures as well as actual changes in land use, apparent trends should be interpreted with caution.

Satellite images show land use that differs from that given by ground-based measures in both area under cultivation and type of land use. Moreover, land use data in countries such as India are based on reporting systems that were geared to the collection of tax revenue. Because taxes on land are no longer a major source of government revenue, the quality and coverage of land use data (except for cropland) have declined. Data on forest area, aggregated in the category *other*, may be particularly unreliable because of differences in definitions and irregular surveys (see *About the data* for table 3.4).

Definitions

• **Rural population** is calculated as the difference between the total population and the urban population (see *Definitions* for tables 2.1 and 3.10). • **Rural population density** is the rural population divided by the arable land area. • **Land area** is a country's total area, excluding area under inland water bodies, national claims to continental shelf, and exclusive economic zones. In most cases the definition of inland water bodies includes major rivers and lakes. (See table 1.1 for the total surface area of countries.) • **Land use** is broken into three categories. • **Arable land** includes land defined by the FAO as land under temporary crops (double-cropped areas are counted once), temporary meadows for mowing or for pasture, land under market or kitchen gardens, and land temporarily fallow. Land abandoned as a result of shifting cultivation is excluded. • **Permanent cropland** is land cultivated with crops that occupy the land for long periods and need not be replanted after each harvest, such as cocoa, coffee, and rubber. This category includes land under flowering shrubs, fruit trees, nut trees, and vines, but excludes land under trees grown for wood or timber. • **Other land** includes forest and woodland as well as logged-over areas to be forested in the near future. Also included are uncultivated land, grassland not used for pasture, wetlands, wastelands, and built-up areas—residential, recreational, and industrial lands and areas covered by roads and other fabricated infrastructure.

3.1a

The 10 countries with the largest shares of rural population in 2001—and the 10 with the smallest

% of total population

Country	Rural population	Country	Rural population
Rwanda	94	Belgium	3
Burundi	91	Kuwait	4
Nepal	88	Uruguay	8
Uganda	85	Israel	8
Malawi	85	Australia	9
Ethiopia	84	Lebanon	10
Burkina Faso	83	Netherlands	10
Cambodia	83	United Kingdom	10
Papua New Guinea	82	Argentina	12
Eritrea	81	Libya	12

Source: Table 3.1.

Data sources

The data on urban population shares used to estimate rural population come from the United Nations Population Division's *World Urbanization Prospects: The 2001 Revision*. The total population figures are World Bank estimates. The data on land area and land use are from the FAO's electronic files and are published in its *Production Yearbook*. The FAO gathers these data from national agencies through annual questionnaires and by analyzing the results of national agricultural censuses.

3.2 Agricultural inputs

	Arable land		Irrigated land		Land under cereal production		Fertilizer consumption		Agricultural machinery			
	hectares per capita		% of cropland		thousand hectares		hundreds of grams per hectare of arable land		tractors per 1,000 agricultural workers		tractors per 100 sq. km of arable land	
	1979–81	1998–2000	1979–81	1998–2000	1979–81	1999–2001	1979–81	1998–2000	1979–81	1998–2000	1979–81	1998–2000
Afghanistan	0.50	0.31	31.1	29.6	3,037	2,400	62	7	0	0	1	1
Albania	0.22	0.19	53.0	48.6	367	213	1,556	261	15	11	173	142
Algeria	0.37	0.26	3.4	6.8	2,968	1,965	277	127	27	38	68	121
Angola	0.41	0.24	2.2	2.2	705	904	49	9	4	2	35	34
Argentina	0.89	0.68	5.7	5.7	11,154	11,004	46	323	132	191	73	112
Armenia	..	0.13	..	51.3	..	178	..	153	..	69	..	354
Australia	2.97	2.67	3.5	4.6	15,986	17,514	269	455	751	700	75	62
Austria	0.20	0.17	0.2	0.3	1,062	820	2,615	1,665	945	1,728	2,084	2,512
Azerbaijan	..	0.21	..	74.3	..	635	..	62	..	34	..	192
Bangladesh	0.10	0.06	17.1	47.6	10,823	11,736	459	1,593	0	0	5	7
Belarus	..	0.61	..	1.8	..	2,462	..	1,403	..	107	..	132
Belgium [a]	0.08	0.08	1.7	4.2	426	324	5,323	3,687	917	1,234	1,416	1,298
Benin	0.43	0.31	0.3	0.6	525	843	11	228	0	0	1	1
Bolivia	0.35	0.24	6.6	5.9	559	775	23	25	4	4	21	29
Bosnia and Herzegovina	..	0.13	..	0.4	..	367	..	872	..	284	..	580
Botswana	0.44	0.21	0.5	0.3	153	159	32	127	9	20	54	175
Brazil	0.32	0.32	3.3	4.4	20,612	17,629	915	1,200	31	59	139	152
Bulgaria	0.43	0.53	28.3	17.6	2,110	1,867	2,334	333	66	77	161	58
Burkina Faso	0.39	0.34	0.4	0.7	2,026	2,948	26	114	0	0	0	5
Burundi	0.23	0.13	4.2	5.9	203	202	11	41	0	0	1	2
Cambodia	0.29	0.31	5.8	7.1	1,241	2,050	45	7	0	0	6	5
Cameroon	0.68	0.41	0.2	0.5	1,021	734	56	76	0	0	1	1
Canada	1.86	1.49	1.3	1.6	19,561	18,016	416	572	827	1,761	144	156
Central African Republic	0.81	0.53	..	..	194	151	5	3	0	0	0	0
Chad	0.70	0.47	0.4	0.6	907	2,156	6	49	0	0	1	0
Chile	0.34	0.13	31.1	78.4	820	586	338	2,416	43	55	90	273
China	0.10	0.10	45.1	39.6	94,647	86,688	1,494	2,871	2	2	76	62
Hong Kong, China	0.00	..	*37.5*	..	0	*0*	..	..	0	..	10	..
Colombia	0.13	0.06	7.7	19.6	1,361	1,119	812	2,342	8	6	77	83
Congo, Dem. Rep.	0.25	0.14	0.1	0.1	1,115	2,066	12	2	0	0	3	4
Congo, Rep.	0.08	0.06	0.6	0.5	19	10	27	287	2	1	49	40
Costa Rica	0.12	0.06	12.1	21.2	136	79	2,650	8,572	22	21	210	311
Côte d'Ivoire	0.24	0.19	1.0	1.0	1,008	1,439	261	264	1	1	16	13
Croatia	..	0.33	..	0.2	..	665	..	1,354	..	12	..	17
Cuba	0.27	0.33	22.9	19.5	224	208	2,024	423	78	98	259	215
Czech Republic	..	0.30	..	0.7	..	1,624	..	936	..	173	..	273
Denmark	0.52	0.43	14.5	19.4	1,818	1,523	2,453	1,667	973	1,104	708	557
Dominican Republic	0.19	0.13	11.7	17.2	149	160	572	860	3	4	20	22
Ecuador	0.20	0.13	24.8	28.8	419	897	471	1,062	6	7	40	57
Egypt, Arab Rep.	0.06	0.05	100.0	100.0	2,007	2,716	2,864	4,284	4	10	158	303
El Salvador	0.12	0.09	4.3	4.9	422	380	1,376	1,497	5	4	61	61
Eritrea	..	0.12	..	4.3	..	333	..	189	..	0	..	12
Estonia	..	0.81	..	0.4	..	326	..	268	..	556	..	454
Ethiopia	..	0.16	..	1.8	..	7,562	..	163	..	0	..	3
Finland	0.50	0.42	2.5	2.9	1,190	1,154	2,024	1,419	721	1,268	893	893
France	0.32	0.31	4.6	10.8	9,804	8,963	3,260	2,491	737	1,326	836	692
Gabon	0.42	0.27	2.4	3.0	6	16	20	11	5	7	43	46
Gambia, The	0.26	0.17	0.6	0.9	54	133	136	70	0	0	3	2
Georgia	..	0.15	..	44.2	..	352	..	480	..	19	..	131
Germany	0.15	0.14	3.7	4.0	7,692	6,911	4,249	2,460	624	965	1,340	887
Ghana	0.18	0.19	0.2	0.2	902	1,304	104	39	1	1	19	10
Greece	0.30	0.26	24.2	37.2	1,600	1,254	1,927	1,688	120	302	485	877
Guatemala	0.19	0.12	5.0	6.8	716	655	726	1,511	3	2	32	32
Guinea	0.16	0.12	7.9	6.4	708	803	16	36	0	0	2	6
Guinea-Bissau	0.34	0.26	6.0	4.9	142	123	24	40	0	0	1	1
Haiti	0.10	0.07	7.9	8.2	416	460	62	203	0	0	3	3

Agricultural inputs 3.2

	Arable land		Irrigated land		Land under cereal production		Fertilizer consumption		Agricultural machinery			
	hectares per capita		% of cropland		thousand hectares		hundreds of grams per hectare of arable land		tractors per 1,000 agricultural workers		tractors per 100 sq. km of arable land	
	1979–81	1998–2000	1979–81	1998–2000	1979–81	1999–2001	1979–81	1998–2000	1979–81	1998–2000	1979–81	1998–2000
Honduras	0.42	0.22	4.1	4.6	421	446	171	1,242	5	7	22	35
Hungary	0.47	0.47	3.6	4.2	2,878	2,758	2,906	897	59	171	111	192
India	0.24	0.16	22.8	32.2	104,350	100,967	345	1,063	2	6	24	93
Indonesia	0.12	0.10	16.2	14.7	11,825	15,270	645	1,326	0	1	5	36
Iran, Islamic Rep.	0.36	0.25	35.5	42.5	8,062	7,234	430	833	17	37	57	139
Iraq	0.40	0.23	32.1	63.6	2,159	2,646	172	732	23	76	44	95
Ireland	0.33	0.29	..	..	425	282	5,373	6,252	607	1,035	1,289	1,590
Israel	0.08	0.05	49.3	46.4	129	80	2,384	3,406	304	343	809	734
Italy	0.17	0.14	19.3	24.3	5,082	4,185	2,295	2,116	370	1,154	1,117	1,979
Jamaica	0.06	0.07	10.1	9.1	4	2	1,231	1,320	9	12	208	177
Japan	0.04	0.04	56.0	54.6	2,724	2,026	4,131	3,192	209	707	2,723	4,691
Jordan	0.14	0.05	11.0	19.1	158	34	404	882	47	28	153	197
Kazakhstan	..	1.47	..	10.4	..	12,121	..	12	..	44	..	28
Kenya	0.23	0.14	0.9	1.5	1,692	1,945	160	349	1	1	17	36
Korea, Dem. Rep.	0.09	0.08	58.9	73.0	1,625	1,287	4,688	1,530	12	21	275	441
Korea, Rep.	0.05	0.04	59.6	60.4	1,689	1,163	3,920	4,794	1	66	14	981
Kuwait	0.00	0.00	83.3	81.1	0	1	4,500	1,341	3	10	220	132
Kyrgyz Republic	..	0.28	..	74.8	..	607	..	210	..	47	..	190
Lao PDR	0.24	0.17	13.3	18.1	751	765	35	88	0	1	7	12
Latvia	..	0.77	..	1.1	..	422	..	278	..	324	..	293
Lebanon	0.07	0.04	28.3	32.3	34	39	1,663	3,416	28	113	141	298
Lesotho	0.22	0.16	..	..	203	233	150	170	6	6	47	62
Liberia	0.20	0.12	0.3	0.5	203	147	123	0	0	0	8	9
Libya	0.58	0.35	10.7	21.9	538	337	357	356	101	306	134	187
Lithuania	..	0.83	..	0.2	..	947	..	509	..	394	..	337
Macedonia, FYR	..	0.29	..	8.8	..	220	..	744	..	420	..	919
Madagascar	0.29	0.19	21.2	31.3	1,309	1,409	30	30	1	1	10	12
Malawi	0.25	0.20	1.1	1.3	1,155	1,622	203	217	0	0	8	7
Malaysia	0.07	0.08	6.7	4.8	729	719	4,273	7,843	4	24	77	238
Mali	0.31	0.44	4.5	3.0	1,346	2,411	61	107	0	1	5	6
Mauritania	0.14	0.19	22.8	9.8	125	246	57	29	1	1	13	8
Mauritius	0.10	0.09	15.0	18.9	0	0	2,547	3,463	4	6	33	37
Mexico	0.34	0.26	20.3	23.8	9,356	10,269	570	726	16	20	54	69
Moldova	..	0.42	..	14.1	..	854	..	28	..	82	..	239
Mongolia	0.71	0.52	3.0	6.8	559	222	83	28	32	22	82	56
Morocco	0.39	0.31	15.0	13.2	4,414	5,258	268	393	7	10	34	48
Mozambique	0.24	0.23	2.1	2.6	1,077	1,793	107	26	1	1	20	14
Myanmar	0.28	0.21	10.4	17.8	5,133	6,919	111	186	1	1	9	10
Namibia	0.66	0.47	0.6	0.9	195	308	0	3	11	11	39	39
Nepal	0.16	0.13	22.5	38.2	2,251	3,289	98	325	0	0	10	16
Netherlands	0.06	0.06	58.5	59.8	225	209	8,620	5,082	560	590	2,238	1,673
New Zealand	0.84	0.41	5.2	8.7	193	138	1,879	4,743	619	447	352	489
Nicaragua	0.39	0.50	6.0	3.2	266	398	392	141	6	7	19	11
Niger	0.62	0.43	0.7	1.5	3,872	7,569	10	7	0	0	0	0
Nigeria	0.39	0.23	0.7	0.8	6,048	18,995	59	63	1	2	3	11
Norway	0.20	0.20	..	..	311	328	3,146	2,230	824	1,266	1,603	1,549
Oman	0.01	0.01	92.7	77.2	2	2	840	3,586	1	1	76	77
Pakistan	0.24	0.16	72.7	82.1	10,693	12,443	525	1,312	5	13	50	151
Panama	0.22	0.18	5.0	5.3	166	129	692	716	27	20	122	100
Papua New Guinea	0.05	0.04	..	..	2	3	452	480	1	1	82	58
Paraguay	0.52	0.42	3.4	2.9	307	552	44	299	14	24	45	74
Peru	0.19	0.14	32.3	28.5	732	1,210	381	619	5	5	37	36
Philippines	0.11	0.07	12.8	15.4	6,790	6,581	636	1,269	1	1	20	21
Poland	0.41	0.36	0.7	0.7	7,875	8,778	2,393	1,092	112	293	425	930
Portugal	0.25	0.20	20.1	24.3	1,099	566	1,113	1,224	72	242	351	844
Puerto Rico	0.02	0.01	27.2	49.4	1	1	..	..	..	..	..	..

3.2 Agricultural inputs

	Arable land		Irrigated land		Land under cereal production		Fertilizer consumption		Agricultural machinery			
	hectares per capita		% of cropland		thousand hectares		hundreds of grams per hectare of arable land		tractors per 1,000 agricultural workers		tractors per 100 sq. km of arable land	
	1979–81	1998–2000	1979–81	1998–2000	1979–81	1999–2001	1979–81	1998–2000	1979–81	1998–2000	1979–81	1998–2000
Romania	0.44	0.42	21.9	27.8	6,340	5,732	1,448	343	39	96	150	178
Russian Federation	..	0.86	..	3.6	..	37,953	..	108	..	96	..	65
Rwanda	0.15	0.10	0.4	0.4	239	266	3	3	0	0	1	1
Saudi Arabia	0.20	0.18	28.9	42.8	388	629	228	1,002	2	15	10	26
Senegal	0.42	0.25	2.6	3.0	1,216	1,247	104	162	0	0	2	2
Sierra Leone	0.14	0.10	4.1	5.4	434	220	58	4	0	0	6	2
Singapore	0.00	0.00	..	..	..	..	22,333	36,137	3	19	220	650
Slovak Republic	..	0.27	..	11.0	..	..	..	711	..	..	..	167
Slovenia	..	0.09	..	1.1	..	100	..	4,468	..	4,476	..	6,108
Somalia	0.15	0.12	13.3	18.7	638	507	9	5	1	1	17	18
South Africa	0.45	0.35	8.4	8.9	6,760	4,741	874	523	92	46	140	55
Spain	0.42	0.34	14.8	19.9	7,391	6,637	1,012	1,688	200	636	335	642
Sri Lanka	0.06	0.05	28.3	34.7	864	888	1,800	2,791	4	2	141	88
Sudan	0.64	0.54	14.4	11.8	4,447	6,764	51	23	2	1	8	6
Swaziland	0.30	0.17	34.0	36.7	70	58	1,050	320	29	26	173	164
Sweden	0.36	0.31	..	..	1,505	1,188	1,654	1,049	715	1,083	623	623
Switzerland	0.06	0.06	6.2	5.7	172	181	4,623	2,607	494	673	2,428	2,699
Syrian Arab Republic	0.60	0.29	9.6	22.1	2,642	3,060	250	766	29	68	54	201
Tajikistan	..	0.12	..	83.5	..	373	..	257	..	37	..	410
Tanzania	0.16	0.12	3.1	3.3	2,834	3,005	110	64	1	1	35	20
Thailand	0.35	0.25	16.4	27.1	10,625	11,154	177	1,113	1	10	11	148
Togo	0.77	0.56	0.3	0.3	416	680	14	73	0	0	0	0
Trinidad and Tobago	0.06	0.06	1.7	2.5	4	4	1,064	836	50	53	337	360
Tunisia	0.51	0.31	4.8	7.6	1,416	1,411	212	388	30	38	79	121
Turkey	0.57	0.38	9.6	16.7	13,499	13,174	529	890	38	63	169	372
Turkmenistan	..	0.32	..	..	..	779	..	558	..	75	..	307
Uganda	0.32	0.23	0.1	0.1	752	1,371	1	8	0	1	6	9
Ukraine	..	0.66	..	7.2	..	12,801	..	140	..	93	..	110
United Arab Emirates	0.01	0.02	..	47.2	0	1	2,250	8,034	6	4	106	70
United Kingdom	0.12	0.10	2.0	1.8	3,930	3,168	3,191	3,195	726	908	744	822
United States	0.83	0.64	10.8	12.5	72,639	57,456	1,092	1,090	1,230	1,542	253	271
Uruguay	0.48	0.39	5.4	13.5	614	542	564	974	171	174	236	257
Uzbekistan	..	0.18	..	88.3	..	1,520	..	1,733	..	57	..	380
Venezuela, RB	0.19	0.10	10.1	16.9	814	736	722	920	50	60	136	201
Vietnam	0.11	0.07	25.6	40.9	5,962	8,322	302	3,420	1	5	38	224
West Bank and Gaza	..	..	..	..	..	..	..	..	..	..	..	..
Yemen, Rep.	0.16	0.09	19.9	29.5	865	621	93	111	3	2	33	37
Yugoslavia, Fed. Rep.	0.73	..	1.9	..	4,310	..	1,261	..	140	..	616	..
Zambia	0.89	0.53	0.4	0.9	595	735	145	64	2	2	9	11
Zimbabwe	0.35	0.26	3.1	3.5	1,633	1,787	610	544	7	7	66	73
World	**0.25 w**	**0.23 w**	**17.7 w**	**19.8 w**	**588,602 s**	**668,229 s**	**870 w**	**1,013 w**	**19 w**	**20 w**	**175 w**	**190 w**
Low income	0.22	0.18	19.9	25.1	199,696	259,265	290	671	2	5	20	69
Middle income	0.18	0.22	23.2	20.7	232,195	274,711	969	1,125	8	11	114	127
Lower middle income	0.15	0.20	30.0	24.0	175,911	216,305	996	1,169	5	7	101	96
Upper middle income	0.33	0.30	9.6	11.4	56,284	58,406	914	999	42	89	139	217
Low & middle income	0.20	0.20	21.6	22.6	431,892	533,976	635	930	5	8	67	102
East Asia & Pacific	0.12	0.11	36.5	38.1	139,904	139,990	1,117	2,346	2	2	55	71
Europe & Central Asia	0.16	0.57	10.6	10.7	37,380	107,728	1,445	339	67	101	266	170
Latin America & Carib.	0.32	0.26	11.8	13.9	49,847	48,455	587	895	25	36	95	118
Middle East & N. Africa	0.29	0.19	25.8	37.3	25,655	25,954	422	787	12	24	61	123
South Asia	0.23	0.15	28.7	39.9	132,128	131,832	360	1,065	2	5	25	91
Sub-Saharan Africa	0.32	0.24	4.0	4.2	46,978	80,017	158	130	3	1	23	15
High income	0.45	0.38	10.1	11.9	156,710	134,253	1,328	1,249	429	851	385	438
Europe EMU	0.23	0.21	13.4	18.5	35,999	31,316	2,704	2,254	424	862	878	986

a. Includes Luxembourg.

Agricultural inputs 3.2

About the data

Agricultural activities provide developing countries with food and revenue, but they also can degrade natural resources. Poor farming practices can cause soil erosion and loss of soil fertility. Efforts to increase productivity through the use of chemical fertilizers, pesticides, and intensive irrigation have environmental costs and health impacts. Excessive use of chemical fertilizers can alter the chemistry of soil. Pesticide poisoning is common in developing countries. And salinization of irrigated land diminishes soil fertility. Thus inappropriate use of inputs for agricultural production has far-reaching effects.

This table provides indicators of major inputs to agricultural production: land, fertilizers, and agricultural machinery. There is no single correct mix of inputs: appropriate levels and application rates vary by country and over time, depending on the type of crops, the climate and soils, and the production process used.

The data shown here and in table 3.3 are collected by the Food and Agriculture Organization (FAO) through annual questionnaires. The FAO tries to impose standard definitions and reporting methods, but exact consistency across countries and over time is not possible. Data on agricultural employment in particular should be used with caution. In many countries much agricultural employment is informal and unrecorded, including substantial work performed by women and children.

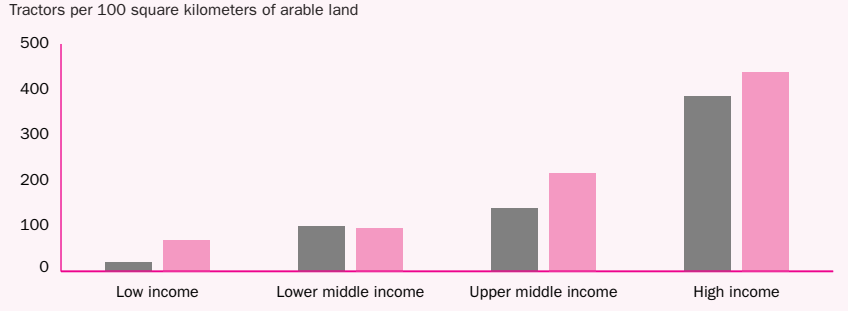
Fertilizer consumption measures the quantity of plant nutrients in the form of nitrogen, potassium, and phosphorous compounds available for direct application. Consumption is calculated as production plus imports minus exports. Traditional nutrients—animal and plant manures—are not included. Because some chemical compounds used for fertilizers have other industrial applications, the consumption data may overstate the quantity available for crops.

To smooth annual fluctuations in agricultural activity, the indicators in the table have been averaged over three years.

3.2a

In low-income countries fertilizer consumption has more than doubled in the past two decades . . .

. . . while agricultural machinery use has tripled . . .



. . . but cereal yields remain less than a third of those in high-income countries

Source: Tables 3.2 and 3.3.

Definitions

• **Arable land** includes land defined by the FAO as land under temporary crops (double-cropped areas are counted once), temporary meadows for mowing or for pasture, land under market or kitchen gardens, and land temporarily fallow. Land abandoned as a result of shifting cultivation is excluded. • **Irrigated land** refers to areas purposely provided with water, including land irrigated by controlled flooding. Cropland refers to arable land and permanent cropland (see table 3.1). • **Land under cereal production** refers to harvested areas, although some countries report only sown or cultivated area. • **Fertilizer consumption** is the quantity of plant nutrients used per unit of arable land. Fertilizer products cover nitrogenous, potash, and phosphate fertilizers (including ground rock phosphate). The time reference for fertilizer consumption is the crop year (July through June). • **Agricultural machinery** refers to wheel and crawler tractors (excluding garden tractors) in use in agriculture at the end of the calendar year specified or during the first quarter of the following year.

Data sources

The data are from electronic files that the FAO makes available to the World Bank. Data on arable land, irrigated land, and land under cereal production are published in the FAO's *Production Yearbook*.

3.3 Agricultural output and productivity

	Crop production index		Food production index		Livestock production index		Cereal yield		Agricultural productivity	
							kilograms		Agriculture value added	
	1989–91 = 100		1989–91 = 100		1989–91 = 100		per hectare		per worker 1995 $	
	1979–81	1999–2001	1979–81	1999–2001	1979–81	1999–2001	1979–81	1999–2001	1979–81	1999–2001
Afghanistan	..	..	..	..	..	..	1,337	1,026	..	..
Albania	..	..	..	..	..	..	2,500	2,622	1,184	2,101
Algeria	77.5	127.9	67.3	133.1	54.6	128.3	656	929	1,357	1,939
Angola	101.9	151.2	90.0	146.3	83.8	136.8	526	630	..	131
Argentina	83.6	163.9	91.7	142.9	100.9	112.1	2,184	3,397	7,148	10,351
Armenia	..	98.5	..	73.9	..	60.2	..	1,675	..	5,435
Australia	79.9	171.2	91.3	145.7	85.6	114.8	1,321	2,038	20,872	33,225
Austria	92.8	102.6	92.2	107.6	94.5	106.3	4,131	5,629	11,082	31,091
Azerbaijan	..	57.4	..	78.0	..	79.6	..	2,373	..	768
Bangladesh	80.0	132.4	79.2	135.6	81.3	140.9	1,938	3,322	217	311
Belarus	..	86.7	..	59.5	..	56.8	..	1,722	..	2,180
Belgium [a]	84.9	146.1	88.5	113.6	88.8	109.7	4,861	7,679	21,861	29,098
Benin	53.8	181.9	63.0	157.6	69.0	110.8	698	1,047	311	608
Bolivia	71.9	163.0	71.5	144.8	75.5	126.8	1,183	1,577	..	748
Bosnia and Herzegovina	..	..	..	..	..	..	..	3,034	..	7,811
Botswana	86.4	80.4	87.2	95.5	87.5	97.4	203	146	657	575
Brazil	75.4	129.1	69.5	145.9	67.9	162.2	1,496	2,825	2,049	4,798
Bulgaria	107.7	59.8	105.5	66.0	96.3	60.7	3,853	2,696	2,754	8,277
Burkina Faso	59.3	137.8	62.7	135.4	59.9	141.4	575	880	136	183
Burundi	79.9	92.3	79.9	91.8	82.3	77.3	1,081	1,290	177	150
Cambodia	55.2	149.0	48.9	153.3	27.3	166.1	1,025	2,050	..	363
Cameroon	86.7	132.9	80.2	130.8	61.3	122.0	849	1,842	826	1,189
Canada	77.6	123.7	79.8	126.7	88.3	129.6	2,173	2,772	15,881	43,428
Central African Republic	102.8	133.3	79.7	139.4	48.9	137.3	529	1,217	380	490
Chad	66.9	144.5	79.9	138.0	89.2	119.9	587	555	160	213
Chile	70.7	131.2	71.5	137.8	75.8	147.4	2,124	4,453	3,488	6,040
China	67.1	146.1	60.8	175.9	45.4	217.9	3,027	4,869	161	334
Hong Kong, China	133.6	*59.3*	99.8	*58.0*	194.3	*57.0*	1,712	..	..	..
Colombia	84.1	104.1	75.5	120.2	72.6	122.9	2,452	3,236	3,034	3,590
Congo, Dem. Rep.	73.0	81.9	72.2	85.3	77.7	101.5	807	782	241	218
Congo, Rep.	86.4	126.0	83.5	128.3	80.1	133.4	838	782	385	471
Costa Rica	70.1	149.9	72.6	148.0	77.2	132.7	2,498	4,023	3,139	5,272
Côte d'Ivoire	73.7	135.8	70.7	138.0	74.7	122.9	867	1,307	1,026	1,057
Croatia	..	86.6	..	67.3	..	50.0	..	4,355	..	9,449
Cuba	84.1	58.4	90.1	62.2	96.0	68.3	2,458	2,601	..	..
Czech Republic	..	92.0	..	77.1	..	66.9	..	4,277	..	6,235
Denmark	65.2	91.9	83.3	104.2	95.0	116.8	4,040	6,032	19,350	57,896
Dominican Republic	96.5	87.3	85.2	110.1	68.8	141.0	3,024	4,105	2,020	3,179
Ecuador	78.2	157.6	77.4	156.1	73.0	153.1	1,633	2,212	1,206	1,716
Egypt, Arab Rep.	75.5	151.2	68.4	155.9	67.0	161.4	4,053	7,238	721	1,324
El Salvador	120.4	104.0	88.9	117.0	86.5	120.2	1,702	2,098	1,924	1,710
Eritrea	..	148.9	..	126.8	..	111.0	..	671	..	85
Estonia	..	69.5	..	43.4	..	37.2	..	1,704	..	4,265
Ethiopia	..	153.2	..	141.1	..	118.4	..	1,164	..	141
Finland	76.3	94.7	93.8	89.8	107.5	91.7	2,511	3,071	18,547	40,463
France	87.4	107.9	93.6	105.3	97.8	104.6	4,700	7,088	19,318	58,177
Gabon	76.2	119.9	79.0	115.9	86.5	119.0	1,718	1,638	1,814	2,047
Gambia, The	79.5	145.0	82.7	139.8	93.7	106.1	1,284	1,298	325	298
Georgia	..	52.5	..	78.7	..	94.9	..	1,576	..	..
Germany	90.0	119.4	91.4	98.2	98.7	87.8	4,166	6,749	9,061	32,814
Ghana	67.0	178.6	68.6	169.6	78.7	117.7	807	1,305	671	569
Greece	86.8	111.6	91.2	103.4	99.9	96.1	3,090	3,527	8,600	14,079
Guatemala	87.3	131.8	68.0	134.7	76.3	134.1	1,578	1,778	2,143	2,115
Guinea	89.7	153.8	95.8	155.3	112.0	174.4	958	1,311	..	274
Guinea-Bissau	64.9	144.7	68.3	140.0	78.0	126.2	711	1,271	237	322
Haiti	103.4	87.6	101.3	99.8	100.2	145.6	1,009	899	..	..

Agricultural output and productivity

3.3

	Crop production index		Food production index		Livestock production index		Cereal yield		Agricultural productivity	
									Agriculture value added per worker	
	1989–91 = 100		1989–91 = 100		1989–91 = 100		kilograms per hectare		1995 $	
	1979–81	1999–2001	1979–81	1999–2001	1979–81	1999–2001	1979–81	1999–2001	1979–81	1999–2001
Honduras	90.4	105.1	88.2	112.1	80.8	149.5	1,170	1,327	696	990
Hungary	93.3	80.1	90.7	76.3	94.1	70.1	4,519	4,392	3,390	5,159
India	70.9	124.6	68.2	129.9	62.6	144.1	1,324	2,321	269	402
Indonesia	66.2	119.4	63.3	118.3	51.0	116.4	2,837	3,947	604	744
Iran, Islamic Rep.	57.5	135.9	61.2	139.0	68.0	145.1	1,108	1,806	2,165	3,698
Iraq	74.7	73.6	78.0	73.3	81.4	68.1	832	530	..	..
Ireland	93.9	111.0	83.3	113.5	83.3	115.2	4,733	7,241	..	..
Israel	99.8	100.3	85.0	115.0	78.4	122.5	1,840	2,411	..	..
Italy	106.1	104.7	101.4	104.9	93.0	106.6	3,548	4,920	11,090	26,690
Jamaica	98.6	118.1	86.0	118.8	73.9	122.3	1,667	1,183	965	1,540
Japan	108.3	88.0	94.1	92.5	85.1	94.1	5,252	6,147	17,378	30,828
Jordan	54.6	114.9	57.4	134.1	51.5	176.6	521	1,949	1,141	825
Kazakhstan	..	84.1	..	70.3	..	45.3	..	1,162	..	1,649
Kenya	74.5	110.4	67.5	107.7	60.1	106.5	1,364	1,477	265	216
Korea, Dem. Rep.	..	..	..	..	..	..	3,694	2,753	..	..
Korea, Rep.	87.8	113.0	77.4	131.0	52.3	161.6	4,986	6,500	3,765	13,782
Kuwait	37.1	166.2	91.4	208.1	106.6	210.0	3,124	2,260	..	..
Kyrgyz Republic	..	143.5	..	121.4	..	78.1	..	2,726	..	1,636
Lao PDR	73.5	153.7	70.3	163.4	56.0	185.7	1,402	2,978	..	614
Latvia	..	74.3	..	41.9	..	31.7	..	2,090	..	2,671
Lebanon	52.0	138.3	59.2	143.7	100.5	164.7	1,307	2,415	..	28,322
Lesotho	98.2	164.4	90.2	116.9	87.7	87.5	977	1,337	636	553
Liberia	..	..	..	..	..	..	1,251	1,278	..	525
Libya	76.3	133.8	78.7	157.5	68.4	162.1	430	637	..	..
Lithuania	..	74.6	..	59.8	..	49.4	..	2,480	..	3,131
Macedonia, FYR	..	105.2	..	94.6	..	86.1	..	2,711	..	4,155
Madagascar	83.1	103.3	83.8	109.5	87.7	110.0	1,664	1,831	158	155
Malawi	85.7	149.4	93.2	160.8	78.2	113.2	1,161	1,634	96	123
Malaysia	75.3	119.7	55.6	143.2	41.0	155.1	2,828	3,075	3,939	6,843
Mali	54.5	135.0	76.7	119.5	94.5	111.8	804	1,113	242	290
Mauritania	62.1	133.9	86.5	109.4	89.4	106.0	384	718	299	500
Mauritius	93.3	90.4	89.7	101.7	64.0	141.3	2,536	4,793	2,891	5,580
Mexico	86.5	121.9	83.8	133.6	83.5	145.1	2,164	2,765	1,482	1,801
Moldova	..	56.8	..	45.9	..	34.5	..	2,437	..	1,661
Mongolia	44.6	30.9	88.1	103.4	93.2	109.2	573	716	*994*	1,428
Morocco	54.8	93.1	55.8	103.8	59.8	121.9	811	670	1,146	1,512
Mozambique	109.6	140.8	100.9	128.5	85.8	103.2	603	929	..	138
Myanmar	89.0	167.9	88.2	163.6	89.1	157.9	2,521	3,082	..	..
Namibia	80.1	121.5	107.2	118.0	115.6	117.7	377	347	1,003	1,618
Nepal	62.6	127.8	65.9	127.6	77.3	125.5	1,615	2,089	156	200
Netherlands	79.8	115.4	86.5	102.9	88.3	100.5	5,696	7,701	24,343	58,280
New Zealand	74.4	142.7	90.7	128.0	95.5	117.9	4,089	6,303	16,636	28,791
Nicaragua	124.1	138.4	117.8	144.1	139.7	139.5	1,475	1,706	1,549	..
Niger	89.3	144.5	97.4	136.0	109.7	125.2	440	358	229	201
Nigeria	51.4	159.7	57.2	156.2	84.3	127.4	1,265	1,197	417	714
Norway	94.8	79.2	93.9	91.9	96.2	99.1	3,634	3,928	17,013	34,535
Oman	60.1	166.1	62.1	162.5	61.5	133.6	982	2,266	..	..
Pakistan	65.6	126.0	66.3	145.2	59.5	155.1	1,608	2,305	416	712
Panama	97.1	94.0	85.6	106.7	71.3	126.1	1,524	2,732	2,122	2,738
Papua New Guinea	86.5	122.2	86.2	122.8	85.0	140.9	2,087	4,079	694	815
Paraguay	58.7	114.6	60.7	137.5	62.1	132.6	1,535	2,092	2,641	3,389
Peru	82.1	173.0	77.3	171.8	78.0	160.0	1,946	2,977	1,273	1,834
Philippines	88.3	119.9	86.1	131.1	73.8	162.7	1,611	2,571	1,381	1,428
Poland	84.6	85.3	87.9	85.9	98.0	83.4	2,345	2,860	..	1,601
Portugal	85.0	93.8	72.2	102.9	71.8	119.9	1,102	2,729	3,796	7,552
Puerto Rico	131.3	67.9	99.8	83.8	90.3	89.2	7,970	1,870	..	..

3.3 Agricultural output and productivity

	Crop production index		Food production index		Livestock production index		Cereal yield		Agricultural productivity	
							kilograms		Agriculture value added	
	1989–91 = 100		1989–91 = 100		1989–91 = 100		per hectare		per worker 1995 $	
	1979–81	1999–2001	1979–81	1999–2001	1979–81	1999–2001	1979–81	1999–2001	1979–81	1999–2001
Romania	114.1	92.4	113.0	96.3	110.0	88.2	2,854	2,569	*1,277*	3,193
Russian Federation	..	78.7	..	63.7	..	51.5	..	1,767	..	2,648
Rwanda	84.3	100.4	85.3	103.8	80.9	116.8	1,134	891	271	251
Saudi Arabia	27.2	88.1	26.7	83.3	32.7	144.6	820	3,649	..	..
Senegal	77.2	129.5	74.1	136.6	65.7	147.4	690	854	336	334
Sierra Leone	80.3	72.9	84.5	81.9	84.1	126.0	1,249	1,092	674	359
Singapore	595.0	48.2	154.3	39.5	173.7	39.5	..	..	15,938	44,907
Slovak Republic	..	..	..	..	..	..	..	..	..	..
Slovenia	..	94.4	..	108.9	..	104.7	..	4,912	..	34,697
Somalia	..	..	..	..	..	..	474	544	..	..
South Africa	95.0	106.9	91.0	107.7	86.8	103.0	2,105	2,334	2,857	3,837
Spain	83.0	112.3	82.0	114.8	84.2	128.4	1,986	3,047	7,556	22,088
Sri Lanka	99.3	120.3	98.3	122.2	93.2	135.0	2,462	3,270	642	734
Sudan	130.2	159.6	105.1	161.7	89.3	158.3	645	484	..	..
Swaziland	72.5	87.9	80.2	89.0	96.5	82.5	1,345	1,620	1,752	1,922
Sweden	93.1	89.2	100.6	97.1	103.8	102.5	3,595	4,557	18,020	36,365
Switzerland	95.5	90.1	95.8	94.1	98.8	93.5	4,883	6,204	..	..
Syrian Arab Republic	100.5	156.3	94.2	147.0	72.2	134.6	1,156	1,304	2,206	2,618
Tajikistan	..	51.6	..	51.5	..	39.5	..	1,025	..	1,332
Tanzania	81.8	97.2	76.7	103.8	69.3	121.8	1,063	1,273	..	185
Thailand	79.1	118.5	80.2	118.3	64.6	130.1	1,911	2,659	626	904
Togo	70.6	140.7	78.3	132.9	56.2	107.5	729	1,096	365	531
Trinidad and Tobago	119.9	108.2	101.9	114.7	84.3	100.8	3,167	2,928	3,536	3,036
Tunisia	68.1	122.1	66.3	132.4	60.3	162.8	828	1,109	1,743	3,168
Turkey	76.6	113.8	75.8	111.5	80.4	106.8	1,869	2,187	1,872	1,852
Turkmenistan	..	91.8	..	134.1	..	136.8	..	1,771	..	1,518
Uganda	67.5	135.5	69.9	131.8	81.9	127.3	1,555	1,605	..	342
Ukraine	..	63.9	..	49.5	..	46.4	..	2,226	..	1,521
United Arab Emirates	38.9	284.6	48.8	270.7	45.3	203.4	2,224	598	..	..
United Kingdom	80.1	97.9	92.2	95.5	98.1	95.7	4,792	6,836	20,326	33,520
United States	98.6	119.8	94.5	122.4	89.0	122.1	4,151	5,824	20,634	50,777
Uruguay	86.8	150.4	87.1	136.6	85.9	119.9	1,644	3,796	6,240	8,010
Uzbekistan	..	88.8	..	118.0	..	116.3	..	2,603	..	1,088
Venezuela, RB	76.3	118.2	80.2	123.2	84.9	118.6	1,904	3,341	3,935	5,304
Vietnam	66.6	166.8	63.0	153.9	49.5	154.9	2,049	4,075	..	253
West Bank and Gaza	..	..	..	..	..	..	..	..	..	..
Yemen, Rep.	82.3	129.6	75.0	134.1	68.9	145.9	1,038	1,094	..	406
Yugoslavia, Fed. Rep.	96.3	..	94.3	..	94.2	..	3,601	..	..	..
Zambia	64.5	100.7	72.9	106.0	86.2	117.5	1,676	1,437	186	195
Zimbabwe	77.8	121.3	83.3	110.0	89.7	114.5	1,359	1,221	310	361
World	**79.1 w**	**124.4 w**	**78.8 w**	**129.0 w**	**79.6 w**	**130.5 w**	**1,608 w**	**2,143 w**	**.. w**	**.. w**
Low income	71.7	125.8	70.7	127.8	68.4	132.1	1,090	1,309	..	*415*
Middle income	74.3	128.7	71.8	143.2	69.6	155.8	1,811	2,357	..	*737*
Lower middle income	72.5	131.9	68.8	150.8	60.8	176.0	1,771	2,004	..	*558*
Upper middle income	79.4	119.3	78.8	125.7	82.8	124.4	1,892	2,803	..	..
Low & middle income	73.3	127.6	71.5	137.9	69.3	149.7	1,422	1,818	..	*583*
East Asia & Pacific	68.5	136.9	63.4	159.7	47.9	202.7	2,034	2,978	..	..
Europe & Central Asia	..	..	..	..	..	..	2,854	2,388	..	*2,049*
Latin America & Carib.	80.3	125.9	78.3	133.0	79.8	133.4	1,842	2,545	2,209	3,680
Middle East & N. Africa	66.0	128.2	64.8	132.2	64.1	137.9	965	1,595	..	..
South Asia	71.9	122.8	69.6	127.1	64.0	137.1	1,510	2,182	284	568
Sub-Saharan Africa	75.4	129.4	78.3	125.8	84.1	114.9	895	1,188	421	675
High income	93.4	116.4	91.9	113.6	90.6	110.9	3,400	4,246	..	..
Europe EMU	90.7	109.6	91.4	104.0	93.9	101.1	4,035	5,629	..	..

a. Includes Luxembourg.

Agricultural output and productivity 3.3

About the data

The agricultural production indexes in the table are prepared by the Food and Agriculture Organization (FAO). The FAO obtains data from official and semiofficial reports of crop yields, area under production, and livestock numbers. If data are not available, the FAO makes estimates. The indexes are calculated using the Laspeyres formula: production quantities of each commodity are weighted by average international commodity prices in the base period and summed for each year. Because the FAO's indexes are based on the concept of agriculture as a single enterprise, estimates of the amounts retained for seed and feed are subtracted from the production data to avoid double counting. The resulting aggregate represents production available for any use except as seed and feed. The FAO's indexes may differ from other sources because of differences in coverage, weights, concepts, time periods, calculation methods, and use of international prices.

To ease cross-country comparisons, the FAO uses international commodity prices to value production. These prices, expressed in international dollars (equivalent in purchasing power to the U.S. dollar), are derived using a Geary-Khamis formula applied to agricultural outputs (see Inter-Secretariat Working Group on National Accounts 1993, sections 16.93–96). This method assigns a single price to each commodity so that, for example, one metric ton of wheat has the same price regardless of where it was produced. The use of international prices eliminates fluctuations in the value of output due to transitory movements of nominal exchange rates unrelated to the purchasing power of the domestic currency.

Data on cereal yield may be affected by a variety of reporting and timing differences. The FAO allocates production data to the calendar year in which the bulk of the harvest took place. But most of a crop harvested near the end of a year will be used in the following year. Cereal crops harvested for hay or harvested green for food, feed, or silage, and those used for grazing, are generally excluded. But millet and sorghum, which are grown as feed for livestock and poultry in Europe and North America, are used as food in Africa, Asia, and countries of the former Soviet Union. So some cereal crops are excluded from the data for some countries and included elsewhere, depending on their use.

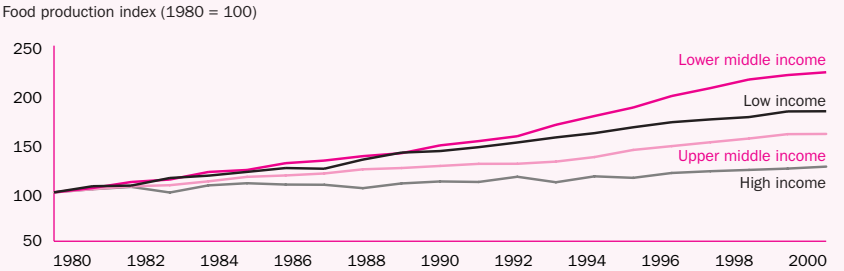
Agricultural productivity is measured by value added per unit of input. (For further discussion of the calculation of value added in national accounts, see *About the data* for tables 4.1 and 4.2.) Agricultural value added includes that from forestry and fishing. Thus interpretations of land productivity should be made with caution. To smooth annual fluctuations in agricultural activity, the indicators in the table have been averaged over three years.

Definitions

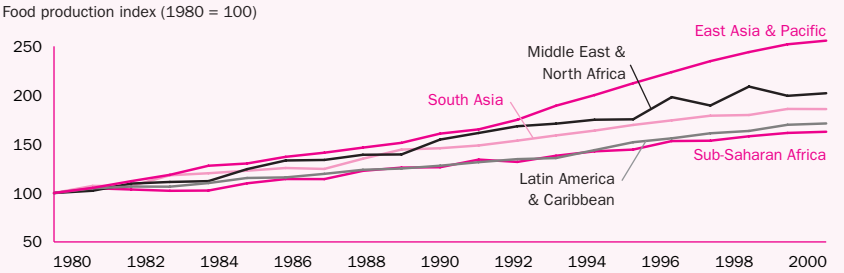
• **Crop production index** shows agricultural production for each period relative to the base period 1989–91. It includes all crops except fodder crops. The regional and income group aggregates for the FAO's production indexes are calculated from the underlying values in international dollars, normalized to the base period 1989–91. The data in this table are three-year averages. Missing observations have not been estimated or imputed. • **Food production index** covers food crops that are considered edible and that contain nutrients. Coffee and tea are excluded because, although edible, they have no nutritive value. • **Livestock production index** includes meat and milk from all sources, dairy products such as cheese, and eggs, honey, raw silk, wool, and hides and skins. • **Cereal yield,** measured in kilograms per hectare of harvested land, includes wheat, rice, maize, barley, oats, rye, millet, sorghum, buckwheat, and mixed grains. Production data on cereals refer to crops harvested for dry grain only. Cereal crops harvested for hay or harvested green for food, feed, or silage, and those used for grazing, are excluded. • **Agricultural productivity** refers to the ratio of agricultural value added, measured in constant 1995 U.S. dollars, to the number of workers in agriculture.

3.3a

Food production has grown in all country income groups and regions in the past two decades . . .



. . . but the progress has been uneven



Food production has outpaced population growth in the past two decades, but the progress has been uneven. And despite the more than 80 percent increase in food production in low-income countries, hunger persists in parts of the world. Among developing regions, East Asia and Pacific has had the highest growth in food production, Sub-Saharan Africa the lowest.

Source: Table 3.3.

Data sources

The agricultural production indexes are prepared by the FAO and published annually in its *Production Yearbook*. The FAO makes these data and the data on cereal yield and agricultural employment available to the World Bank in electronic files that may contain more recent information than the published versions. For sources of data on agricultural value added, see *Data sources* for table 4.2.

3.4 Deforestation and biodiversity

	Forest area		Average annual deforestation		Mammals		Birds		Higher plants [a]		Nationally protected areas	
	thousand sq. km	% of total land area	sq. km	%	Species	Threatened species	Species	Threatened species	Species	Threatened species	thousand sq. km	% of total land area
	2000	2000	1990–2000	1990–2000	1996	2002 [b]	1996	2002 [b]	1997	1997	2002 [c]	2002 [c]
Afghanistan	14	2.1	0	0.0	123	13	235	11	4,000	4	2.2	0.3
Albania	10	36.2	78	0.8	68	3	230	3	3,031	79	1.0	3.8
Algeria	21	0.9	–266	–1.3	92	13	192	6	3,164	141	119.5	5.0
Angola	698	56.0	1,242	0.2	276	19	765	15	5,185	30	81.8	6.6
Argentina	346	12.7	2,851	0.8	320	34	897	39	9,372	247	181.6	6.6
Armenia	4	12.4	–42	–1.3	..	11	..	4	..	31	2.1	7.6
Australia	1,581	20.6	0	0.0	252	63	649	37	15,638	2,245	1,017.7	13.2
Austria	39	47.0	–77	–0.2	83	7	213	3	3,100	23	28.1	33.9
Azerbaijan	11	12.6	–130	–1.3	..	13	..	8	..	28	4.8	5.5
Bangladesh	13	10.2	–165	–1.3	109	23	295	23	5,000	24	1.0	0.8
Belarus	94	45.3	–2,562	–3.2	..	7	221	3	..	1	13.0	6.3
Belgium	..	..	..	..	58	11	180	2	1,550	2	0.9	2.6
Benin	27	24.0	699	2.3	188	8	307	2	2,201	4	12.6	11.4
Bolivia	531	48.9	1,611	0.3	316	24	..	28	17,367	227	151.0	13.9
Bosnia and Herzegovina	23	44.6	0	0.0	..	10	..	3	..	64	0.3	0.5
Botswana	124	21.9	1,184	0.9	164	6	386	7	2,151	7	105.0	18.5
Brazil	5,325	63.0	22,264	0.4	394	81	1,492	114	56,215	1,358	568.6	6.7
Bulgaria	37	33.4	–204	–0.6	81	14	240	10	3,572	106	5.0	4.5
Burkina Faso	71	25.9	152	0.2	147	7	335	2	*1,100*	*0*	28.6	10.4
Burundi	1	3.7	147	9.0	107	6	451	7	*2,500*	*1*	1.5	5.7
Cambodia	93	52.9	561	0.6	123	24	307	19	..	5	32.7	18.5
Cameroon	239	51.3	2,218	0.9	297	40	690	15	8,260	89	21.0	4.5
Canada	2,446	26.5	0	0.0	193	14	426	8	3,270	278	1,077.6	11.7
Central African Republic	229	36.8	300	0.1	209	14	537	3	3,602	1	55.2	8.9
Chad	127	10.1	817	0.6	134	17	370	5	1,600	12	114.9	9.1
Chile	155	20.7	203	0.1	91	21	296	22	5,284	329	141.4	18.9
China	1,589	17.0	–13,483	–0.9	499	94	1,258	183	32,200	312	730.4	7.8
Hong Kong, China	..	..	..	..	24	1	76	11	1,984	9	0.5	..
Colombia	496	47.8	1,905	0.4	359	41	1,695	78	51,220	712	94.7	9.1
Congo, Dem. Rep.	1,352	59.6	5,324	0.4	415	40	929	28	11,007	78	146.4	6.5
Congo, Rep.	221	64.6	175	0.1	200	15	449	3	6,000	3	17.0	5.0
Costa Rica	20	38.5	158	0.8	205	14	600	13	12,119	527	11.8	23.0
Côte d'Ivoire	71	22.4	2,649	3.1	230	19	535	12	3,660	94	20.5	6.4
Croatia	18	31.9	–20	–0.1	..	9	224	4	..	6	4.2	7.5
Cuba	23	21.4	–277	–1.3	31	11	137	18	6,522	888	74.1	67.5
Czech Republic	26	34.1	–5	0.0	..	8	199	2	..	81	12.5	16.1
Denmark	5	10.7	–10	–0.2	43	5	196	1	1,450	2	14.4	34.0
Dominican Republic	14	28.4	0	0.0	20	5	136	15	5,657	136	15.5	32.0
Ecuador	106	38.1	1,372	1.2	302	33	1,388	62	19,362	824	128.5	46.4
Egypt, Arab Rep.	1	0.1	–20	–3.4	98	13	153	7	2,076	82	10.1	1.0
El Salvador	1	5.8	72	4.6	135	2	251	0	2,911	42	0.1	0.4
Eritrea	16	15.7	54	0.3	112	12	319	7	..	*0*	5.0	5.0
Estonia	21	48.7	–125	–0.6	65	4	213	3	*1,630*	2	5.0	11.8
Ethiopia	46	4.6	403	0.8	255	35	626	16	6,603	163	227.7	22.8
Finland	219	72.0	–80	0.0	60	5	248	3	1,102	6	28.4	9.3
France	153	27.9	–616	–0.4	93	18	269	5	4,630	195	73.2	13.3
Gabon	218	84.7	101	0.0	190	15	466	5	6,651	91	7.2	2.8
Gambia, The	5	48.1	–45	–1.0	108	3	280	2	974	1	0.2	2.3
Georgia	30	43.0	0	0.0	..	13	..	3	..	29	2.0	2.8
Germany	107	30.1	0	0.0	76	11	239	5	2,682	14	111.6	31.3
Ghana	63	27.8	1,200	1.7	222	14	529	8	3,725	103	12.7	5.6
Greece	36	27.9	–300	–0.9	95	13	251	7	4,992	571	4.7	3.6
Guatemala	29	26.3	537	1.7	250	6	458	6	8,681	355	21.7	20.0
Guinea	69	28.2	347	0.5	190	12	409	10	3,000	39	1.6	0.7
Guinea-Bissau	22	77.8	216	0.9	108	3	243	0	*1,000*	*0*	..	..
Haiti	1	3.2	70	5.7	3	4	75	14	5,242	100	0.1	0.4

Deforestation and biodiversity 3.4

	Forest area		Average annual deforestation		Mammals		Birds		Higher plants [a]		Nationally protected areas	
	thousand sq. km	% of total land area	sq. km	%	Species	Threatened species	Species	Threatened species	Species	Threatened species	thousand sq. km	% of total land area
	2000	2000	1990–2000	1990–2000	1996	2002 [b]	1996	2002 [b]	1997	1997	2002 [c]	2002 [c]
Honduras	54	48.1	590	1.0	173	10	422	5	5,680	96	7.2	6.4
Hungary	18	19.9	–72	–0.4	72	9	205	8	2,214	30	6.5	7.0
India	641	21.6	–381	–0.1	316	88	923	72	16,000	1,236	154.7	5.2
Indonesia	1,050	58.0	13,124	1.2	436	147	1,519	114	29,375	264	357.4	19.7
Iran, Islamic Rep.	73	4.5	0	0.0	140	22	323	13	8,000	2	83.0	5.1
Iraq	8	1.8	0	0.0	81	11	172	11	..	*2*	0.0	0.0
Ireland	7	9.6	–170	–3.0	25	5	142	1	950	1	0.7	1.0
Israel	1	6.4	–50	–4.9	92	14	180	12	2,317	32	3.3	15.8
Italy	100	34.0	–295	–0.3	90	14	234	5	5,599	311	23.1	7.9
Jamaica	3	30.0	54	1.5	24	5	113	12	3,308	744	..	..
Japan	241	66.1	–34	0.0	132	37	250	34	5,565	707	25.6	7.0
Jordan	1	1.0	0	0.0	71	10	141	8	2,100	9	3.0	3.4
Kazakhstan	121	4.5	–2,390	–2.2	..	16	..	15	..	71	73.4	2.7
Kenya	171	30.0	931	0.5	359	51	844	24	6,506	240	45.5	8.0
Korea, Dem. Rep.	82	68.2	0	0.0	..	13	115	19	2,898	4	3.2	2.6
Korea, Rep.	63	63.3	49	0.1	49	13	112	25	2,898	66	6.8	6.9
Kuwait	0	0.3	–2	–5.2	21	1	20	7	*234*	*0*	0.3	1.5
Kyrgyz Republic	10	5.2	–228	–2.6	..	7	..	4	..	34	6.9	3.6
Lao PDR	126	54.4	527	0.4	172	31	487	20	..	2	30.3	13.1
Latvia	29	47.1	–127	–0.4	83	4	217	3	*1,153*	*0*	8.3	13.4
Lebanon	0	3.5	1	0.3	54	5	154	7	3,000	5	0.0	0.5
Lesotho	0	0.5	0	0.0	33	3	58	7	1,591	21	0.1	0.2
Liberia	35	36.1	760	2.0	193	17	372	11	2,200	25	2.5	2.6
Libya	4	0.2	–47	–1.4	76	8	91	1	1,825	57	1.7	0.1
Lithuania	20	30.8	–48	–0.2	68	5	202	4	1,796	1	6.5	10.0
Macedonia, FYR	9	35.6	0	0.0	..	11	..	3	..	*0*	1.8	7.1
Madagascar	117	20.2	1,174	0.9	105	50	202	27	9,505	306	12.3	2.1
Malawi	26	27.6	707	2.4	195	8	521	11	3,765	61	10.6	11.3
Malaysia	193	58.7	2,377	1.2	286	50	501	37	15,500	490	17.4	5.3
Mali	132	10.8	993	0.7	137	13	397	4	1,741	15	45.3	3.7
Mauritania	3	0.3	98	2.7	61	10	273	2	1,100	3	17.5	1.7
Mauritius	0	7.9	1	0.6	4	3	27	9	750	294	0.2	7.8
Mexico	552	28.9	6,306	1.1	450	70	769	39	26,071	1,593	195.2	10.2
Moldova	3	9.9	–7	–0.2	68	6	177	5	..	5	0.5	1.4
Mongolia	106	6.8	600	0.5	134	14	..	16	2,272	0	179.9	11.5
Morocco	30	6.8	12	0.0	105	16	210	9	3,675	186	3.2	0.7
Mozambique	306	39.0	637	0.2	179	14	498	16	5,692	89	66.0	8.4
Myanmar	344	52.3	5,169	1.4	251	39	867	35	7,000	32	5.6	0.9
Namibia	80	9.8	734	0.9	154	15	469	11	3,174	75	112.2	13.6
Nepal	39	27.3	783	1.8	167	31	611	25	6,973	20	12.7	8.9
Netherlands	4	11.1	–10	–0.3	55	10	191	4	1,221	1	4.8	14.2
New Zealand	79	29.7	–390	–0.5	10	8	150	63	2,382	211	63.4	23.7
Nicaragua	33	27.0	1,172	3.0	200	6	482	5	7,590	98	21.6	17.8
Niger	13	1.0	617	3.7	131	11	299	3	*1,170*	*0*	96.9	7.7
Nigeria	135	14.8	3,984	2.6	274	27	681	9	4,715	37	30.2	3.3
Norway	89	28.9	–310	–0.4	54	10	243	2	1,715	12	20.9	6.8
Oman	0	0.0	0	0.0	56	9	107	10	1,204	30	39.1	12.6
Pakistan	25	3.2	304	1.1	151	19	375	17	4,950	14	37.4	4.9
Panama	29	38.6	519	1.6	218	20	732	16	9,915	1,302	17.1	22.9
Papua New Guinea	306	67.6	1,129	0.4	214	58	644	32	11,544	92	10.5	2.3
Paraguay	234	58.8	1,230	0.5	305	10	556	26	7,851	129	14.0	3.5
Peru	652	50.9	2,688	0.4	344	49	1,538	76	18,245	906	78.3	6.1
Philippines	58	19.4	887	1.4	153	50	395	67	8,931	360	17.0	5.7
Poland	93	30.6	–110	–0.1	84	15	227	4	2,450	27	37.9	12.4
Portugal	37	40.1	–570	–1.7	63	17	207	7	5,050	269	6.0	6.6
Puerto Rico	2	25.8	5	0.2	16	2	105	8	2,493	223	0.3	3.5

3.4 Deforestation and biodiversity

	Forest area		Average annual deforestation		Mammals		Birds		Higher plants [a]		Nationally protected areas	
	thousand sq. km	% of total land area	sq. km	%	Species	Threatened species	Species	Threatened species	Species	Threatened species	thousand sq. km	% of total land area
	2000	2000	1990–2000	1990–2000	1996	2002 [b]	1996	2002 [b]	1997	1997	2002 [c]	2002 [c]
Romania	64	28.0	–147	–0.2	84	17	247	8	3,400	99	10.9	4.7
Russian Federation	8,514	50.4	–1,353	0.0	269	45	628	38	..	214	1,395.1	8.3
Rwanda	3	12.4	150	3.9	151	9	513	9	*2,288*	*0*	3.6	14.7
Saudi Arabia	15	0.7	0	0.0	77	8	155	15	2,028	7	825.7	38.4
Senegal	62	32.2	450	0.7	155	12	384	4	2,086	31	22.4	11.6
Sierra Leone	11	14.7	361	2.9	147	12	466	10	2,090	29	1.5	2.1
Singapore	0	3.3	0	0.0	45	3	118	7	2,168	29	0.0	4.9
Slovak Republic	20	42.5	–69	–0.3	..	9	209	4	..	65	11.0	..
Slovenia	11	55.0	–22	–0.2	69	9	207	1	..	13	1.2	6.0
Somalia	75	12.0	769	1.0	171	19	422	10	3,028	103	5.2	0.8
South Africa	89	7.3	80	0.1	247	42	596	28	23,420	2,215	67.3	5.5
Spain	144	28.8	–860	–0.6	82	24	278	7	5,050	985	42.4	8.5
Sri Lanka	19	30.0	348	1.6	88	22	250	14	3,314	455	8.7	13.5
Sudan	616	25.9	9,589	1.4	267	23	680	6	3,137	10	122.5	5.2
Swaziland	5	30.3	–58	–1.2	47	4	364	5	2,715	42	0.6	3.5
Sweden	271	65.9	–6	0.0	60	7	249	2	1,750	13	54.2	13.2
Switzerland	12	30.3	–43	–0.4	75	5	193	2	3,030	30	11.9	30.0
Syrian Arab Republic	5	2.5	0	0.0	63	4	204	8	3,000	8	..	..
Tajikistan	4	2.8	–20	–0.5	..	9	..	7	..	50	5.9	4.2
Tanzania	388	43.9	913	0.2	316	42	822	33	10,008	436	263.4	29.8
Thailand	148	28.9	1,124	0.7	265	37	616	37	11,625	385	70.8	13.9
Togo	5	9.4	209	3.4	196	9	391	0	2,201	4	4.3	7.9
Trinidad and Tobago	3	50.5	22	0.8	100	1	260	1	2,259	21	0.3	6.0
Tunisia	5	3.3	–11	–0.2	78	11	173	5	2,196	24	0.4	0.3
Turkey	102	13.3	–220	–0.2	116	17	302	11	8,650	1,876	12.0	1.6
Turkmenistan	38	8.0	0	0.0	..	13	..	6	..	17	19.8	4.2
Uganda	42	21.3	913	2.0	338	20	830	13	5,406	15	49.2	24.9
Ukraine	96	16.5	–310	–0.3	..	16	263	8	*2,927*	52	22.9	3.9
United Arab Emirates	3	3.8	–78	–2.8	25	3	67	8	..	0	0.0	0.0
United Kingdom	26	10.7	–200	–0.8	50	12	230	2	1,623	18	54.8	22.8
United States	2,260	24.7	–3,880	–0.2	428	37	650	55	19,473	4,669	2,373.9	25.9
Uruguay	13	7.4	–501	–5.0	81	6	237	11	2,278	15	0.5	0.3
Uzbekistan	20	4.8	–46	–0.2	..	9	..	9	..	41	8.2	2.0
Venezuela, RB	495	56.1	2,175	0.4	305	26	1,181	24	21,073	426	563.1	63.8
Vietnam	98	30.2	–516	–0.5	213	40	535	37	10,500	341	11.6	3.5
West Bank and Gaza	..	..	..	..	..	1	..	1	..	..	..	..
Yemen, Rep.	4	0.9	92	1.8	66	5	143	12	..	*149*	..	..
Yugoslavia, Fed. Rep.	29	..	14	0.0	..	12	..	5	5,351	155	..	..
Zambia	312	42.0	8,509	2.4	229	11	605	11	4,747	12	453.2	61.0
Zimbabwe	190	49.2	3,199	1.5	270	11	532	10	4,440	100	50.0	12.9
World	**38,607 s**	**29.7 w**	**90,419.0 s**	**0.2 w**							**15,177.0 s**	**11.7 w**
Low income	9,131	27.1	72,735.0	0.8							2,974.8	9.2
Middle income	21,442	32.7	25,646.0	0.1							6,141.4	9.3
Lower middle income	13,700	31.8	–11,406.0	–0.1							3,372.5	7.5
Upper middle income	7,742	34.5	37,052.0	0.5							2,768.9	13.0
Low & middle income	30,568	30.9	98,347.0	0.3							9,116.2	9.3
East Asia & Pacific	4,284	27.2	7,033.0	0.2							1,467.5	9.2
Europe & Central Asia	9,464	39.7	–8,143.0	–0.1							1,677.2	7.0
Latin America & Carib.	9,440	47.1	45,878.0	0.5							2,315.2	11.5
Middle East & N. Africa	168	1.5	–239.0	–0.1							1,086.0	10.4
South Asia	782	16.3	889.0	0.1							228.6	4.8
Sub-Saharan Africa	6,436	27.3	52,963.0	0.8							2,341.8	9.9
High income	8,034	26.1	–7,962.0	–0.1							6,060.8	19.5
Europe EMU	927	37.0	–2,988.0	–0.3							332.6	13.1

a. Flowering plants only. b. Data may be for earlier years. They are the most recent reported by the World Conservation Monitoring Centre in 2002. c. These are tentative data and are being finalized.

Deforestation and biodiversity 3.4

About the data

The estimates of forest area are from the Food and Agriculture Organization's (FAO) *State of the World's Forests 2001*, which provides information on forest cover in 2000 and a revised estimate of forest cover in 1990. The current survey is the latest global forest assessment and the first to use a uniform global definition of forest. According to this assessment, the global rate of net deforestation has slowed to 9 million hectares a year, a rate 20 percent lower than that previously reported.

No breakdown of forest cover between natural forest and plantation is shown in the table because of space limitations. (This breakdown is provided by the FAO only for developing countries.) For this reason the deforestation data in the table may underestimate the rate at which natural forest is disappearing in some countries.

Deforestation is a major cause of loss of biodiversity, and habitat conservation is vital for stemming this loss. Conservation efforts traditionally have focused on protected areas, which have grown substantially in recent decades. Measures of species richness are among the most straightforward ways to indicate the importance of an area for biodiversity. The number of small plants and animals is usually estimated by sampling plots. It is also important to know which aspects are under the most immediate threat. This, however, requires a large amount of data and time-consuming analysis. For this reason global analyses of the status of threatened species have been carried out for few groups of organisms. Only for birds has the status of all species been assessed. An estimated 45 percent of mammal species remain to be assessed. For plants the World Conservation Union's (IUCN) *1997 IUCN Red List of Threatened Plants* provides the first-ever comprehensive listing of threatened species on a global scale, the result of more than 20 years' work by botanists from around the world. Nearly 34,000 plant species, 12.5 percent of the total, are threatened with extinction.

The table shows information on protected areas, numbers of certain species, and numbers of those species under threat. The World Conservation Monitoring Centre (WCMC) compiles these data from a variety of sources. Because of differences in definitions and reporting practices, cross-country comparability is limited. Compounding these problems, available data cover different periods.

Nationally protected areas are areas of at least 1,000 hectares that fall into one of five management categories defined by the WCMC:

- Scientific reserves and strict nature reserves with limited public access.
- National parks of national or international significance (not materially affected by human activity).
- Natural monuments and natural landscapes with unique aspects.
- Managed nature reserves and wildlife sanctuaries.
- Protected landscapes and seascapes (which may include cultural landscapes).

Designating land as a protected area does not necessarily mean that protection is in force. For small countries that may only have protected areas smaller than 1,000 hectares, this size limit in the definition will result in an underestimate of the extent and number of protected areas.

Threatened species are defined according to the IUCN's classification categories: endangered (in danger of extinction and unlikely to survive if causal factors continue operating), vulnerable (likely to move into the endangered category in the near future if causal factors continue operating), rare (not endangered or vulnerable but at risk), indeterminate (known to be endangered, vulnerable, or rare but not enough information is available to say which), out of danger (formerly included in one of the above categories but now considered relatively secure because appropriate conservation measures are in effect), and insufficiently known (suspected but not definitely known to belong to one of the above categories).

Figures on species are not necessarily comparable across countries because taxonomic concepts and coverage vary. And while the number of birds and mammals is fairly well known, it is difficult to make an accurate count of plants. Although the data in the table should be interpreted with caution, especially for numbers of threatened species (where our knowledge is very incomplete), they do identify countries that are major sources of global biodiversity and show national commitments to habitat protection.

Definitions

• **Forest area** is land under natural or planted stands of trees, whether productive or not. • **Average annual deforestation** refers to the permanent conversion of natural forest area to other uses, including shifting cultivation, permanent agriculture, ranching, settlements, and infrastructure development. Deforested areas do not include areas logged but intended for regeneration or areas degraded by fuelwood gathering, acid precipitation, or forest fires. Negative numbers indicate an increase in forest area. • **Mammals** exclude whales and porpoises. • **Birds** are listed for countries included within their breeding or wintering ranges. • **Higher plants** refer to native vascular plant species. • **Threatened species** are the number of species classified by the IUCN as endangered, vulnerable, rare, indeterminate, out of danger, or insufficiently known. • **Nationally protected areas** are totally or partially protected areas of at least 1,000 hectares that are designated as national parks, natural monuments, nature reserves or wildlife sanctuaries, protected landscapes and seascapes, or scientific reserves with limited public access. The data do not include sites protected under local or provincial law. Total land area is used to calculate the percentage of total area protected (see table 3.1).

Data sources

The forestry data are from the FAO's *State of the World's Forests 2001*. The data on species are from the WCMC's electronic files and the IUCN's *2002 IUCN Red List of Threatened Animals* and *1997 IUCN Red List of Threatened Plants*. The data on protected areas are from the WCMC's Protected Areas Data Unit.

3.5 Freshwater

	Freshwater resources			Annual freshwater withdrawals					Access to improved water source			
	Internal flows billion cu. m 2000	Flows from other countries billion cu. m 2000	Total renewable resources per capita cu. m[a] 2000	billion cu. m[b]	% of total renewable resources[b]	% for agriculture[b]	% for industry[b]	% for domestic[b]	Urban % of population 1990	Urban % of population 2000	Rural % of population 1990	Rural % of population 2000
Afghanistan	55	10.0	2,448	26.1	40.2	99	0	1	..	19	..	11
Albania	27	15.7	13,593	1.4	3.3	71	0	29	..	99	..	95
Algeria	14	0.4	471	5.0	35.0	52	14	34	..	94	..	82
Angola	184	..	14,009	0.5	0.3	76	10	14	..	34	..	40
Argentina	276	623.0	24,276	28.6	3.2	75	9	16	..	97	..	73
Armenia	9	1.5	2,787	2.9	27.4	66	4	30	..	..	..	..
Australia	492	0.0	25,649	14.6	3.0	33	2	65	100	100	100	100
Austria	55	29.0	10,357	2.4	2.9	9	58	33	100	100	100	100
Azerbaijan	8	21.0	3,615	16.5	56.7	70	25	5	..	93	..	58
Bangladesh	105	1,105.6	9,238	14.6	1.2	86	2	12	99	99	93	97
Belarus	37	20.8	5,797	2.7	4.7	35	43	22	..	100	..	100
Belgium	12	4.0	1,561	..	..	..	..	..	..	..	..	..
Benin	10	15.5	4,114	0.1	0.4	67	10	23	..	74	..	55
Bolivia	304	7.2	37,305	1.2	0.4	87	3	10	91	95	47	64
Bosnia and Herzegovina	36	2.0	9,429	1.0	2.7	60	10	30	..	..	..	..
Botswana	3	11.8	8,776	0.1	0.7	48	20	32	100	100	88	90
Brazil	5,418	1,900.0	43,022	54.9	0.8	61	18	21	93	95	54	53
Bulgaria	21	0.2	2,595	13.9	65.6	22	75	3	..	100	..	100
Burkina Faso	13	2.0	1,286	0.4	2.8	81	0	19	..	66	..	37
Burundi	4	..	529	0.1	2.8	64	0	36	96	91	67	77
Cambodia	121	355.6	39,613	0.5	0.1	94	1	5	..	54	..	26
Cameroon	273	0.0	18,352	0.4	0.1	35	19	46	78	78	32	39
Canada	2,850	52.0	94,314	45.1	1.6	12	70	18	100	100	99	99
Central African Republic	141	..	37,934	0.1	0.1	74	5	21	71	89	35	57
Chad	15	28.0	5,589	0.2	0.5	82	2	16	..	31	..	26
Chile	884	0.0	58,115	20.3	2.3	84	11	5	98	99	49	58
China	2,812	17.2	2,241	525.5	18.6	78	18	5	99	94	60	66
Hong Kong, China	..	..	..	..	..	..	..	..	..	..	..	..
Colombia	2,112	0.0	49,930	8.9	0.4	37	4	59	98	99	84	70
Congo, Dem. Rep.	900	313.0	23,809	0.4	0.0	23	16	61	..	89	..	26
Congo, Rep.	222	610.0	275,679	0.0	0.0	11	27	62	..	71	..	17
Costa Rica	112	..	29,501	5.8	5.2	80	7	13	..	99	..	92
Côte d'Ivoire	77	..	4,790	0.7	0.9	67	11	22	97	92	69	72
Croatia	38	33.7	16,301	0.8	1.1	0	50	50	..	..	..	..
Cuba	38	0.0	3,405	5.2	13.6	51	0	49	..	95	..	77
Czech Republic	13	1.0	1,382	2.7	19.0	2	57	41	..	..	..	..
Denmark	6	..	1,124	1.2	20.0	43	27	30	..	100	..	100
Dominican Republic	21	..	2,508	8.3	39.5	89	0	11	92	90	71	78
Ecuador	432	0.0	34,161	17.0	3.9	82	6	12	82	90	58	75
Egypt, Arab Rep.	2	66.7	1,071	66.0	96.4	82	11	7	97	99	92	96
El Salvador	18	..	2,836	0.7	3.9	46	20	34	88	91	48	64
Eritrea	3	6.0	2,148	..	..	..	..	..	..	63	..	42
Estonia	13	0.1	9,346	0.2	1.6	5	39	56	..	..	..	..
Ethiopia	110	0.0	1,711	2.2	2.0	86	3	11	80	81	17	12
Finland	107	3.0	21,268	2.2	2.0	3	85	12	100	100	100	100
France	179	11.0	3,218	32.3	17.0	10	72	18	..	..	..	..
Gabon	164	0.0	133,333	0.1	0.1	6	22	72	..	95	..	47
Gambia, The	3	5.0	6,140	0.0	0.0	91	2	7	..	80	..	53
Georgia	58	8.4	12,395	3.5	5.3	59	20	21	..	90	..	61
Germany	107	71.0	2,165	46.3	26.0	20	69	11	..	..	..	..
Ghana	30	22.9	2,756	0.3	0.6	52	13	35	85	91	36	62
Greece	58	15.0	6,913	8.7	11.9	87	3	10	..	..	..	..
Guatemala	109	0.0	9,591	1.2	1.1	74	17	9	88	98	69	88
Guinea	226	0.0	30,479	0.7	0.3	87	3	10	72	72	36	36
Guinea-Bissau	16	11.0	22,519	0.0	0.0	36	4	60	..	79	..	49
Haiti	13	..	1,633	1.0	7.7	94	1	5	59	49	50	45

Freshwater 3.5

	Freshwater resources			Annual freshwater withdrawals					Access to improved water source			
	Internal flows billion cu. m 2000	Flows from other countries billion cu. m 2000	Total renewable resources per capita cu. m [a] 2000	billion cu. m [b]	% of total renewable resources [b]	% for agriculture [b]	% for industry [b]	% for domestic [b]	Urban % of population 1990	Urban % of population 2000	Rural % of population 1990	Rural % of population 2000
Honduras	96	0.0	14,945	1.5	1.6	91	5	4	89	95	78	81
Hungary	6	114.0	11,855	6.8	5.7	36	55	9	100	100	98	98
India	1,261	647.2	1,878	500.0	26.2	92	3	5	88	95	61	79
Indonesia	2,838	..	13,759	74.3	2.6	93	1	6	92	90	62	69
Iran, Islamic Rep.	129	..	2,018	70.0	54.5	92	2	6	..	98	..	83
Iraq	35	75.9	4,776	42.8	38.5	92	5	3	..	96	..	48
Ireland	49	3.0	13,706	0.8	1.5	10	74	16	..	..	..	..
Israel	1	0.9	273	1.6	94.1	54	7	39	..	..	..	..
Italy	183	6.8	3,281	42.0	22.2	48	34	19	..	..	..	..
Jamaica	9	..	3,653	0.9	9.6	77	7	15	98	98	87	85
Japan	430	0.0	3,389	91.4	21.3	64	17	19	..	..	..	..
Jordan	1	..	143	1.0	..	75	3	22	99	100	92	84
Kazakhstan	75	34.2	7,278	33.7	30.7	81	17	2	..	98	..	82
Kenya	20	10.0	1,004	2.0	6.6	76	4	20	91	88	31	42
Korea, Dem. Rep.	67	10.1	3,462	14.2	18.4	73	16	11	..	100	..	100
Korea, Rep.	65	4.9	1,485	23.7	34.0	63	11	26	..	97	..	71
Kuwait	0	0.0	0	0.5	..	60	2	37	..	..	..	..
Kyrgyz Republic	47	0.0	9,461	10.1	21.7	94	3	3	..	98	..	66
Lao PDR	190	143.1	63,175	1.0	0.3	82	10	8	..	61	..	29
Latvia	17	18.7	14,924	0.3	0.8	13	32	55	..	..	..	..
Lebanon	5	0.0	1,109	1.3	27.1	68	6	27	..	100	..	100
Lesotho	5	0.0	2,555	0.1	1.9	56	22	22	..	88	..	74
Liberia	200	32.0	74,121	0.1	0.0	60	13	27	..	..	..	..
Libya	1	0.0	113	4.5	..	84	3	13	72	72	68	68
Lithuania	16	9.3	7,102	0.3	1.2	3	16	81	..	..	..	..
Macedonia, FYR	5	1.0	3,151	1.9	29.7	74	15	12	..	..	..	..
Madagascar	337	0.0	21,710	16.3	4.8	99	..	1	85	85	31	31
Malawi	16	1.1	1,668	0.9	5.2	86	3	10	90	95	43	44
Malaysia	580	..	24,925	12.7	2.2	77	13	11	..	..	..	94
Mali	60	40.0	9,225	1.4	1.4	97	1	2	65	74	52	61
Mauritania	0	11.0	4,278	1.6	14.0	92	2	6	34	34	40	40
Mauritius	2	0.0	1,853	..	..	77	7	16	100	100	100	100
Mexico	409	49.0	4,675	77.8	17.0	78	5	17	90	95	52	69
Moldova	1	10.7	2,735	3.0	25.6	26	65	9	..	97	..	88
Mongolia	35	..	14,512	0.4	1.1	53	27	20	..	77	..	30
Morocco	29	0.0	1,010	11.5	39.7	89	2	10	94	98	58	56
Mozambique	99	111.0	11,870	0.6	0.3	89	2	9	..	81	..	41
Myanmar	881	165.0	21,898	4.0	0.4	90	3	7	..	89	..	66
Namibia	6	39.3	25,896	0.2	0.4	68	3	29	98	100	63	67
Nepal	198	12.0	9,122	29.0	13.8	99	0	1	93	94	64	87
Netherlands	11	80.0	5,716	7.8	8.6	34	61	5	100	100	100	100
New Zealand	327	0.0	85,361	2.0	0.6	44	10	46	100	100	..	..
Nicaragua	190	0.0	37,409	1.3	0.7	84	2	14	93	91	44	59
Niger	4	29.0	3,000	0.5	1.5	82	2	16	65	70	51	56
Nigeria	221	59.0	2,206	3.6	1.3	54	15	31	83	78	37	49
Norway	382	11.0	87,508	2.0	0.5	8	72	20	100	100	100	100
Oman	1	..	415	1.2	..	94	2	5	41	41	30	30
Pakistan	52	170.3	1,610	155.6	70.0	97	2	2	96	95	77	87
Panama	147	..	51,647	1.6	1.1	70	2	28	..	99	..	79
Papua New Guinea	801	..	156,140	0.1	0.0	49	22	29	88	88	32	32
Paraguay	94	..	17,103	0.4	0.4	78	7	15	80	93	46	59
Peru	1,616	144.0	67,852	19.0	1.1	86	7	7	88	87	42	62
Philippines	479	0.0	6,251	55.4	11.6	88	4	8	93	91	82	79
Poland	54	8.0	1,594	12.3	20.0	11	76	13	..	..	..	..
Portugal	38	35.0	7,294	7.3	10.0	48	37	15	..	..	..	..
Puerto Rico	..	..	..	..	..	..	..	..	..	..	..	..

3.5 Freshwater

	Freshwater resources			Annual freshwater withdrawals					Access to improved water source			
	Internal flows billion cu. m 2000	Flows from other countries billion cu. m 2000	Total renewable resources per capita cu. m[a] 2000	billion cu. m[b]	% of total renewable resources[b]	% for agriculture[b]	% for industry[b]	% for domestic[b]	Urban % of population 1990	Urban % of population 2000	Rural % of population 1990	Rural % of population 2000
Romania	42	170.0	9,463	26.0	12.2	59	33	8	..	91	..	16
Russian Federation	4,313	185.5	30,904	77.1	1.7	20	62	19	..	100	..	96
Rwanda	5	..	611	0.8	15.4	94	2	5	..	60	..	40
Saudi Arabia	2	..	116	17.0	..	90	1	9	..	100	..	64
Senegal	26	13.0	4,134	1.4	3.6	92	3	5	90	92	60	65
Sierra Leone	160	0.0	31,803	0.4	0.3	89	4	7	..	75	..	46
Singapore	..	..	..	..	..	4	51	45	100	100	100	..
Slovak Republic	13	70.0	15,293	1.8	2.2	..	..	..	..	100	..	100
Slovenia	19	0.0	9,402	1.3	7.0	1	80	20	100	100	100	100
Somalia	6	9.7	1,789	0.8	5.1	97	0	3	..	..	..	..
South Africa	45	5.2	1,168	13.3	26.6	72	11	17	99	99	73	73
Spain	111	0.3	2,753	35.2	31.6	68	19	13	..	..	..	..
Sri Lanka	50	0.0	2,708	9.8	19.6	96	2	2	91	98	62	70
Sudan	30	119.0	4,792	17.8	11.9	94	1	4	86	86	60	69
Swaziland	3	1.9	4,306	..	..	96	2	2	..	..	..	..
Sweden	171	12.2	20,656	2.9	1.6	9	55	36	100	100	100	100
Switzerland	40	13.0	7,437	1.2	2.2	4	73	23	100	100	100	100
Syrian Arab Republic	7	37.7	2,761	12.0	26.8	90	2	8	..	94	..	64
Tajikistan	66	13.3	12,853	11.9	14.9	92	4	3	..	93	..	47
Tanzania	82	9.0	2,701	1.2	1.3	89	2	9	76	90	28	57
Thailand	210	199.9	6,750	33.1	8.1	91	4	5	87	95	78	81
Togo	12	0.5	2,651	0.1	0.8	25	13	62	82	85	38	38
Trinidad and Tobago	4	..	2,921	0.3	7.9	6	26	68	..	..	..	..
Tunisia	4	0.4	481	2.8	60.9	86	1	13	91	92	54	58
Turkey	227	7.6	3,593	35.5	15.1	73	12	16	83	81	72	86
Turkmenistan	1	59.5	11,523	23.8	39.1	98	1	1	..	..	..	..
Uganda	39	27.0	2,972	0.2	0.3	60	8	32	81	80	40	47
Ukraine	53	86.5	2,820	26.0	18.6	30	52	18	..	100	..	94
United Arab Emirates	0	0.0	69	2.1	..	67	9	24	..	..	..	..
United Kingdom	145	2.0	2,503	11.8	8.0	3	77	20	100	100	100	100
United States	2,800	18.0	9,985	467.3	16.6	42	45	13	100	100	100	100
Uruguay	59	74.0	39,856	0.7	0.5	91	3	6	..	98	..	93
Uzbekistan	16	98.1	4,623	58.1	50.8	94	2	4	..	94	..	79
Venezuela, RB	723	..	29,892	4.1	0.6	46	10	44	..	85	..	70
Vietnam	367	524.7	11,350	54.3	6.1	87	10	4	86	95	48	72
West Bank and Gaza	..	..	..	..	..	..	..	..	..	..	..	..
Yemen, Rep.	4	..	234	2.9	70.7	92	1	7	..	74	..	68
Yugoslavia, Fed. Rep.	44	144.0	17,674	13.0	6.9	8	86	6	..	99	..	97
Zambia	80	35.8	11,498	1.7	1.5	77	7	16	88	88	28	48
Zimbabwe	14	..	1,117	1.2	8.5	79	7	14	99	100	69	73
World	**42,900 w**	**9,468.8 s**	**8,649 w**			**71 w**	**20 w**	**10 w**	**94 w**	**94 w**	**62 w**	**71 w**
Low income	11,247	4,903.6	6,559			90	5	5	88	90	59	70
Middle income	22,836	4,187.4	10,230			74	17	9	95	95	63	70
Lower middle income	13,877	1,274.8	7,066			75	18	8	96	95	63	70
Upper middle income	8,958	2,912.6	23,872			69	14	16	93	94	57	69
Low & middle income	34,082	9,091.0	8,460			81	12	7	93	93	61	70
East Asia & Pacific	9,454	1,415.6	6,020			81	14	5	97	93	61	67
Europe & Central Asia	5,255	1,134.8	13,465			57	33	10	..	96	..	83
Latin America & Carib.	13,429	2,833.8	31,530			74	9	18	92	94	58	65
Middle East & N. Africa	234	183.1	1,413			88	5	7	..	96	..	78
South Asia	1,816	1,945.1	2,777			94	3	4	90	94	66	80
Sub-Saharan Africa	3,895	1,578.7	8,306			85	6	10	86	83	40	46
High income	8,818	372.8	9,672			42	42	16	..	..	..	..
Europe EMU	910	258.8	3,832			38	47	15	..	..	..	..

a. River flows from other countries are included when available, but river outflows are not because of data unreliability. b. Most data are for years between 1980 and 2000. For specific year, please refer to the *Primary data documentation*.

About the data

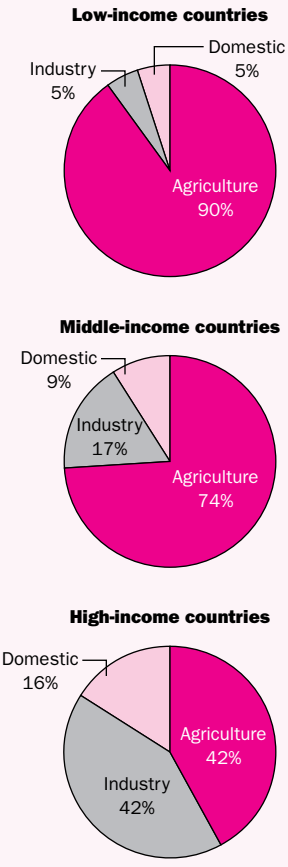
The data on freshwater resources are based on estimates of runoff into rivers and recharge of groundwater. These estimates are based on different sources and refer to different years, so cross-country comparisons should be made with caution. Because the data are collected intermittently, they may hide significant variations in total renewable water resources from one year to the next. The data also fail to distinguish between seasonal and geographic variations in water availability within countries. Data for small countries and countries in arid and semiarid zones are less reliable than those for larger countries and countries with greater rainfall. Finally, caution is also needed in comparing data on annual freshwater withdrawals, which are subject to variations in collection and estimation methods.

The table shows both internal freshwater resources and river flows arising outside countries. However, river outflows are not shown because they are of different vintage and are deemed unreliable. Because the data on total freshwater resources include river flows entering a country without river flows out of the country being deducted, they overestimate the availability of water from international river ways. This can be important in water-short countries, notably in the Middle East.

The data on access to an improved water source measure the share of the population with reasonable and ready access to an adequate amount of safe water for domestic purposes. An improved source can be any form of collection or piping used to make water regularly available. While information on access to an improved water source is widely used, it is extremely subjective, and such terms as *safe*, *improved*, *adequate*, and *reasonable* may have very different meanings in different countries despite official World Health Organization definitions (see *Definitions*). Even in high-income countries treated water may not always be safe to drink. While access to an improved water source is equated with connection to a public supply system, this does not take into account variations in the quality and cost (broadly defined) of the service once connected. Thus cross-country comparisons must be made cautiously. Changes over time within countries may result from changes in definitions or measurements.

3.5a

Agriculture accounts for most freshwater withdrawals in developing countries



Note: Data are for the most recent year available (see table 3.5).
Source: Table 3.5.

Definitions

• **Freshwater resources** refer to total renewable resources, broken down between internal flows (internal river flows and groundwater from rainfall) in the country and river flows from other countries. Freshwater resources per capita are calculated using the World Bank's population estimates (see table 2.1). • **Annual freshwater withdrawals** refer to total water withdrawals, not counting evaporation losses from storage basins. Withdrawals also include water from desalination plants in countries where they are a significant source. Data on total withdrawals are for single years between 1980 and 2000 unless otherwise indicated. Withdrawals can exceed 100 percent of total renewable resources where extraction from nonrenewable aquifers or desalination plants is considerable or where there is significant water reuse. Withdrawals for agriculture and industry are total withdrawals for irrigation and livestock production and for direct industrial use (including withdrawals for cooling thermoelectric plants). Withdrawals for domestic uses include drinking water, municipal use or supply, and use for public services, commercial establishments, and homes. For most countries sectoral withdrawal data are estimated for 1987. • **Access to an improved water source** refers to the percentage of the population with reasonable access to an adequate amount of water from an improved source, such as a household connection, public standpipe, borehole, protected well or spring, or rainwater collection. Unimproved sources include vendors, tanker trucks, and unprotected wells and springs. Reasonable access is defined as the availability of at least 20 liters a person a day from a source within one kilometer of the dwelling.

Data sources

The data on freshwater resources and withdrawals are compiled by the World Resources Institute from various sources and published in *World Resources 2000–01* and *World Resources 2002–03* (produced in collaboration with the United Nations Environment Programme, United Nations Development Programme, and World Bank). These are supplemented by the Food and Agriculture Organization's AQUASTAT data. The data on access to an improved water source come from the World Health Organization.

3.6 Water pollution

	Emissions of organic water pollutants				Industry shares of emissions of organic water pollutants							
	kilograms per day		kilograms per day per worker		Primary metals %	Paper and pulp %	Chemicals %	Food and beverages %	Stone, ceramics, and glass %	Textiles %	Wood %	Other %
	1980	2000 [a]	1980	2000 [a]	2000 [a]	2000 [a]	2000 [a]	2000 [a]	2000 [a]	2000 [a]	2000 [a]	2000 [a]
Afghanistan	6,680	..	0.17	..	..	..	..	..	0.2	..	..	..
Albania	..	*6,512*	..	*0.29*	*14.3*	*0.9*	*6.0*	*73.5*	*0.3*	*4.6*	*0.7*	*1.5*
Algeria	60,290	*45,645*	0.19	*0.24*	*19.3*	*9.0*	*6.0*	*48.4*	*0.3*	*13.9*	*1.7*	*4.0*
Angola	..	*1,472*	..	*0.20*	*7.6*	*3.0*	*9.0*	*65.9*	*0.3*	*5.5*	*4.4*	*4.1*
Argentina	244,711	*177,882*	0.18	*0.21*	7.1	11.6	*8.0*	59.0	0.2	8.4	1.8	3.9
Armenia	..	*10,014*	..	*0.25*	..	..	..	..	..	..	..	..
Australia	204,333	95,369	0.18	0.21	..	..	..	..	..	..	..	..
Austria	108,416	80,789	0.16	0.13	14.9	18.2	11.0	32.8	0.4	5.1	5.3	12.1
Azerbaijan	..	*45,025*	..	*0.17*	*11.6*	*2.5*	*12.0*	*49.0*	*0.2*	*18.1*	*1.0*	*5.6*
Bangladesh	66,713	*273,082*	0.16	*0.14*	4.5	8.2	*3.0*	30.3	0.1	48.6	0.3	1.5
Belarus	..	..	..	..	..	..	..	..	..	..	..	..
Belgium	136,452	*113,460*	0.16	*0.16*	16.2	16.9	*12.0*	34.5	0.2	9.9	1.9	9.9
Benin	1,646	..	0.28	..	..	2.9	..	*82.6*	0.2	*12.2*	0.5	..
Bolivia	9,343	12,759	0.22	0.25	0.9	20.5	7.0	61.4	0.3	7.1	2.4	0.9
Bosnia and Herzegovina	..	*8,903*	..	*0.18*	*20.5*	*13.1*	*7.0*	*33.3*	*0.2*	*17.6*	*5.8*	*2.8*
Botswana	1,307	*4,635*	0.24	*0.20*	*1.7*	5.2	*5.0*	80.1	*0.2*	10.7	1.8	*1.8*
Brazil	866,790	*629,406*	0.16	*0.20*	10.5	14.1	*9.0*	42.7	0.3	14.5	3.5	6.9
Bulgaria	152,125	*107,945*	0.13	*0.17*	10.6	6.9	*7.0*	46.7	0.4	15.7	2.3	9.3
Burkina Faso	2,385	*2,598*	0.29	*0.22*	1.6	2.8	*5.0*	81.5	0.0	6.5	0.6	1.3
Burundi	769	*1,644*	0.22	*0.24*	*0.0*	*7.9*	*5.0*	*72.1*	*0.2*	*9.5*	*1.7*	*0.8*
Cambodia	..	*12,078*	..	*0.16*	*0.0*	*3.4*	*3.0*	*59.2*	*0.6*	*24.7*	*5.8*	*3.1*
Cameroon	14,569	*10,714*	0.29	*0.20*	*3.1*	4.7	*28.0*	78.9	0.1	4.5	2.9	*0.4*
Canada	330,241	307,325	0.18	0.15	10.8	23.9	10.0	34.8	0.1	5.4	5.1	10.0
Central African Republic	861	*670*	0.26	*0.17*	*0.0*	..	*4.0*	*62.0*	*0.0*	*13.8*	*19.6*	..
Chad	..	..	..	..	..	..	..	..	..	..	..	..
Chile	44,371	72,850	0.21	0.24	6.9	11.3	9.0	62.7	0.1	5.0	2.6	2.5
China	3,377,105	*6,519,911*	0.14	*0.14*	*20.5*	*10.9*	*15.0*	*28.7*	*0.5*	*14.7*	*0.8*	*8.7*
Hong Kong, China	102,002	31,725	0.11	0.17	1.6	42.5	4.0	21.9	0.1	22.9	0.2	6.7
Colombia	96,055	100,752	0.19	0.21	3.9	16.2	10.0	51.1	0.2	14.8	0.7	2.7
Congo, Dem. Rep.	..	..	..	..	..	..	..	..	..	..	..	..
Congo, Rep.	*1,039*	..	*0.21*	..	..	..	..	..	..	..	..	..
Costa Rica	..	*35,164*	..	*0.22*	*1.4*	*9.5*	*7.0*	*64.3*	*0.1*	*13.4*	*1.6*	*2.6*
Côte d'Ivoire	15,414	*12,401*	0.23	*0.24*	0.5	3.9	*7.0*	73.5	0.1	10.3	5.2	1.6
Croatia	..	*48,447*	..	*0.17*	*7.2*	*14.4*	*9.0*	*45.2*	*0.2*	*14.6*	*3.8*	*6.0*
Cuba	120,703	..	0.24	..	..	..	..	..	..	..	..	..
Czech Republic	..	*158,462*	..	*0.14*	*15.6*	*7.0*	*8.0*	*43.6*	*0.3*	*10.4*	*3.9*	*11.4*
Denmark	65,465	*83,591*	0.17	*0.17*	3.6	20.1	*8.0*	53.4	0.2	5.0	2.2	8.5
Dominican Republic	54,935	..	0.38	..	0.6	2.8	..	92.1	0.1	1.9	0.2	0.3
Ecuador	25,297	*32,266*	0.23	*0.27*	2.0	10.8	*6.0*	65.5	0.2	9.6	2.2	2.5
Egypt, Arab Rep.	169,146	*210,242*	0.19	*0.19*	13.5	7.8	*10.0*	43.9	0.2	22.1	0.4	3.8
El Salvador	9,390	*22,760*	0.24	*0.18*	3.5	13.2	*8.0*	57.9	0.1	16.4	0.5	1.2
Eritrea	16,754	..	..	..	..	..	..	..	..	..	..	..
Estonia	..	..	..	..	..	..	..	..	..	..	..	..
Ethiopia	16,754	..	0.22	..	..	8.8	..	58.5	..	24.9	2.1	..
Finland	92,275	62,610	0.17	0.19	9.8	43.3	2.0	30.2	0.2	2.8	4.4	7.0
France	729,776	*278,878*	0.14	*0.10*	15.7	18.0	*23.0*	31.7	0.2	10.4	2.1	11.6
Gabon	2,661	*1,886*	0.15	*0.26*	5.1	5.8	*5.0*	54.5	0.2	3.4	22.3	3.7
Gambia, The	549	*832*	0.30	*0.34*	*0.0*	2.3	*2.0*	89.3	0.0	2.1	3.9	*0.4*
Georgia	..	..	..	..	..	..	..	..	..	..	..	..
Germany	..	*792,194*	..	*0.13*	*11.2*	*22.3*	*10.0*	*34.4*	*0.2*	*3.2*	*2.3*	*16.5*
Ghana	15,868	*14,449*	0.20	*0.17*	*9.8*	*16.9*	*10.0*	*39.5*	*0.2*	*9.1*	*12.4*	*1.7*
Greece	65,304	57,178	0.17	0.20	6.3	11.8	9.0	54.0	0.2	13.2	1.5	3.8
Guatemala	20,856	*19,253*	0.25	*0.28*	2.3	10.1	*6.0*	*72.8*	0.2	9.8	1.3	*1.0*
Guinea	..	..	..	..	..	..	..	..	..	..	..	..
Guinea-Bissau	..	..	..	..	..	..	..	..	..	..	..	..
Haiti	4,734	..	0.19	..	..	..	..	71.5	..	18.4	0.8	..

Water pollution 3.6

	Emissions of organic water pollutants				Industry shares of emissions of organic water pollutants							
	kilograms per day		kilograms per day per worker		Primary metals %	Paper and pulp %	Chemicals %	Food and beverages %	Stone, ceramics, and glass %	Textiles %	Wood %	Other %
	1980	2000 [a]	1980	2000 [a]	2000 [a]	2000 [a]	2000 [a]	2000 [a]	2000 [a]	2000 [a]	2000 [a]	2000 [a]
Honduras	13,067	*34,036*	0.23	*0.20*	*1.1*	*7.8*	*4.0*	*55.5*	*0.1*	*26.8*	*4.0*	*0.8*
Hungary	201,888	152,531	0.15	0.17	8.0	12.1	8.0	48.0	0.2	14.1	2.4	7.3
India	1,422,564	1,651,250	0.21	0.19	13.5	6.8	10.0	51.0	0.2	13.3	0.3	5.3
Indonesia	214,010	783,207	0.22	0.18	2.7	5.9	9.0	52.8	*0.1*	21.8	5.6	*4.5*
Iran, Islamic Rep.	72,334	*101,900*	0.15	*0.17*	*20.6*	*8.0*	*8.0*	*39.7*	*0.5*	*17.3*	*0.7*	*5.4*
Iraq	32,986	*19,617*	0.19	*0.16*	*8.8*	*14.1*	*15.0*	*39.4*	*0.7*	*16.7*	*0.3*	*4.8*
Ireland	43,544	49,144	0.19	0.15	1.3	14.2	11.0	56.4	0.2	3.1	1.6	11.8
Israel	39,113	*54,149*	0.15	*0.16*	*3.7*	*19.7*	*9.0*	*43.9*	*0.2*	*12.1*	*1.8*	*9.3*
Italy	442,712	495,411	0.13	0.13	9.5	16.9	11.0	30.3	0.3	16.0	3.7	12.5
Jamaica	11,123	*17,507*	0.25	*0.29*	*6.9*	*7.2*	*4.0*	*70.8*	*0.1*	*9.8*	*1.3*	*0.0*
Japan	1,456,016	1,369,931	0.14	0.15	7.9	21.8	9.0	41.0	0.2	5.6	1.7	12.9
Jordan	4,146	*16,142*	0.17	*0.18*	*3.9*	*16.2*	*15.0*	*51.4*	*0.5*	*7.2*	*3.3*	*3.0*
Kazakhstan	..	..	..	..	..	..	..	..	..	..	..	..
Kenya	26,834	*52,945*	0.19	*0.25*	*4.1*	*11.8*	*6.0*	*69.9*	*0.1*	*8.5*	*1.8*	*2.7*
Korea, Dem. Rep.	..	..	..	..	..	..	..	..	..	..	..	..
Korea, Rep.	281,900	303,091	0.14	0.12	12.2	17.0	12.0	26.0	0.2	15.7	1.3	15.3
Kuwait	6,921	*11,050*	0.16	*0.17*	*2.6*	*16.6*	*11.0*	*47.7*	*0.4*	*13.7*	*2.8*	*5.4*
Kyrgyz Republic	..	*20,700*	..	*0.16*	*13.7*	*0.2*	*1.0*	*54.8*	*0.4*	*21.0*	*1.0*	*8.0*
Lao PDR	..	..	..	..	..	..	..	..	..	..	..	..
Latvia	..	*22,491*	..	*0.21*	*2.8*	*7.5*	*1.0*	*69.0*	*0.1*	*11.0*	*9.6*	*5.7*
Lebanon	14,586	*14,899*	0.20	*0.19*	3.1	17.8	*4.0*	57.6	0.5	11.8	3.7	2.2
Lesotho	*993*	*3,123*	*0.24*	*0.16*	*1.2*	*4.0*	*1.0*	*39.7*	*0.1*	*51.3*	*0.6*	*2.3*
Liberia	..	..	..	..	..	..	..	..	..	..	..	..
Libya	3,532	..	0.21	..	..	*1.4*	..	*77.0*	*0.7*	*9.6*	..	..
Lithuania	..	*37,125*	..	*0.18*	*1.4*	*12.5*	*5.0*	*54.6*	*0.2*	*17.8*	*4.1*	*4.4*
Macedonia, FYR	..	*23,490*	..	*0.18*	*11.7*	*9.6*	*6.0*	*45.0*	*0.1*	*20.9*	*1.7*	*4.9*
Madagascar	9,131	..	0.23	..	..	7.1	..	73.4	..	15.4	0.6	..
Malawi	12,224	*11,805*	0.32	*0.29*	*0.0*	*16.0*	*4.0*	*70.0*	*0.0*	*7.8*	*1.7*	*0.7*
Malaysia	77,215	180,641	0.15	0.11	7.5	13.3	17.0	30.2	0.3	8.3	6.6	17.4
Mali	..	..	..	..	..	..	..	..	..	..	..	..
Mauritania	..	..	..	..	..	..	..	..	..	..	..	..
Mauritius	9,224	*17,700*	0.21	*0.15*	*0.9*	*6.6*	*3.0*	*32.8*	*0.1*	*55.4*	*0.6*	*1.1*
Mexico	130,993	296,093	0.22	0.20	7.8	12.5	10.0	55.6	0.2	7.5	0.9	5.1
Moldova	..	*34,234*	..	*0.29*	*0.2*	*4.0*	*1.0*	*81.7*	*0.2*	*10.8*	*1.3*	*0.6*
Mongolia	9,254	*7,939*	0.19	*0.18*	*1.8*	8.5	*1.0*	54.5	0.0	25.3	6.7	*0.8*
Morocco	26,598	*89,200*	0.15	*0.17*	2.0	12.1	*7.0*	39.3	0.4	30.1	1.9	4.5
Mozambique	..	*495*	..	*0.16*	*3.1*	*41.4*	*4.0*	*10.9*	*0.1*	*30.3*	*17.4*	*1.1*
Myanmar	..	*3,356*	..	*0.13*	*14.0*	*9.0*	*40.0*	*27.0*	*0.5*	*4.9*	*2.9*	*1.2*
Namibia	..	*7,350*	..	*0.35*	*0.0*	*5.0*	*2.0*	*90.4*	*0.1*	*1.2*	*0.9*	*0.8*
Nepal	*18,692*	*26,550*	*0.25*	*0.14*	*1.5*	*8.1*	*4.0*	*43.3*	*1.2*	*39.3*	*1.7*	*1.0*
Netherlands	165,416	124,182	0.18	0.18	7.3	26.7	11.0	43.0	0.2	2.3	1.2	8.2
New Zealand	59,012	*50,706*	0.21	*0.22*	4.0	19.1	*5.0*	*58.6*	0.1	*4.9*	*3.1*	*4.2*
Nicaragua	9,647	..	0.28	..	0.2	5.4	..	79.7	0.1	7.6	1.0	0.9
Niger	372	..	0.19	..	..	..	..	50.3	..	..	..	..
Nigeria	72,082	*82,477*	0.17	*0.17*	*1.4*	*15.4*	*11.0*	*40.2*	*0.1*	*23.5*	*4.7*	*3.5*
Norway	67,897	55,439	0.19	0.20	8.7	31.7	5.0	42.9	0.1	1.4	3.0	7.2
Oman	..	*5,560*	..	*0.17*	*6.0*	*14.0*	*7.0*	*52.2*	*0.8*	*12.7*	*3.9*	*3.5*
Pakistan	75,125	*100,821*	0.17	*0.18*	8.2	5.9	*8.0*	39.2	0.2	35.0	0.2	3.2
Panama	8,121	*11,461*	0.26	*0.31*	2.2	14.1	*5.0*	68.0	0.2	9.0	1.8	0.9
Papua New Guinea	4,365	..	0.22	..	2.7	9.5	..	73.3	0.1	0.7	8.7	4.0
Paraguay	..	*3,250*	..	*0.28*	*2.3*	*9.9*	*6.0*	*73.6*	*0.3*	*6.7*	*0.3*	*0.9*
Peru	50,367	*52,644*	0.18	*0.21*	7.9	14.0	*9.0*	47.2	0.2	14.1	2.2	3.8
Philippines	182,052	*201,952*	0.19	*0.18*	*5.2*	*9.8*	*7.0*	58.2	*0.2*	15.9	3.4	*4.6*
Poland	580,869	388,153	0.14	0.16	13.8	6.2	7.0	48.8	0.4	13.6	2.6	7.9
Portugal	105,441	121,013	0.15	0.14	4.0	17.4	5.0	33.6	0.4	27.4	5.4	7.1
Puerto Rico	24,034	*16,207*	0.16	*0.14*	*1.0*	*13.5*	*19.0*	*37.6*	*0.2*	*17.3*	*1.6*	*9.4*

3.6 Water pollution

	Emissions of organic water pollutants				Industry shares of emissions of organic water pollutants							
	kilograms per day		kilograms per day per worker		Primary metals %	Paper and pulp %	Chemicals %	Food and beverages %	Stone, ceramics, and glass %	Textiles %	Wood %	Other %
	1980	2000 [a]	1980	2000 [a]	2000 [a]	2000 [a]	2000 [a]	2000 [a]	2000 [a]	2000 [a]	2000 [a]	2000 [a]
Romania	343,145	*333,168*	0.12	*0.14*	23.9	5.5	*9.0*	25.5	0.3	20.2	5.4	10.9
Russian Federation	..	*1,485,833*	..	*0.16*	*17.7*	*7.4*	*9.0*	*46.8*	*0.3*	*6.9*	*2.1*	*9.5*
Rwanda	..	..	..	..	..	..	..	..	..	..	..	..
Saudi Arabia	*18,181*	*24,436*	*0.12*	*0.14*	*4.7*	*17.2*	*21.0*	*41.3*	*1.4*	*14.4*	*4.3*	*10.8*
Senegal	9,865	*10,488*	0.31	*0.30*	*0.0*	2.7	*9.0*	87.1	0.0	4.8	0.2	*1.3*
Sierra Leone	*1,612*	*4,170*	*0.24*	*0.32*	..	7.8	*3.0*	72.1	*0.1*	7.1	6.4	..
Singapore	28,558	33,331	0.10	0.09	1.3	26.8	16.0	20.9	0.1	4.0	1.3	29.5
Slovak Republic	..	*57,970*	..	*0.15*	*17.2*	*12.7*	*8.0*	*37.5*	*0.3*	*11.9*	*2.7*	*9.9*
Slovenia	..	*38,213*	..	*0.17*	*30.1*	*15.8*	*8.0*	*25.6*	*0.2*	*11.9*	*2.0*	*5.8*
Somalia	..	..	..	..	..	..	..	..	..	..	..	..
South Africa	237,599	234,012	0.17	0.17	13.7	16.3	9.0	40.3	0.2	10.2	3.4	6.8
Spain	376,253	374,589	0.16	0.15	6.7	19.8	9.0	42.5	0.3	9.3	4.0	8.6
Sri Lanka	30,086	*83,885*	0.18	*0.18*	3.5	13.9	*7.0*	*50.1*	0.5	*33.2*	1.6	*1.2*
Sudan	..	..	..	..	..	..	..	..	..	..	..	..
Swaziland	2,826	*2,009*	0.26	*0.23*	..	*79.8*	*0.0*	..	*0.2*	*16.5*	*2.0*	..
Sweden	130,439	103,913	0.15	0.14	11.3	35.0	8.0	26.6	0.1	1.3	3.0	14.9
Switzerland	..	*123,752*	..	*0.17*	*24.9*	*23.6*	*10.0*	*25.0*	*0.2*	*3.2*	*4.2*	*8.7*
Syrian Arab Republic	36,262	*15,115*	0.19	*0.20*	1.4	4.4	*4.0*	*69.8*	0.4	20.3	3.5	*0.2*
Tajikistan	..	..	..	..	..	..	..	..	..	..	..	..
Tanzania	21,084	*35,155*	0.21	*0.25*	2.1	8.1	*3.0*	58.6	0.1	22.7	1.7	1.8
Thailand	*213,271*	*355,819*	*0.22*	*0.16*	*4.8*	*5.3*	*5.0*	*42.2*	*0.2*	*35.4*	*1.5*	*3.9*
Togo	963	..	0.27	..	*4.4*	*22.1*	..	*45.0*	*0.1*	*24.1*	*1.9*	*0.0*
Trinidad and Tobago	7,835	*11,787*	0.18	*0.28*	*4.4*	14.6	*7.0*	51.6	0.3	8.8	2.2	*1.2*
Tunisia	20,294	*46,025*	0.16	*0.16*	*5.9*	*8.0*	*6.0*	45.8	*0.4*	22.7	1.9	*3.4*
Turkey	160,173	170,685	0.20	0.17	11.0	7.1	8.0	44.5	0.3	23.6	1.1	5.0
Turkmenistan	..	..	..	..	..	..	..	..	..	..	..	..
Uganda	..	..	..	..	..	..	..	..	..	..	..	..
Ukraine	..	*499,886*	..	*0.18*	*22.8*	*3.4*	*7.0*	*51.6*	*0.3*	*5.8*	*1.6*	*7.9*
United Arab Emirates	*4,524*	..	*0.15*	..	..	..	..	..	..	..	..	..
United Kingdom	964,510	569,736	0.15	0.15	7.2	30.4	10.0	32.1	0.2	5.6	2.5	12.0
United States	2,742,993	1,968,196	0.14	0.12	10.5	11.0	14.0	38.4	0.2	7.1	4.1	14.9
Uruguay	34,270	*23,109*	0.21	*0.27*	3.4	*11.2*	*6.0*	*72.3*	0.2	*6.6*	*0.7*	*1.8*
Uzbekistan	..	..	..	..	..	..	..	..	..	..	..	..
Venezuela, RB	84,797	*94,175*	0.20	*0.21*	13.7	13.9	*10.0*	46.9	0.2	9.9	1.7	3.9
Vietnam	..	..	..	..	..	..	..	..	..	..	..	..
West Bank and Gaza	..	..	..	..	..	..	..	..	..	..	..	..
Yemen, Rep.	..	*7,823*	..	*0.25*	*5.4*	*9.1*	*13.0*	*71.1*	*0.3*	*4.9*	*1.0*	*0.0*
Yugoslavia, Fed. Rep.	..	*106,409*	..	*0.16*	*9.3*	*12.3*	*8.0*	*45.9*	*0.3*	*14.1*	*2.1*	*8.1*
Zambia	13,605	*11,433*	0.23	*0.22*	3.1	7.8	*7.0*	68.0	0.2	9.8	1.7	2.5
Zimbabwe	32,681	*29,617*	0.20	*0.20*	15.9	9.2	*6.0*	50.5	0.2	13.3	2.9	3.5

Note: Industry shares may not sum to 100 percent because data may be for different years.
a. Data are for any year from 1993 to 2000.

Water pollution 3.6

About the data

Emissions of organic pollutants from industrial activities are a major cause of degradation of water quality. Water quality and pollution levels are generally measured in terms of concentration or load—the rate of occurrence of a substance in an aqueous solution. Polluting substances include organic matter, metals, minerals, sediment, bacteria, and toxic chemicals. This table focuses on organic water pollution resulting from industrial activities. Because water pollution tends to be sensitive to local conditions, the national-level data in the table may not reflect the quality of water in specific locations.

The data in the table come from an international study of industrial emissions that may be the first to include data from developing countries (Hettige, Mani, and Wheeler 1998). These data were updated through 2000 by the World Bank's Development Research Group. Unlike estimates from earlier studies based on engineering or economic models, these estimates are based on actual measurements of plant-level water pollution. The focus is on organic water pollution, measured in terms of biochemical oxygen demand (BOD), because the data for this indicator are the most plentiful and the most reliable for cross-country comparisons of emissions. BOD measures the strength of an organic waste in terms of the amount of oxygen consumed in breaking it down. A sewage overload in natural waters exhausts the water's dissolved oxygen content. Wastewater treatment, by contrast, reduces BOD.

Data on water pollution are more readily available than other emissions data because most industrial pollution control programs start by regulating emissions of organic water pollutants. Such data are fairly reliable because sampling techniques for measuring water pollution are more widely understood and much less expensive than those for air pollution.

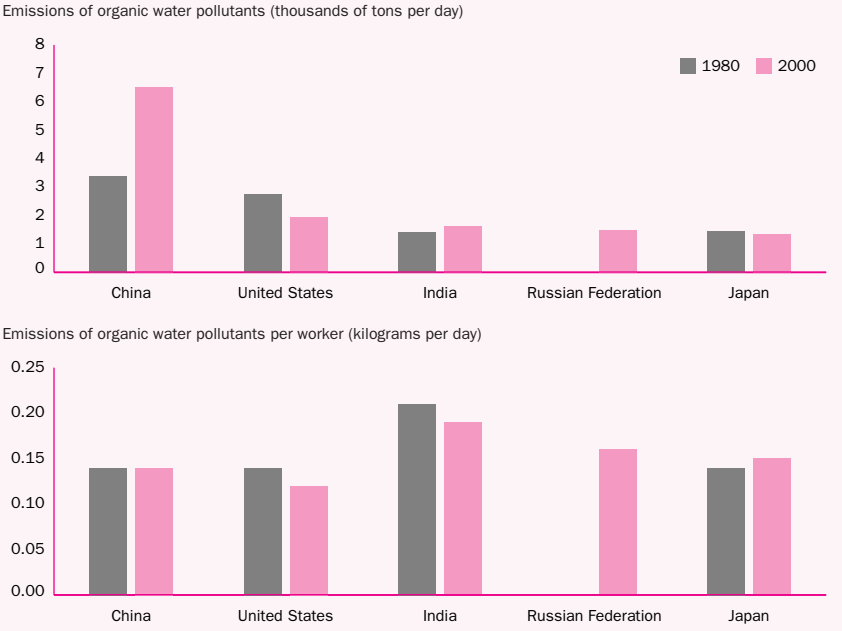
Hettige, Mani, and Wheeler (1998) used plant- and sector-level information on emissions and employment from 13 national environmental protection agencies and sector-level information on output and employment from the United Nations Industrial Development Organization (UNIDO). Their econometric analysis found that the ratio of BOD to employment in each industrial sector is about the same across countries. This finding allowed the authors to estimate BOD loads across countries and over time. The estimated BOD intensities per unit of employment were multiplied by sectoral employment numbers from UNIDO's industry database for 1980–98. The estimates of sectoral emissions were then totaled to get daily emissions of organic water pollutants in kilograms per day for each country and year. The data in the table were derived by updating these estimates through 2000.

Definitions

• **Emissions of organic water pollutants** are measured in terms of biochemical oxygen demand, which refers to the amount of oxygen that bacteria in water will consume in breaking down waste. This is a standard water treatment test for the presence of organic pollutants. Emissions per worker are total emissions divided by the number of industrial workers. • **Industry shares of emissions of organic water pollutants** refer to emissions from manufacturing activities as defined by two-digit divisions of the International Standard Industrial Classification (ISIC) revision 2: primary metals (ISIC division 37), paper and pulp (34), chemicals (35), food and beverages (31), stone, ceramics, and glass (36), textiles (32), wood (33), and other (38 and 39).

3.6a

Top five emitters of organic water pollutants



Total emissions of organic water pollutants have increased in most developing countries while they have fallen in several high-income countries. Relative to the number of industrial workers, emissions have generally declined.

Note: No data are available for the Russian Federation for 1980.
Source: Table 3.6.

Data sources

The data come from a 1998 study by Hemamala Hettige, Muthukumara Mani, and David Wheeler, "Industrial Pollution in Economic Development: Kuznets Revisited" (available on the Web at http://www.worldbank.org/nipr). These data were updated through 2000 by the World Bank's Development Research Group using the same methodology as the initial study. Sectoral employment numbers are from UNIDO's industry database.

3.7 Energy production and use

	Commercial energy production		Commercial energy use			Commercial energy use per capita			Net energy imports [a]	
	thousand metric tons of oil equivalent		thousand metric tons of oil equivalent		average annual % growth	kg of oil equivalent		average annual % growth	% of commercial energy use	
	1980	2000	1980	2000	1980–2000	1980	2000	1980–2000	1980	2000
Afghanistan	..	..	..	..	..	..	..	..	..	..
Albania	3,428	814	3,049	1,634	–5.6	1,142	521	–6.3	–12	50
Algeria	67,103	149,629	12,185	29,060	3.5	653	956	1.0	–451	–415
Angola	11,301	43,669	4,437	7,667	2.8	628	584	–0.3	–155	–470
Argentina	38,813	81,221	41,868	61,469	2.2	1,490	1,660	0.8	7	–32
Armenia	1,263	632	1,070	2,061	..	346	542	..	–18	69
Australia	86,096	232,552	70,372	110,174	2.4	4,790	5,744	1.0	–22	–111
Austria	7,561	9,686	22,823	28,582	1.6	3,022	3,524	1.1	67	66
Azerbaijan	14,821	18,951	15,001	11,703	..	2,433	1,454	..	1	–62
Bangladesh	6,745	15,053	8,441	18,666	4.1	99	142	1.9	20	19
Belarus	2,566	3,466	2,385	24,330	..	247	2,432	..	–8	86
Belgium	7,445	13,233	46,100	59,217	1.8	4,682	5,776	1.6	84	78
Benin	1,212	1,821	1,363	2,362	2.3	394	377	–0.8	11	23
Bolivia	4,372	5,901	2,436	4,929	3.8	455	592	1.5	–79	–20
Bosnia and Herzegovina	..	3,277	..	4,359	..	..	1,096	..	..	25
Botswana	..	..	..	..	..	..	..	..	..	..
Brazil	62,372	142,078	111,471	183,165	2.7	917	1,077	1.0	44	22
Bulgaria	7,737	10,005	28,673	18,784	–2.6	3,235	2,299	–2.2	73	47
Burkina Faso	..	..	..	..	..	..	..	..	..	..
Burundi	..	..	..	..	..	..	..	..	..	..
Cambodia	..	..	..	..	..	..	..	..	..	..
Cameroon	6,707	12,729	3,676	6,355	2.5	421	427	–0.2	–82	–100
Canada	207,417	374,864	193,000	250,967	1.6	7,848	8,156	0.4	–7	–49
Central African Republic	..	..	..	..	..	..	..	..	..	..
Chad	..	..	..	..	..	..	..	..	..	..
Chile	5,801	8,299	9,662	24,403	5.7	867	1,604	4.0	40	66
China	615,475	1,107,636	598,498	1,142,439	3.7	610	905	2.4	–3	3
Hong Kong, China	39	48	5,439	15,453	5.6	1,079	2,319	4.2	99	100
Colombia	18,040	74,584	19,348	28,786	2.5	680	681	0.5	7	–159
Congo, Dem. Rep.	8,697	15,446	8,706	14,888	2.7	324	292	–0.6	0	–4
Congo, Rep.	4,024	14,656	862	895	–1.1	516	296	–4.0	–367	–1,538
Costa Rica	767	1,591	1,527	3,281	4.2	669	861	1.5	50	52
Côte d'Ivoire	2,419	6,097	3,662	6,928	3.3	447	433	–0.1	34	12
Croatia	..	3,582	..	7,775	..	..	1,775	..	..	54
Cuba	4,227	6,051	14,910	13,203	–1.6	1,536	1,180	–2.4	72	54
Czech Republic	41,185	29,869	47,254	40,383	–1.2	4,618	3,931	–1.2	13	26
Denmark	952	27,831	19,783	19,456	0.6	3,862	3,643	0.4	95	–43
Dominican Republic	1,327	1,421	3,491	7,804	4.0	613	932	2.1	62	82
Ecuador	11,744	22,520	5,180	8,187	2.1	651	647	–0.3	–127	–175
Egypt, Arab Rep.	34,168	57,599	15,970	46,423	4.6	391	726	2.3	–114	–24
El Salvador	1,913	2,157	2,537	4,083	2.2	553	651	0.6	25	47
Eritrea	..	..	..	..	..	..	..	..	..	..
Estonia	6,951	2,917	6,275	4,523	..	4,248	3,303	..	–11	36
Ethiopia	10,575	17,583	11,145	18,732	2.6	295	291	–0.1	5	6
Finland	6,912	15,134	25,413	33,147	1.7	5,316	6,409	1.3	73	54
France	45,544	130,730	187,737	257,128	1.9	3,484	4,366	1.5	76	49
Gabon	9,441	16,800	1,493	1,563	–0.2	2,157	1,271	–3.1	–532	–975
Gambia, The	..	..	..	..	..	..	..	..	..	..
Georgia	1,504	737	4,474	2,860	..	882	533	..	66	74
Germany	185,628	134,317	360,385	339,640	–0.2	4,602	4,131	–0.5	48	60
Ghana	3,305	5,883	4,063	7,720	3.6	378	400	0.5	19	24
Greece	3,696	9,987	15,695	27,822	3.0	1,628	2,635	2.5	76	64
Guatemala	2,583	5,241	3,847	7,146	3.5	564	628	0.9	33	27
Guinea	..	..	..	..	..	..	..	..	..	..
Guinea-Bissau	..	..	..	..	..	..	..	..	..	..
Haiti	1,877	1,542	2,099	2,039	0.4	392	256	–1.6	11	24

Energy production and use 3.7

	Commercial energy production		Commercial energy use			Commercial energy use per capita			Net energy imports [a]	
	thousand metric tons of oil equivalent		thousand metric tons of oil equivalent		average annual % growth	kg of oil equivalent		average annual % growth	% of commercial energy use	
	1980	2000	1980	2000	1980–2000	1980	2000	1980–2000	1980	2000
Honduras	1,315	1,522	1,892	3,012	2.8	530	469	–0.2	31	49
Hungary	14,935	11,090	28,940	24,783	–1.0	2,703	2,448	–0.7	48	55
India	221,322	421,565	241,016	501,894	3.8	351	494	1.8	8	16
Indonesia	128,996	229,478	59,933	145,575	4.8	404	706	3.1	–115	–58
Iran, Islamic Rep.	81,142	242,146	38,987	112,725	5.6	997	1,771	3.1	–108	–115
Iraq	136,643	134,089	12,030	27,678	4.3	925	1,190	1.3	–1,036	–384
Ireland	1,894	2,197	8,485	14,623	2.7	2,495	3,854	2.3	78	85
Israel	153	654	8,563	20,200	5.2	2,208	3,241	2.6	98	97
Italy	19,644	26,858	138,629	171,567	1.3	2,456	2,974	1.2	86	84
Jamaica	224	486	2,378	3,920	3.5	1,115	1,524	2.6	91	88
Japan	43,204	105,505	346,538	524,715	2.6	2,967	4,136	2.2	88	80
Jordan	1	286	1,714	5,185	4.9	786	1,061	0.5	100	94
Kazakhstan	76,799	78,102	76,799	39,063	..	5,163	2,594	..	0	–100
Kenya	7,891	12,260	9,791	15,482	2.2	589	515	–0.7	19	21
Korea, Dem. Rep.	29,669	42,576	32,631	46,112	1.9	1,898	2,071	0.5	9	8
Korea, Rep.	9,272	33,615	41,372	193,626	9.1	1,085	4,119	8.0	78	83
Kuwait	91,636	111,469	12,249	20,894	1.0	8,908	10,529	0.2	–648	–434
Kyrgyz Republic	2,190	1,443	1,717	2,445	..	473	497	..	–28	41
Lao PDR	..	..	..	..	..	..	..	..	..	..
Latvia	261	1,250	566	3,655	..	222	1,541	..	54	66
Lebanon	178	171	2,524	5,058	4.8	841	1,169	2.8	93	97
Lesotho	..	..	..	..	..	..	..	..	..	..
Liberia	..	..	..	..	..	..	..	..	..	..
Libya	96,550	73,904	7,193	16,438	3.6	2,364	3,107	1.0	–1,242	–350
Lithuania	..	3,212	..	7,124	..	..	2,032	..	..	55
Macedonia, FYR	..	..	..	..	..	..	..	..	..	..
Madagascar	..	..	..	..	..	..	..	..	..	..
Malawi	..	..	..	..	..	..	..	..	..	..
Malaysia	18,202	76,759	12,162	49,472	7.7	884	2,126	4.9	–50	–55
Mali	..	..	..	..	..	..	..	..	..	..
Mauritania	..	..	..	..	..	..	..	..	..	..
Mauritius	..	..	..	..	..	..	..	..	..	..
Mexico	149,359	229,653	98,898	153,513	2.1	1,464	1,567	0.2	–51	–50
Moldova	35	60	..	2,871	..	..	671	..	..	98
Mongolia	..	..	..	..	..	..	..	..	..	..
Morocco	877	572	4,778	10,293	4.3	247	359	2.2	82	94
Mozambique	7,413	7,219	8,074	7,126	–0.8	668	403	–2.6	8	–1
Myanmar	9,513	15,144	9,430	12,522	1.3	280	262	–0.4	–1	–21
Namibia	..	292	..	1,031	..	..	587	..	..	72
Nepal	4,403	6,872	4,576	7,900	2.7	314	343	0.4	4	13
Netherlands	71,821	57,239	64,984	75,799	1.4	4,593	4,762	0.8	–11	24
New Zealand	5,488	15,379	9,213	18,633	3.8	2,959	4,864	2.7	40	17
Nicaragua	907	1,553	1,553	2,746	2.7	531	542	0.0	42	43
Niger	..	..	..	..	..	..	..	..	..	..
Nigeria	148,479	197,726	52,846	90,169	2.6	743	710	–0.4	–181	–119
Norway	55,675	224,993	18,768	25,617	1.8	4,588	5,704	1.3	–197	–778
Oman	15,090	60,084	996	9,750	11.0	905	4,046	6.6	–1,415	–516
Pakistan	20,997	47,124	25,472	63,951	4.8	308	463	2.2	18	26
Panama	526	732	1,399	2,546	2.7	717	892	0.7	62	71
Papua New Guinea	..	..	..	..	..	..	..	..	..	..
Paraguay	1,605	6,886	2,089	3,930	4.2	671	715	1.2	23	–75
Peru	14,656	9,477	11,752	12,695	0.2	678	489	–1.8	–25	25
Philippines	10,670	20,922	21,212	42,424	3.9	442	554	1.5	50	51
Poland	122,222	78,960	123,031	89,975	–1.4	3,458	2,328	–1.8	1	12
Portugal	1,481	3,129	10,291	24,613	4.7	1,054	2,459	4.7	86	87
Puerto Rico	..	..	..	..	..	..	..	..	..	..

3.7 Energy production and use

	Commercial energy production		Commercial energy use			Commercial energy use per capita			Net energy imports [a]	
	thousand metric tons of oil equivalent		thousand metric tons of oil equivalent		average annual % growth	kg of oil equivalent		average annual % growth	% of commercial energy use	
	1980	2000	1980	2000	1980–2000	1980	2000	1980–2000	1980	2000
Romania	52,587	28,290	65,123	36,330	–3.1	2,933	1,619	–3.2	19	22
Russian Federation	748,647	966,512	763,707	613,969	..	5,494	4,218	..	2	–57
Rwanda	..	..	..	..	..	..	..	..	..	..
Saudi Arabia	533,071	487,889	31,108	105,303	5.0	3,319	5,081	1.0	–1,614	–363
Senegal	1,046	1,723	1,919	3,086	2.4	346	324	–0.3	45	44
Sierra Leone	..	..	..	..	..	..	..	..	..	..
Singapore	..	64	6,062	24,591	8.7	2,511	6,120	6.0	..	100
Slovak Republic	3,418	5,994	21,056	17,466	–1.4	4,224	3,234	–1.7	84	66
Slovenia	..	3,098	..	6,540	..	..	3,288	..	..	53
Somalia	..	..	..	..	..	..	..	..	..	..
South Africa	73,169	144,469	65,417	107,595	2.1	2,372	2,514	–0.2	–12	–34
Spain	15,636	31,865	68,576	124,881	3.2	1,834	3,084	2.9	77	74
Sri Lanka	3,209	4,530	4,536	8,063	2.5	311	437	1.4	29	44
Sudan	7,089	23,664	8,406	16,216	3.1	435	521	0.7	16	–46
Swaziland	..	..	..	..	..	..	..	..	..	..
Sweden	16,132	30,681	39,911	47,481	1.0	4,803	5,354	0.6	60	35
Switzerland	7,030	11,792	20,861	26,597	1.4	3,301	3,704	0.7	66	56
Syrian Arab Republic	9,502	32,890	5,348	18,407	5.4	614	1,137	2.2	–78	–79
Tajikistan	1,986	1,250	1,650	2,911	..	416	470	..	–20	57
Tanzania	9,502	14,601	10,280	15,386	2.0	553	457	–1.0	8	5
Thailand	11,182	41,118	22,808	73,618	7.4	488	1,212	6.0	51	44
Togo	562	1,036	715	1,530	3.8	284	338	0.8	21	32
Trinidad and Tobago	13,141	17,884	3,873	8,665	3.3	3,580	6,660	2.4	–239	–106
Tunisia	6,966	7,003	3,907	7,888	3.7	612	825	1.6	–78	11
Turkey	17,077	26,186	31,452	77,104	4.6	707	1,181	2.7	46	66
Turkmenistan	8,034	45,968	7,948	13,885	..	2,778	2,627	..	–1	–231
Uganda	..	..	..	..	..	..	..	..	..	..
Ukraine	109,708	82,330	97,893	139,592	..	1,956	2,820	..	–12	41
United Arab Emirates	89,716	143,589	6,273	29,559	8.2	6,014	10,175	2.8	–1,330	–386
United Kingdom	196,792	272,338	201,284	232,644	1.0	3,573	3,962	0.8	2	–17
United States	1,553,263	1,675,770	1,811,650	2,299,669	1.5	7,973	8,148	0.4	14	27
Uruguay	766	1,028	2,643	3,079	1.7	907	923	1.0	71	67
Uzbekistan	4,615	55,066	4,821	50,151	..	302	2,027	..	4	–10
Venezuela, RB	140,578	225,470	36,148	59,256	2.5	2,395	2,452	0.1	–289	–280
Vietnam	18,364	46,299	19,573	36,965	3.2	364	471	1.2	6	–25
West Bank and Gaza	..	..	..	..	..	..	..	..	..	..
Yemen, Rep.	60	22,046	1,424	3,526	4.2	167	201	0.3	96	–525
Yugoslavia, Fed. Rep.	..	10,122	..	13,706	..	..	1,289	..	..	26
Zambia	4,179	5,916	4,719	6,244	1.3	822	619	–1.6	11	5
Zimbabwe	5,793	8,708	6,570	10,219	2.6	921	809	–0.3	12	15
World	**6,912,364 t**	**10,010,145 t**	**6,930,291 t**	**9,886,146 t**	**2.9 w**	**1,623 w**	**1,694 w**	**0.9 w**	**0 w**	**0 w**
Low income	819,169	1,400,460	674,008	1,287,496	4.7	452	569	2.2	–22	–9
Middle income	3,302,613	4,812,604	2,446,876	3,457,150	4.1	1,252	1,318	2.1	–35	–39
Lower middle income	2,028,987	3,252,169	1,856,387	2,573,688	5.0	1,156	1,206	2.9	–9	–26
Upper middle income	1,273,626	1,560,436	590,489	883,462	2.1	1,694	1,805	0.3	–116	–77
Low & middle income	4,121,782	6,213,064	3,120,884	4,744,646	4.3	906	971	2.0	–32	–31
East Asia & Pacific	842,071	1,579,933	776,249	1,549,127	3.9	578	871	2.4	–8	–2
Europe & Central Asia	1,241,969	1,470,085	1,332,884	1,253,443	7.6	3,348	2,653	..	7	–17
Latin America & Carib.	476,911	847,298	381,002	601,859	2.4	1,074	1,181	0.6	–25	–41
Middle East & N. Africa	981,350	1,268,307	138,565	398,549	4.9	798	1,368	2.2	–610	–219
South Asia	256,676	495,144	284,041	600,474	3.9	321	453	1.8	10	18
Sub-Saharan Africa	322,805	552,297	208,143	341,194	2.3	714	669	–0.5	–55	–62
High income	2,790,581	3,797,081	3,809,407	5,141,500	1.8	4,623	5,430	1.1	27	26
Europe EMU	367,292	434,433	952,761	1,160,702	1.2	3,337	3,824	0.9	61	63

a. A negative value indicates that a country is a net exporter.

Energy production and use 3.7

About the data

In developing countries growth in commercial energy use is closely related to growth in the modern sectors—industry, motorized transport, and urban areas—but commercial energy use also reflects climatic, geographic, and economic factors (such as the relative price of energy). Commercial energy use has been growing rapidly in low- and middle-income countries, but high-income countries still use more than five times as much on a per capita basis.

Because commercial energy is widely traded, it is necessary to distinguish between its production and its use. Net energy imports show the extent to which an economy's use exceeds its domestic production. High-income countries are net energy importers; middle-income countries have been their main suppliers.

Energy data are compiled by the International Energy Agency (IEA). IEA data for countries that are not members of the Organisation for Economic Co-operation and Development (OECD) are based on national energy data adjusted to conform to annual questionnaires completed by OECD member governments.

Commercial energy use refers to the use of domestic primary energy before transformation to other end-use fuels (such as electricity and refined petroleum products). It includes energy from combustible renewables and waste—solid biomass and animal products, gas and liquid from biomass, and industrial and municipal waste. Biomass is defined as any plant matter used directly as fuel or converted into fuel, heat, or electricity. (The data series published in *World Development Indicators 1998* and earlier editions did not include energy from combustible renewables and waste.) All forms of commercial energy—primary energy and primary electricity—are converted into oil equivalents. To convert nuclear electricity into oil equivalents, a notional thermal efficiency of 33 percent is assumed; for hydroelectric power 100 percent efficiency is assumed.

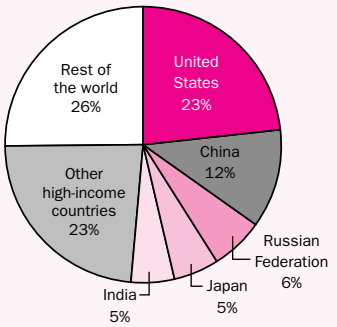
Definitions

• **Commercial energy production** refers to commercial forms of primary energy—petroleum (crude oil, natural gas liquids, and oil from nonconventional sources), natural gas, and solid fuels (coal, lignite, and other derived fuels)—and primary electricity, all converted into oil equivalents (see *About the data*). • **Commercial energy use** refers to apparent consumption, which is equal to indigenous production plus imports and stock changes, minus exports and fuels supplied to ships and aircraft engaged in international transport (see *About the data*). • **Net energy imports** are calculated as energy use less production, both measured in oil equivalents. A negative value indicates that the country is a net exporter.

3.7a

High-income countries consume a disproportionate share of the world's energy

Commercial energy use, 2000



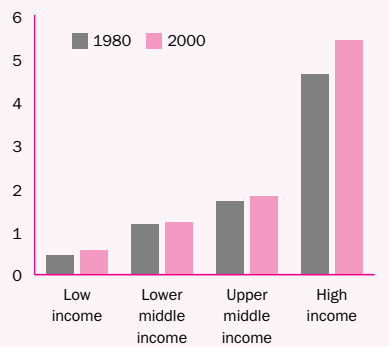
High-income countries, with 15 percent of the world's population, consume more than half its commercial energy.

Source: Table 3.7.

3.7b

People in high-income countries use almost 10 times as much commercial energy as do people in low-income countries

Energy use per capita (thousands of kg of oil equivalent)



Source: Table 3.7.

Data sources

The data on commercial energy production and use come from IEA electronic files. The IEA's data are published in its annual publications, *Energy Statistics and Balances of Non-OECD Countries*, *Energy Statistics of OECD Countries*, and *Energy Balances of OECD Countries*.

3.8 Energy efficiency and emissions

	GDP per unit of energy use		Carbon dioxide emissions					
	PPP $ per kg oil equivalent		Total million metric tons		Per capita metric tons		kg per PPP $ of GDP	
	1980	2000	1980	1999	1980	1999	1980	1999
Afghanistan	..	..	1.7	1.0	0.1	0.0	..	..
Albania	..	6.7	4.8	1.5	1.8	0.5	..	0.2
Algeria	5.5	6.4	66.1	90.8	3.5	3.0	1.0	0.5
Angola	..	3.6	5.3	10.3	0.8	0.8	..	0.4
Argentina	4.4	7.2	107.5	137.8	3.8	3.8	0.6	0.3
Armenia	..	4.5	..	3.1	..	0.8	..	0.4
Australia	2.0	4.3	202.8	344.4	13.8	18.2	1.5	0.8
Austria	3.4	7.5	52.4	61.4	6.9	7.6	0.7	0.3
Azerbaijan	..	1.9	..	33.6	..	4.2	..	1.8
Bangladesh	5.4	10.8	7.6	25.4	0.1	0.2	0.2	0.1
Belarus	..	3.0	..	57.6	..	5.7	..	0.9
Belgium	2.2	4.4	131.3	104.4	13.3	10.2	1.3	0.4
Benin	1.2	2.5	0.5	1.3	0.1	0.2	0.3	0.2
Bolivia	3.0	3.9	4.5	11.2	0.8	1.4	0.6	0.6
Bosnia and Herzegovina	..	5.2	..	4.8	..	1.2	..	0.2
Botswana	..	..	1.0	3.9	1.1	2.4	0.7	0.4
Brazil	4.2	6.7	183.4	300.7	1.5	1.8	0.4	0.3
Bulgaria	1.0	2.8	75.3	42.1	8.5	5.1	2.7	0.9
Burkina Faso	..	..	0.4	1.0	0.1	0.1	0.1	0.1
Burundi	..	..	0.1	0.2	0.0	0.0	0.1	0.1
Cambodia	..	..	0.3	0.7	0.0	0.1	..	0.0
Cameroon	2.7	3.8	3.9	4.7	0.4	0.3	0.4	0.2
Canada	1.4	3.3	420.9	438.6	17.1	14.4	1.5	0.6
Central African Republic	..	..	0.1	0.3	0.0	0.1	0.1	0.1
Chad	..	..	0.2	0.1	0.0	0.0	0.1	0.0
Chile	3.0	5.6	27.5	62.5	2.5	4.2	1.0	0.5
China	0.7	4.1	1,476.8	2,825.0	1.5	2.3	3.5	0.7
Hong Kong, China	6.2	10.9	16.3	41.2	3.2	6.2	0.5	0.3
Colombia	4.7	10.3	39.8	63.6	1.4	1.5	0.4	0.2
Congo, Dem. Rep.	3.8	2.5	3.5	2.1	0.1	0.0	0.1	0.1
Congo, Rep.	0.8	3.2	0.4	2.4	0.2	0.8	0.6	0.9
Costa Rica	6.6	11.7	2.5	6.1	1.1	1.6	0.2	0.2
Côte d'Ivoire	2.7	3.6	4.6	12.1	0.6	0.8	0.5	0.5
Croatia	..	4.9	..	20.8	..	4.8	..	0.6
Cuba	..	..	30.8	25.4	3.2	2.3	..	..
Czech Republic	..	3.6	..	108.9	..	10.6	..	0.8
Denmark	3.0	7.9	62.9	49.7	12.3	9.3	1.1	0.3
Dominican Republic	4.1	7.4	6.4	23.3	1.1	2.8	0.4	0.4
Ecuador	2.8	4.9	13.4	23.3	1.7	1.9	0.9	0.6
Egypt, Arab Rep.	3.3	4.8	45.2	123.6	1.1	2.0	0.9	0.6
El Salvador	5.0	8.1	2.1	5.8	0.5	0.9	0.2	0.2
Eritrea	..	..	..	0.6	..	0.1	..	0.1
Estonia	..	2.9	..	16.2	..	11.7	..	1.4
Ethiopia	*1.6*	2.6	1.8	5.5	0.0	0.1	*0.1*	0.1
Finland	1.7	3.8	56.9	58.4	11.9	11.3	1.3	0.5
France	2.8	5.4	482.7	359.7	9.0	6.1	0.9	0.3
Gabon	1.8	4.7	6.2	3.6	8.9	3.0	2.3	0.5
Gambia, The	..	..	0.2	0.3	0.2	0.2	0.2	0.1
Georgia	4.6	4.5	..	5.4	..	1.0	..	0.5
Germany	2.2	6.1	..	792.2	..	9.7	..	0.4
Ghana	3.1	5.5	2.4	5.6	0.2	0.3	0.2	0.1
Greece	4.7	6.3	51.7	85.9	5.4	8.2	0.7	0.5
Guatemala	4.6	7.1	4.5	9.7	0.7	0.9	0.3	0.2
Guinea	..	..	0.9	1.3	0.2	0.2	..	0.1
Guinea-Bissau	..	..	0.5	0.3	0.7	0.2	1.4	0.3
Haiti	4.7	7.5	0.8	1.4	0.1	0.2	0.1	0.1

Energy efficiency and emissions 3.8

	GDP per unit of energy use		Carbon dioxide emissions					
	PPP $ per kg oil equivalent		Total million metric tons		Per capita metric tons		kg per PPP $ of GDP	
	1980	2000	1980	1999	1980	1999	1980	1999
Honduras	3.2	6.0	2.1	5.0	0.6	0.8	0.3	0.3
Hungary	2.0	4.9	82.5	56.9	7.7	5.6	1.5	0.5
India	2.2	5.5	347.3	1,077.0	0.5	1.1	0.7	0.4
Indonesia	2.0	4.2	94.6	235.6	0.6	1.2	0.8	0.4
Iran, Islamic Rep.	2.7	3.2	116.1	301.4	3.0	4.8	1.1	0.9
Iraq	..	..	44.0	74.2	3.4	3.3	..	..
Ireland	2.3	7.9	25.2	40.4	7.4	10.8	1.3	0.4
Israel	3.7	6.5	21.1	61.1	5.4	10.0	0.7	0.5
Italy	3.9	8.2	371.9	422.7	6.6	7.3	0.7	0.3
Jamaica	1.8	2.4	8.4	10.2	4.0	4.0	2.0	1.2
Japan	3.1	6.1	920.4	1,155.2	7.9	9.1	0.8	0.4
Jordan	3.1	3.6	4.7	14.6	2.2	3.1	0.9	0.8
Kazakhstan	..	2.2	..	112.8	..	7.4	..	1.5
Kenya	1.0	1.9	6.2	8.8	0.4	0.3	0.6	0.3
Korea, Dem. Rep.	..	..	124.9	208.7	7.3	9.4	..	..
Korea, Rep.	2.3	3.6	125.1	393.5	3.3	8.4	1.3	0.6
Kuwait	1.4	1.8	24.7	48.0	18.0	24.9	1.5	1.4
Kyrgyz Republic	..	5.4	..	4.7	..	1.0	..	0.4
Lao PDR	..	..	0.2	0.4	0.1	0.1	..	0.1
Latvia	19.8	4.6	..	6.6	..	2.8	..	0.4
Lebanon	..	3.5	6.2	16.9	2.1	4.0	..	1.0
Lesotho	..	..	..	..	..	..	..	..
Liberia	..	..	2.0	0.4	1.1	0.1	..	..
Libya	..	..	26.9	42.8	8.8	8.3	..	..
Lithuania	..	3.9	..	13.2	..	3.8	..	0.5
Macedonia, FYR	..	..	..	11.4	..	5.6	..	1.0
Madagascar	..	..	1.6	1.9	0.2	0.1	0.3	0.2
Malawi	..	..	0.7	0.8	0.1	0.1	0.3	0.1
Malaysia	2.6	4.3	28.0	123.7	2.0	5.4	0.9	0.7
Mali	..	..	0.4	0.5	0.1	0.0	0.1	0.1
Mauritania	..	..	0.6	3.0	0.4	1.2	0.3	0.6
Mauritius	..	..	0.6	2.5	0.6	2.1	0.3	0.2
Mexico	2.9	5.5	252.5	378.5	3.7	3.9	0.9	0.5
Moldova	..	3.1	..	6.5	..	1.5	..	0.8
Mongolia	..	..	6.8	7.5	4.1	3.2	3.7	1.9
Morocco	6.4	9.5	15.9	35.8	0.8	1.3	0.5	0.4
Mozambique	0.7	2.5	3.2	1.3	0.3	0.1	0.6	0.1
Myanmar	..	..	4.8	9.2	0.1	0.2	..	..
Namibia	..	12.0	..	0.1	..	0.1	..	0.0
Nepal	1.5	3.7	0.5	3.3	0.0	0.1	0.1	0.1
Netherlands	2.3	5.7	153.0	134.6	10.8	8.5	1.0	0.3
New Zealand	2.7	3.7	17.6	30.8	5.6	8.1	0.7	0.5
Nicaragua	4.0	*4.6*	2.0	3.8	0.7	0.8	0.3	0.3
Niger	..	..	0.6	1.1	0.1	0.1	0.1	0.1
Nigeria	0.8	1.2	68.1	40.4	1.0	0.3	1.7	0.4
Norway	2.3	5.1	38.7	38.7	9.5	8.7	0.9	0.3
Oman	4.5	3.0	5.9	19.9	5.3	8.5	1.3	0.7
Pakistan	2.1	4.0	31.6	98.9	0.4	0.7	0.6	0.4
Panama	4.1	6.5	3.5	8.3	1.8	2.9	0.6	0.5
Papua New Guinea	..	..	1.8	2.4	0.6	0.5	0.4	0.2
Paraguay	4.8	7.2	1.5	4.5	0.5	0.8	0.1	0.2
Peru	4.4	9.5	23.6	30.4	1.4	1.2	0.5	0.3
Philippines	5.3	6.8	36.5	73.2	0.8	1.0	0.3	0.3
Poland	..	4.0	456.2	314.4	12.8	8.1	..	0.9
Portugal	5.5	7.2	27.1	60.0	2.8	6.0	0.5	0.4
Puerto Rico	..	..	14.0	10.1	4.4	2.7	0.6	0.1

3.8 Energy efficiency and emissions

	GDP per unit of energy use		Carbon dioxide emissions					
	PPP $ per kg oil equivalent		Total million metric tons		Per capita metric tons		kg per PPP $ of GDP	
	1980	2000	1980	1999	1980	1999	1980	1999
Romania	..	3.4	191.8	81.2	8.6	3.6	..	0.7
Russian Federation	..	1.6	..	1,437.3	..	9.8	..	1.6
Rwanda	..	..	0.3	0.6	0.1	0.1	0.1	0.1
Saudi Arabia	4.0	2.6	130.7	235.4	14.0	11.7	1.1	0.9
Senegal	2.2	4.5	2.8	3.7	0.5	0.4	0.7	0.3
Sierra Leone	..	..	0.6	0.5	0.2	0.1	0.3	0.3
Singapore	2.2	3.9	30.1	54.3	12.5	13.7	2.3	0.7
Slovak Republic	..	3.6	..	38.6	..	7.2	..	0.7
Slovenia	..	5.0	..	14.4	..	7.3	..	0.5
Somalia	..	..	0.6	*0.0*	0.1	*0.0*	..	..
South Africa	3.1	4.4	211.3	334.6	7.7	7.9	1.0	0.8
Spain	3.8	6.4	200.0	273.7	5.3	6.8	0.8	0.4
Sri Lanka	3.1	7.8	3.4	8.6	0.2	0.5	0.2	0.2
Sudan	1.6	3.8	3.3	2.6	0.2	0.1	0.2	0.0
Swaziland	..	..	0.5	0.4	0.8	0.4	0.4	0.1
Sweden	2.0	4.4	71.4	46.6	8.6	5.3	0.9	0.2
Switzerland	4.4	7.5	40.9	40.6	6.5	5.7	0.4	0.2
Syrian Arab Republic	2.6	2.9	19.3	53.4	2.2	3.4	1.4	1.1
Tajikistan	..	2.3	..	5.1	..	0.8	..	0.8
Tanzania	..	1.1	1.9	2.5	0.1	0.1	..	0.2
Thailand	2.9	5.1	40.0	199.7	0.9	3.3	0.6	0.6
Togo	4.9	4.9	0.6	1.3	0.2	0.3	0.2	0.2
Trinidad and Tobago	1.2	1.3	16.7	25.1	15.4	19.4	3.6	2.4
Tunisia	3.8	7.4	9.4	17.5	1.5	1.8	0.6	0.3
Turkey	3.2	5.3	76.3	198.5	1.7	3.1	0.8	0.5
Turkmenistan	..	1.4	..	32.4	..	6.4	..	2.1
Uganda	..	..	0.6	1.4	0.1	0.1	*0.1*	0.0
Ukraine	..	1.4	..	374.3	..	7.5	..	2.1
United Arab Emirates	4.9	*2.0*	36.3	88.0	34.8	31.3	1.2	*1.6*
United Kingdom	2.5	6.0	580.3	539.3	10.3	9.2	1.2	0.4
United States	1.6	4.2	4,626.8	5,495.4	20.4	19.7	1.6	0.6
Uruguay	4.8	9.4	5.8	6.5	2.0	2.0	0.5	0.2
Uzbekistan	..	1.2	..	116.6	..	4.8	..	2.2
Venezuela, RB	1.6	2.3	90.1	125.8	6.0	5.3	1.6	1.0
Vietnam	..	4.2	16.8	46.6	0.3	0.6	..	0.3
West Bank and Gaza	..	..	..	..	..	..	..	..
Yemen, Rep.	..	4.0	..	18.3	..	1.1	..	1.4
Yugoslavia, Fed. Rep.	..	..	102.0	39.5	10.4	3.7	..	..
Zambia	0.8	1.2	3.5	1.8	0.6	0.2	0.9	0.3
Zimbabwe	1.5	3.1	9.6	17.6	1.3	1.4	1.0	0.5
World	**2.1 w**	**4.5 w**	**13,852.7 t**	**22,519.8 t**	**3.4 w**	**3.8 w**	**1.1 w**	**0.5 w**
Low income	2.1	4.0	774.3	2,429.2	0.5	1.0	0.6	0.5
Middle income	2.1	4.0	4,132.9	8,484.0	2.3	3.2	1.2	0.7
Lower middle income	1.6	3.7	2,682.6	6,391.3	1.8	3.0	1.6	0.7
Upper middle income	3.4	4.9	1,450.3	2,092.7	4.3	4.3	0.7	0.5
Low & middle income	2.1	4.0	4,907.1	10,913.2	1.5	2.2	1.0	0.6
East Asia & Pacific	..	..	1,833.3	3,734.4	1.3	2.1	2.2	0.6
Europe & Central Asia	..	2.3	989.0	3,144.1	..	6.6	1.3	1.2
Latin America & Carib.	3.6	6.1	848.8	1,286.7	2.4	2.5	0.6	0.4
Middle East & N. Africa	3.6	3.8	491.7	1,048.4	3.0	3.7	1.0	0.7
South Asia	2.3	5.5	392.3	1,215.1	0.4	0.9	0.6	0.4
Sub-Saharan Africa	2.0	2.9	352.0	484.6	0.9	0.8	0.8	0.4
High income	2.2	4.9	8,945.6	11,606.6	12.0	12.3	1.2	0.5
Europe EMU	2.8	6.2	1,565.2	2,408.4	7.5	7.9	0.8	0.4

Energy efficiency and emissions 3.8

About the data

The ratio of GDP to energy use provides a measure of energy efficiency. To produce comparable and consistent estimates of real GDP across countries relative to physical inputs to GDP—that is, units of energy use—GDP is converted to international dollars using purchasing power parity (PPP) rates. Differences in this ratio over time and across countries reflect in part structural changes in the economy, changes in the energy efficiency of particular sectors, and differences in fuel mixes.

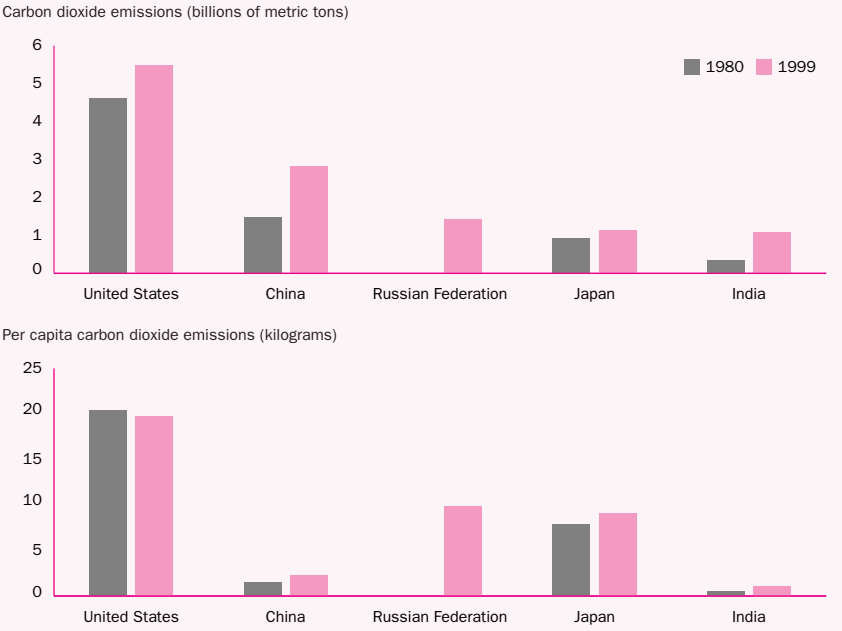
Carbon dioxide emissions, largely a by-product of energy production and use (see table 3.7), account for the largest share of greenhouse gases, which are associated with global warming. Anthropogenic carbon dioxide emissions result primarily from fossil fuel combustion and cement manufacturing. In combustion, different fossil fuels release different amounts of carbon dioxide for the same level of energy use. Burning oil releases about 50 percent more carbon dioxide than burning natural gas, and burning coal releases about twice as much. Cement manufacturing releases about half a metric ton of carbon dioxide for each metric ton of cement produced.

The Carbon Dioxide Information Analysis Center (CDIAC), sponsored by the U.S. Department of Energy, calculates annual anthropogenic emissions of carbon dioxide. These calculations are based on data on fossil fuel consumption (from the World Energy Data Set maintained by the United Nations Statistics Division) and data on world cement manufacturing (from the Cement Manufacturing Data Set maintained by the U.S. Bureau of Mines). Emissions of carbon dioxide are often calculated and reported in terms of their content of elemental carbon. For this table these values were converted to the actual mass of carbon dioxide by multiplying the carbon mass by 3.664 (the ratio of the mass of carbon to that of carbon dioxide).

Although the estimates of global carbon dioxide emissions are probably within 10 percent of actual emissions (as calculated from global average fuel chemistry and use), country estimates may have larger error bounds. Trends estimated from a consistent time series tend to be more accurate than individual values. Each year the CDIAC recalculates the entire time series from 1950 to the present, incorporating its most recent findings and the latest corrections to its database. Estimates do not include fuels supplied to ships and aircraft engaged in international transport because of the difficulty of apportioning these fuels among the countries benefiting from that transport.

3.8a

Per capita emissions of carbon dioxide vary, even among the five largest producers of emissions

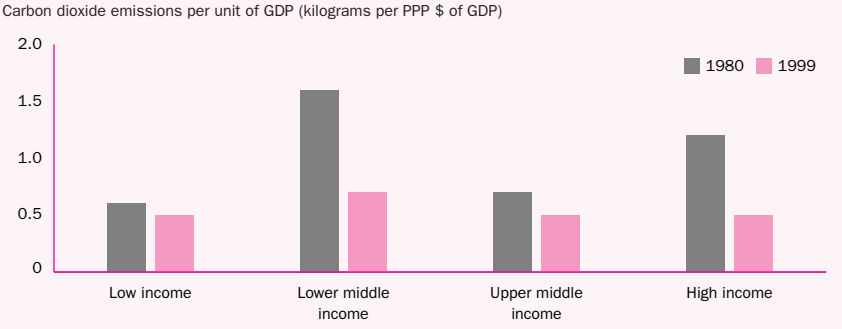


Note: No data are available for the Russian Federation for 1980.

Source: Table 3.8.

3.8b

. . . but emissions per unit of GDP have declined substantially across all income groups



Carbon dioxide emissions rise initially with income but tend to decline in some countries at higher levels of income.

Source: Table 3.8.

Definitions

• **GDP per unit of energy use** is the PPP GDP per kilogram of oil equivalent of commercial energy use. PPP GDP is gross domestic product converted to international dollars using purchasing power parity rates. An international dollar has the same purchasing power over GDP as a U.S. dollar has in the United States. • **Carbon dioxide emissions** are those stemming from the burning of fossil fuels and the manufacture of cement. They include carbon dioxide produced during consumption of solid, liquid, and gas fuels and gas flaring.

Data sources

The underlying data on commercial energy production and use are from electronic files of the International Energy Agency. The data on carbon dioxide emissions are from the Carbon Dioxide Information Analysis Center, Environmental Sciences Division, Oak Ridge National Laboratory, in the U.S. state of Tennessee.

3.9 Sources of electricity

	Electricity production		Access to electricity	Sources of electricity[a]									
	billion kwh		% of population	Hydropower %		Coal %		Oil %		Gas %		Nuclear power %	
	1980	2000	2000	1980	2000	1980	2000	1980	2000	1980	2000	1980	2000
Afghanistan	..	..	2.0	..	..	..	..	..	..	..	..	..	..
Albania	3.7	4.9	..	79.4	98.7	..	..	20.6	1.3	..	..	..	..
Algeria	7.1	25.4	98.0	3.6	0.2	..	..	12.2	3.0	84.1	96.7	..	..
Angola	0.7	1.4	12.0	88.1	63.1	..	..	11.9	36.9	..	..	..	..
Argentina	39.7	89.0	94.6	38.1	32.4	2.1	1.8	31.6	3.5	22.0	55.1	5.9	6.9
Armenia	13.0	6.0	..	12.0	21.2	..	..	54.8	..	..	45.2	33.2	33.7
Australia	95.2	208.1	..	13.6	8.1	73.3	77.2	5.4	1.3	7.3	12.6	..	..
Austria	41.6	60.3	..	69.1	69.6	7.0	11.1	14.0	3.3	9.2	13.0	..	..
Azerbaijan	15.0	18.7	..	7.3	8.2	..	..	92.7	72.6	..	19.2	..	..
Bangladesh	2.4	15.8	20.4	24.8	6.0	..	..	26.6	7.8	48.6	86.2	..	..
Belarus	34.1	26.1	..	0.1	0.1	..	..	99.9	5.9	..	94.0	..	..
Belgium	53.1	82.7	..	0.5	0.6	29.4	19.4	34.7	1.0	11.2	19.3	23.6	58.3
Benin	0.0	0.1	22.0	..	..	..	..	100.0	100.0	..	..	..	..
Bolivia	1.6	4.0	60.4	68.2	49.9	..	..	10.3	2.5	20.0	46.0	..	..
Bosnia and Herzegovina	..	10.4	..	..	48.8	..	50.7	..	0.5	..	..	..	..
Botswana	..	..	22.0	..	..	..	..	..	..	..	..	..	..
Brazil	139.4	349.2	94.9	92.5	87.3	2.4	2.9	3.8	4.8	..	0.7	..	1.7
Bulgaria	34.8	40.6	..	10.7	6.6	49.2	42.3	22.5	1.6	..	4.7	17.7	44.7
Burkina Faso	..	..	13.0	..	..	..	..	..	..	..	..	..	..
Burundi	..	..	..	..	..	..	..	..	..	..	..	..	..
Cambodia	..	..	15.8	..	..	..	..	..	..	..	..	..	..
Cameroon	1.5	3.5	20.0	93.9	98.9	..	..	6.1	1.1	..	..	..	..
Canada	373.3	605.1	..	67.3	59.2	16.0	19.5	3.7	2.5	2.5	5.5	10.2	12.0
Central African Republic	..	..	..	..	..	..	..	..	..	..	..	..	..
Chad	..	..	..	..	..	..	..	..	..	..	..	..	..
Chile	11.8	41.3	99.0	67.0	46.2	16.1	27.0	14.7	2.9	1.3	21.9	..	..
China	300.6	1,355.6	98.6	19.4	16.4	54.6	78.3	25.8	3.4	0.2	0.5	..	1.2
Hong Kong, China	12.6	31.3	..	..	..	..	60.5	100.0	0.4	..	39.1	..	..
Colombia	20.4	44.0	81.0	70.0	73.0	7.9	6.7	1.8	0.2	19.3	18.8	..	..
Congo, Dem. Rep.	4.4	5.5	6.7	95.5	99.7	..	..	4.5	0.3	..	..	..	..
Congo, Rep.	0.2	0.3	20.9	64.5	99.7	..	..	35.5	0.3	..	..	..	..
Costa Rica	2.2	6.9	95.7	95.2	82.1	..	..	4.3	0.9	..	..	..	..
Côte d'Ivoire	1.7	4.8	50.0	77.3	36.6	..	..	22.7	11.0	..	52.4	..	..
Croatia	..	10.7	..	..	55.1	..	14.5	..	15.8	..	14.7	..	..
Cuba	9.9	15.0	97.0	1.0	0.6	..	..	89.7	94.0	..	0.3	..	..
Czech Republic	52.7	72.9	..	4.6	2.4	84.8	73.1	9.6	0.5	1.1	4.3	..	18.6
Denmark	26.8	36.2	..	0.1	0.1	81.8	46.0	18.0	12.2	..	24.3	..	..
Dominican Republic	3.3	9.5	66.8	17.1	8.0	..	2.6	80.5	89.0	..	..	..	..
Ecuador	3.4	10.6	80.0	25.9	71.7	..	..	74.1	28.3	..	..	..	..
Egypt, Arab Rep.	18.9	75.7	93.8	51.8	18.7	..	..	27.7	16.1	20.5	65.2	..	..
El Salvador	1.5	3.9	70.8	63.7	30.5	..	..	2.7	48.5	..	..	..	..
Eritrea	..	..	17.0	..	..	..	..	..	..	..	..	..	..
Estonia	18.9	8.5	..	..	0.1	..	90.2	100.0	0.7	..	8.9	..	..
Ethiopia	0.7	1.7	4.7	70.2	97.5	..	..	29.8	1.4	..	..	..	..
Finland	40.7	70.0	..	25.1	20.9	42.6	18.9	10.8	0.9	4.2	14.4	17.2	32.1
France	257.3	535.8	..	27.0	12.5	27.2	5.8	18.8	1.4	2.7	2.1	23.8	77.5
Gabon	0.5	1.0	31.0	49.1	71.3	..	..	50.9	18.1	..	10.7	..	..
Gambia, The	..	..	..	..	..	..	..	..	..	..	..	..	..
Georgia	14.7	7.4	..	43.8	79.2	..	0.4	56.2	3.4	..	17.0	..	..
Germany	466.3	567.1	..	4.1	3.8	62.9	52.7	5.7	0.8	14.2	9.3	11.9	29.9
Ghana	5.3	7.2	45.0	99.2	91.7	..	..	0.8	8.3	..	..	..	..
Greece	22.7	53.4	..	15.0	6.9	44.8	64.2	40.1	16.6	..	11.1	..	..
Guatemala	1.8	6.0	66.7	12.9	37.8	..	8.3	83.0	39.9	..	..	..	..
Guinea	..	..	..	..	..	..	..	..	..	..	..	..	..
Guinea-Bissau	..	..	..	..	..	..	..	..	..	..	..	..	..
Haiti	0.3	0.5	34.0	70.1	51.7	..	..	26.1	48.3	..	..	..	..

Sources of electricity 3.9

	Electricity production		Access to electricity	Sources of electricity [a]									
	billion kwh		% of population	Hydropower %		Coal %		Oil %		Gas %		Nuclear power %	
	1980	2000	2000	1980	2000	1980	2000	1980	2000	1980	2000	1980	2000
Honduras	0.9	3.7	54.5	86.3	61.9	..	..	13.7	38.1	..	..	..	..
Hungary	23.9	35.0	..	0.5	0.5	50.4	27.7	13.9	12.6	35.2	18.9	..	40.0
India	119.3	542.3	43.0	39.0	13.7	49.1	77.4	8.2	1.0	1.1	4.5	2.5	3.1
Indonesia	8.4	92.6	53.4	16.0	9.8	..	31.1	84.0	21.9	..	34.3	..	..
Iran, Islamic Rep.	22.4	121.4	97.9	25.1	3.0	..	..	50.1	20.4	24.8	76.6	..	..
Iraq	11.4	33.7	95.0	6.1	1.8	..	..	93.9	98.2	..	..	..	..
Ireland	10.6	23.7	..	7.9	3.6	16.4	36.3	60.4	19.6	15.2	39.1	..	..
Israel	12.4	43.0	100.0	0.0	0.1	..	69.0	100.0	30.9	..	0.0	..	..
Italy	183.5	269.9	..	24.7	16.4	9.9	11.3	57.0	31.8	5.0	37.5	1.2	..
Jamaica	1.7	6.6	90.0	7.2	1.7	..	..	76.0	96.7	..	..	..	..
Japan	572.5	1,081.9	..	15.4	8.1	9.6	23.5	46.2	14.7	14.2	22.1	14.4	29.8
Jordan	1.1	7.4	95.0	..	0.5	..	..	100.0	89.4	..	10.1	..	..
Kazakhstan	61.5	51.6	..	9.3	14.6	..	69.9	90.7	4.9	..	10.6	..	..
Kenya	1.5	3.9	7.9	71.1	34.1	..	..	28.9	54.8	..	..	..	..
Korea, Dem. Rep.	35.0	31.6	20.0	67.1	67.4	31.6	32.2	1.2	0.4	..	..	..	..
Korea, Rep.	37.2	292.5	..	5.3	1.4	6.7	43.2	78.7	8.4	..	9.6	9.3	37.3
Kuwait	9.0	32.5	100.0	..	..	..	..	20.1	75.6	79.9	24.4	..	..
Kyrgyz Republic	9.2	14.9	..	53.1	91.7	..	4.1	46.9	..	..	4.1	..	..
Lao PDR	..	..	..	..	..	..	..	..	..	..	..	..	..
Latvia	4.7	4.1	..	64.9	68.2	..	1.9	35.1	2.6	..	27.3	..	..
Lebanon	2.8	7.8	95.0	30.9	5.7	..	..	69.1	94.3	..	..	..	..
Lesotho	..	..	5.0	..	..	..	..	..	..	..	..	..	..
Liberia	..	..	..	..	..	..	..	..	..	..	..	..	..
Libya	4.8	20.7	99.8	..	..	..	..	100.0	100.0	..	..	..	..
Lithuania	11.7	11.1	..	4.0	3.0	..	..	96.0	5.9	..	15.3	..	75.7
Macedonia, FYR	..	..	..	..	..	..	..	..	..	..	..	..	..
Madagascar	..	..	8.0	..	..	..	..	..	..	..	..	..	..
Malawi	..	..	5.0	..	..	..	..	..	..	..	..	..	..
Malaysia	10.0	69.2	96.9	13.9	10.1	..	2.6	84.9	8.8	1.2	78.5	..	..
Mali	..	..	..	..	..	..	..	..	..	..	..	..	..
Mauritania	..	..	..	..	..	..	..	..	..	..	..	..	..
Mauritius	..	..	100.0	..	..	..	..	..	..	..	..	..	..
Mexico	67.0	204.4	..	25.2	16.2	0.0	9.3	57.9	47.5	15.5	19.8	..	4.0
Moldova	15.4	3.3	..	2.6	1.8	..	5.0	97.4	1.0	..	92.3	..	..
Mongolia	..	..	90.0	..	..	..	..	..	..	..	..	..	..
Morocco	5.2	14.1	71.1	28.9	5.1	19.5	58.1	51.6	36.4	..	..	..	..
Mozambique	0.5	7.0	7.2	65.2	99.6	17.5	..	17.3	0.4	..	0.0	..	..
Myanmar	1.5	5.1	5.0	53.5	36.9	2.0	..	31.3	6.1	13.2	57.0	..	..
Namibia	..	1.4	34.0	..	97.6	..	0.4	..	2.1	..	..	..	..
Nepal	0.2	1.7	15.4	93.5	98.4	..	..	6.5	1.6	..	..	..	..
Netherlands	64.8	89.6	..	..	0.2	13.7	28.4	38.4	3.5	39.8	57.7	6.5	4.4
New Zealand	22.6	39.0	..	83.6	63.1	1.9	2.6	0.2	..	7.5	23.8	..	..
Nicaragua	1.1	2.3	48.0	48.1	9.2	..	..	46.4	81.6	..	..	..	..
Niger	..	..	..	..	..	..	..	..	..	..	..	..	..
Nigeria	7.1	15.8	40.0	39.0	36.8	0.4	..	45.1	6.3	15.5	56.9	..	..
Norway	83.8	142.4	..	99.8	99.5	0.0	0.1	0.1	0.0	..	0.1	..	..
Oman	0.8	9.1	94.0	..	..	..	..	21.5	19.1	78.5	80.9	..	..
Pakistan	15.0	68.1	52.9	58.2	25.2	0.2	0.4	1.1	39.5	40.5	32.0	0.0	2.9
Panama	2.0	4.7	76.1	48.2	67.2	..	..	50.2	31.3	..	..	..	..
Papua New Guinea	..	..	..	..	..	..	..	..	..	..	..	..	..
Paraguay	0.8	53.5	74.7	80.0	99.9	..	..	11.1	0.0	..	..	..	..
Peru	10.0	19.9	73.0	69.9	81.2	..	1.0	27.4	13.4	1.9	3.6	..	..
Philippines	18.0	45.3	87.4	19.6	17.2	1.0	36.8	67.9	20.3	..	0.0	..	..
Poland	120.9	143.2	..	1.9	1.5	94.7	96.1	2.9	1.3	0.1	0.7	..	..
Portugal	15.2	43.4	..	52.7	26.1	2.3	33.9	42.9	19.4	..	16.5	..	..
Puerto Rico	..	..	..	..	..	..	..	..	..	..	..	..	..

3.9 Sources of electricity

	Electricity production		Access to electricity	Sources of electricity [a]									
	billion kwh		% of population	Hydropower %		Coal %		Oil %		Gas %		Nuclear power %	
	1980	2000	2000	1980	2000	1980	2000	1980	2000	1980	2000	1980	2000
Romania	67.5	51.9	..	18.7	28.5	31.4	37.2	9.6	6.5	40.2	17.3	..	10.5
Russian Federation	804.9	876.5	..	16.1	18.7	..	20.0	77.2	3.8	..	42.3	6.7	14.9
Rwanda	..	..	..	..	..	..	..	..	..	..	..	..	..
Saudi Arabia	20.5	128.4	97.7	..	..	..	..	58.5	63.4	41.5	36.6	..	..
Senegal	0.6	1.5	30.1	..	..	..	..	100.0	99.9	..	0.1	..	..
Sierra Leone	..	..	..	..	..	..	..	..	..	..	..	..	..
Singapore	7.0	31.3	100.0	..	..	..	..	100.0	82.3	..	15.4	..	..
Slovak Republic	20.0	30.4	..	11.3	15.5	37.9	18.5	17.9	0.7	10.2	11.1	22.7	54.2
Slovenia	..	13.6	..	..	28.1	..	33.7	..	0.5	..	2.2	..	34.9
Somalia	..	..	..	..	..	..	..	..	..	..	..	..	..
South Africa	99.0	207.8	66.1	1.0	0.6	99.0	93.1	0.0	..	..	..	..	6.3
Spain	109.2	221.7	..	27.1	12.8	30.0	36.5	35.2	10.2	2.7	9.1	4.7	28.1
Sri Lanka	1.7	6.8	62.0	88.7	46.7	..	..	11.3	53.3	..	..	..	..
Sudan	0.8	2.4	30.0	70.0	48.3	..	..	30.0	51.7	..	..	..	..
Swaziland	..	..	..	..	..	..	..	..	..	..	..	..	..
Sweden	96.3	145.9	..	61.1	54.1	0.2	2.1	10.4	1.2	..	0.3	27.5	39.3
Switzerland	48.2	66.0	..	68.1	55.8	0.1	..	1.0	0.1	0.6	1.5	29.8	40.1
Syrian Arab Republic	4.0	22.6	85.9	64.7	41.1	..	..	31.9	22.4	3.4	36.5	..	..
Tajikistan	13.6	14.2	..	93.4	97.7	..	..	6.6	..	..	2.3	..	..
Tanzania	0.8	2.3	10.5	86.4	96.5	..	..	13.6	3.5	..	..	..	..
Thailand	14.4	96.0	82.1	8.8	6.3	9.8	18.3	81.4	10.4	..	63.4	..	..
Togo	0.0	0.0	9.0	13.3	2.2	..	..	86.7	97.8	..	..	..	..
Trinidad and Tobago	2.0	5.5	99.0	..	..	..	..	2.3	..	96.5	99.7	..	..
Tunisia	2.9	10.6	94.6	0.8	0.6	..	..	64.5	12.1	34.7	87.1	..	..
Turkey	23.3	124.9	..	48.8	24.7	25.6	30.6	25.1	8.4	..	36.1	..	..
Turkmenistan	6.7	9.8	..	0.1	0.1	..	..	99.9	..	..	99.9	..	..
Uganda	..	..	3.7	..	..	..	..	..	..	..	..	..	..
Ukraine	236.0	171.4	..	5.7	6.7	..	26.8	88.3	4.0	..	17.4	6.0	45.1
United Arab Emirates	6.3	38.6	96.0	..	..	..	..	3.7	7.9	96.3	92.1	..	..
United Kingdom	284.1	372.2	..	1.4	1.4	73.2	33.4	11.7	1.5	0.7	39.4	13.0	22.9
United States	2,427.3	4,003.5	..	11.5	6.2	51.2	52.7	10.8	3.1	15.3	15.7	11.0	20.0
Uruguay	4.6	7.6	98.0	76.3	92.9	..	..	23.5	6.7	..	..	..	..
Uzbekistan	33.9	46.8	..	14.6	12.5	..	4.0	85.4	11.3	..	72.2	..	..
Venezuela, RB	35.8	85.2	94.0	40.7	73.7	..	..	32.4	9.8	26.9	16.5	..	..
Vietnam	3.6	26.6	75.8	41.8	54.7	39.9	11.8	18.3	17.1	..	16.4	..	..
West Bank and Gaza	..	..	..	..	..	..	..	..	..	..	..	..	..
Yemen, Rep.	0.5	3.0	50.0	..	..	..	..	100.0	100.0	..	..	..	..
Yugoslavia, Fed. Rep.	..	31.9	..	..	37.8	..	56.2	..	2.6	..	3.4	..	..
Zambia	9.3	7.8	12.0	98.9	99.4	0.7	0.2	0.5	0.4	..	..	..	..
Zimbabwe	4.5	7.0	39.7	88.3	46.6	11.7	52.5	..	0.9	..	..	..	..
World	**8,205.8 s**	**15,346.5 s**	**.. w**	**20.6 w**	**17.4 w**	**33.0 w**	**39.1 w**	**28.5 w**	**7.8 w**	**8.8 w**	**17.4 w**	**8.7 w**	**16.9 w**
Low income	577.7	1,144.7	37.4	28.0	21.4	12.4	45.0	54.2	8.5	1.7	16.2	3.7	8.6
Middle income	2,195.4	4,777.2	94.0	22.4	24.3	22.6	39.2	47.5	10.6	4.6	20.5	3.1	5.4
Lower middle income	1,598.4	3,429.3	93.8	17.4	18.4	19.4	47.0	56.1	7.3	3.1	21.3	3.8	5.4
Upper middle income	597.0	1,347.9	94.7	..	41.5	31.0	19.2	24.7	19.1	8.6	18.4	1.1	5.4
Low & middle income	2,773.1	5,921.9	65.0	23.6	23.7	20.5	40.3	48.9	10.2	4.0	19.7	3.2	6.0
East Asia & Pacific	391.6	1,722.1	87.3	..	..	45.5	66.2	30.3	5.6	0.3	9.3	..	1.0
Europe & Central Asia	1,640.1	1,827.5	..	13.7	17.1	13.6	31.4	65.4	4.8	2.3	30.7	5.1	15.7
Latin America & Carib.	360.9	973.2	86.6	60.5	60.2	2.1	4.7	25.8	17.6	9.8	13.5	0.6	2.1
Middle East & N. Africa	102.9	481.9	90.4	20.5	9.1	1.0	1.7	53.3	42.5	25.0	46.7	..	..
South Asia	138.5	634.8	40.8	41.6	15.3	42.3	66.2	7.8	5.8	6.2	9.4	2.2	3.0
Sub-Saharan Africa	139.2	282.4	24.6	..	..	70.9	69.8	4.4	2.9	0.8	4.1	..	4.6
High income	5,432.7	9,424.6	..	..	..	39.4	38.4	18.0	6.3	11.3	16.0	11.5	23.7
Europe EMU	1,265.9	2,018.0	..	17.9	11.6	37.3	27.8	23.2	7.4	9.8	14.5	11.7	35.8

a. Shares may not sum to 100 percent because some sources of generated electricity (such as wind, solar, and geothermal) are not shown.

Sources of electricity 3.9

About the data

Use of energy in general, and access to electricity in particular, are important in improving people's standard of living. But electricity generation also can damage the environment. Whether such damage occurs depends largely on how electricity is generated. For example, burning coal releases twice as much carbon dioxide—a major contributor to global warming—as does burning an equivalent amount of natural gas (see *About the data* for table 3.8). Nuclear energy does not generate carbon dioxide emissions, but it produces other dangerous waste products. The table provides information on electricity production by source. Shares may not sum to 100 percent because some sources of generated electricity (such as wind, solar, and geothermal) are not shown.

The International Energy Agency (IEA) compiles data on energy inputs used to generate electricity. IEA data for countries that are not members of the Organisation for Economic Co-operation and Development (OECD) are based on national energy data adjusted to conform to annual questionnaires completed by OECD member governments. In addition, estimates are sometimes made to complete major aggregates from which key data are missing, and adjustments are made to compensate for differences in definitions. The IEA makes these estimates in consultation with national statistical offices, oil companies, electricity utilities, and national energy experts.

The IEA occasionally revises its time series to reflect political changes. Since 1990, for example, it has constructed energy statistics for countries of the former Soviet Union. In addition, energy statistics for other countries have undergone continuous changes in coverage or methodology as more detailed energy accounts have become available in recent years. Breaks in series are therefore unavoidable.

There is no single internationally accepted definition for access to electricity. The definition used here covers access at the household level—that is, the number of people who have electricity in their home. It includes commercially sold electricity, both on-grid and off-grid. For countries where access to electricity has been assessed through surveys by government agencies, the definition also includes self-generated electricity. The data do not capture unauthorized connections.

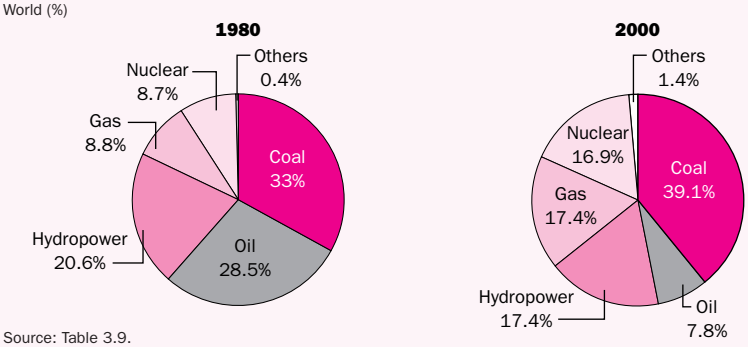
Definitions

• **Electricity production** is measured at the terminals of all alternator sets in a station. In addition to hydropower, coal, oil, gas, and nuclear power generation, it covers generation by geothermal, solar, wind, and tide and wave energy as well as that from combustible renewables and waste. Production includes the output of electricity plants designed to produce electricity only as well as that of combined heat and power plants. • **Access to electricity** refers to the number of people with access to electricity as a percentage of the total population. • **Sources of electricity** refer to the inputs used to generate electricity: hydropower, coal, oil, gas, and nuclear power. Hydropower refers to electricity produced by hydroelectric power plants, oil refers to crude oil and petroleum products, gas refers to natural gas but not natural gas liquids, and nuclear power refers to electricity produced by nuclear power plants.

3.9a

Electricity sources have shifted over the past two decades, though coal still dominates

World (%)

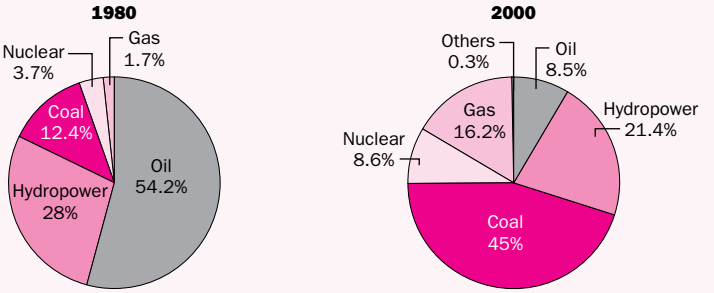


Source: Table 3.9.

3.9b

The shift in electricity sources has been more profound in low-income countries

Low-income economies (%)



Source: Table 3.9.

Data sources

The data on electricity production are from the IEA's electronic files and its annual publications *Energy Statistics and Balances of Non-OECD Countries*, *Energy Statistics of OECD Countries*, and *Energy Balances of OECD Countries*. Data on access to electricity are from the IEA's *World Energy Outlook 2002: Energy and Poverty*.

3.10 Urbanization

	Urban population				Population in urban agglomerations of more than one million			Population in largest city		Access to improved sanitation facilities			
										Urban		Rural	
	millions		% of total population		% of total population			% of urban population		% of population		% of population	
	1980	2001	1980	2001	1980	2000	2015	1980	2001	1990	2000	1990	2000
Afghanistan	2.5	6.1	16	22	6	10	14	39	*45*	..	25	..	8
Albania	0.9	1.4	34	43	..	..	..	..	22	..	99	..	85
Algeria	8.1	17.8	44	58	8	6	7	20	*16*	..	99	..	81
Angola	1.5	4.7	21	35	13	20	25	62	*60*	..	70	..	30
Argentina	23.3	33.1	83	88	42	41	40	43	*37*	..	87	..	47
Armenia	2.0	2.6	66	67	34	34	35	51	*55*	..	..	..	..
Australia	12.6	17.7	86	91	61	56	55	26	*22*	100	100	100	100
Austria	5.1	5.5	67	67	27	26	26	40	*38*	100	100	100	100
Azerbaijan	3.3	4.2	53	52	26	24	26	48	*47*	..	90	..	70
Bangladesh	12.7	34.1	15	26	6	13	18	26	*38*	81	71	31	41
Belarus	5.4	6.9	57	70	14	18	20	24	*24*	..	..	..	..
Belgium	9.4	10.0	95	97	12	11	11	13	*11*	..	..	..	..
Benin	0.9	2.8	27	43	..	..	..	..	8	46	46	6	6
Bolivia	2.4	5.4	45	63	14	18	20	33	*28*	73	86	26	42
Bosnia and Herzegovina	1.5	1.8	36	43	..	..	..	..	31	..	..	..	..
Botswana	0.2	0.8	18	49	..	..	..	..	27	87	88	41	43
Brazil	81.2	140.8	67	82	32	34	34	16	*13*	82	84	38	43
Bulgaria	5.4	5.4	61	67	12	15	16	20	*22*	..	100	..	100
Burkina Faso	0.6	1.9	8	17	..	..	..	45	*45*	..	39	..	27
Burundi	0.2	0.6	4	9	..	..	..	..	54	65	68	89	90
Cambodia	0.8	2.1	12	17	..	..	..	44	*53*	..	56	..	10
Cameroon	2.7	7.5	31	50	11	21	27	19	*23*	97	92	64	66
Canada	18.6	24.5	76	79	32	37	38	16	*20*	100	100	99	99
Central African Republic	0.8	1.6	35	42	..	..	..	..	42	38	38	16	16
Chad	0.8	1.9	19	24	..	..	..	..	38	70	81	4	13
Chile	9.1	13.3	81	86	33	36	37	41	*42*	98	96	92	97
China	192.8	466.7	20	37	13	14	17	6	*3*	57	68	18	24
Hong Kong, China	4.6	6.7	91	100	91	100	100	100	*100*	..	..	..	..
Colombia	17.8	32.5	63	75	26	32	35	21	*21*	96	96	55	56
Congo, Dem. Rep.	..	..	..	..	8	10	12	..	..	..	54	..	6
Congo, Rep.	0.7	2.0	42	66	27	41	44	263	*158*	..	14	..	..
Costa Rica	1.1	2.3	47	60	..	..	..	56	*43*	..	89	..	97
Côte d'Ivoire	2.8	7.2	35	44	15	21	25	44	*54*	70	71	29	35
Croatia	2.3	2.5	50	58	..	..	..	28	*42*	..	..	..	..
Cuba	6.6	8.5	68	75	20	20	20	29	*27*	..	99	..	95
Czech Republic	7.6	7.6	75	75	12	12	12	15	*16*	..	..	..	..
Denmark	4.3	4.6	84	85	27	26	26	32	*29*	..	..	..	..
Dominican Republic	2.9	5.6	51	66	34	61	67	50	*47*	70	70	60	60
Ecuador	3.7	8.2	47	63	23	32	37	29	*27*	88	92	49	74
Egypt, Arab Rep.	17.9	27.9	44	43	23	23	24	38	*35*	96	100	79	96
El Salvador	2.0	3.9	44	61	16	22	25	35	*35*	87	89	62	76
Eritrea	0.3	0.8	14	19	..	..	..	..	63	..	66	..	1
Estonia	1.0	0.9	70	69	..	..	..	..	42	..	93	..	..
Ethiopia	4.0	10.4	10	16	3	4	6	30	*27*	24	33	6	7
Finland	2.9	3.1	60	59	13	23	25	24	*31*	100	100	100	100
France	39.5	44.7	73	76	21	21	20	23	*22*	..	..	..	..
Gabon	0.3	1.0	50	82	..	..	..	..	55	..	55	..	43
Gambia, The	0.1	0.4	20	31	..	..	..	..	100	..	41	..	35
Georgia	2.6	*3.1*	52	57	22	24	29	42	..	..	100	..	99
Germany	64.7	72.2	83	88	39	41	43	10	*9*	..	..	..	..
Ghana	3.3	7.2	31	36	9	10	14	30	*27*	56	74	64	70
Greece	5.6	6.4	58	60	31	30	29	54	*49*	..	..	..	..
Guatemala	2.6	4.7	37	40	11	28	32	29	*72*	82	83	62	79
Guinea	0.9	2.1	19	28	12	25	32	75	*60*	94	94	41	41
Guinea-Bissau	0.1	0.4	17	32	..	..	..	..	74	87	95	33	44
Haiti	1.3	3.0	24	36	13	22	28	55	*62*	33	50	19	16

Urbanization 3.10

	Urban population				Population in urban agglomerations of more than one million			Population in largest city		Access to improved sanitation facilities			
	millions		% of total population		% of total population			% of urban population		Urban % of population		Rural % of population	
	1980	2001	1980	2001	1980	2000	2015	1980	2001	1990	2000	1990	2000
Honduras	1.2	3.5	35	54	..	..	..	33	*28*	88	93	41	55
Hungary	6.1	6.6	57	65	19	18	19	34	*28*	100	100	98	98
India	158.5	287.7	23	28	8	10	12	5	*6*	44	61	6	15
Indonesia	32.9	87.7	22	42	8	10	13	18	*13*	66	69	38	46
Iran, Islamic Rep.	19.4	41.7	50	65	21	23	24	26	*17*	..	86	..	79
Iraq	8.5	16.0	66	68	29	31	34	39	*31*	..	93	..	31
Ireland	1.9	2.3	55	59	..	..	..	48	*44*	..	..	..	..
Israel	3.4	5.8	89	92	37	35	33	41	*35*	..	..	..	..
Italy	37.6	38.9	67	67	24	19	20	14	*11*	..	..	..	..
Jamaica	1.0	1.5	47	57	..	..	..	..	46	99	99	99	99
Japan	89.0	100.2	76	79	34	38	39	25	*26*	..	..	..	..
Jordan	1.3	4.0	60	79	29	29	32	49	*30*	100	100	95	98
Kazakhstan	8.0	8.3	54	56	6	8	9	12	*13*	..	100	..	98
Kenya	2.7	10.5	16	34	5	8	10	32	*22*	91	96	77	82
Korea, Dem. Rep.	9.8	13.5	57	61	11	14	16	19	*24*	..	99	..	100
Korea, Rep.	21.7	39.0	57	82	40	47	45	38	*26*	..	76	..	4
Kuwait	1.2	2.0	91	96	60	60	55	67	*46*	..	..	..	..
Kyrgyz Republic	1.4	1.7	38	34	..	..	..	..	43	..	100	..	100
Lao PDR	0.4	1.1	12	20	..	..	..	..	62	..	67	..	19
Latvia	1.7	1.4	68	60	..	..	..	49	*53*	..	..	..	..
Lebanon	2.2	3.9	74	90	40	47	48	55	*53*	..	100	..	87
Lesotho	0.2	0.6	13	29	..	..	..	..	46	..	72	..	40
Liberia	0.7	1.5	35	45	..	..	..	..	34	..	..	..	..
Libya	2.1	4.8	69	88	26	34	34	38	*37*	97	97	96	96
Lithuania	2.1	2.4	61	69	..	..	..	..	24	..	..	..	..
Macedonia, FYR	1.0	1.2	53	59	..	..	..	..	36	..	..	..	..
Madagascar	1.6	4.8	19	30	6	10	13	33	*35*	70	70	25	30
Malawi	0.6	1.6	9	15	..	..	..	..	33	96	96	70	70
Malaysia	5.8	13.8	42	58	7	6	6	16	*10*	..	..	..	98
Mali	1.2	3.4	18	31	..	..	..	40	*34*	95	93	62	58
Mauritania	0.4	1.6	28	59	..	..	..	..	39	44	44	19	19
Mauritius	0.4	0.5	42	42	..	..	..	..	35	100	100	100	99
Mexico	44.8	74.2	66	75	28	28	25	29	*25*	87	88	26	34
Moldova	1.6	1.8	40	42	..	..	..	..	37	..	100	..	98
Mongolia	0.9	1.4	52	57	..	..	..	49	*56*	..	46	..	2
Morocco	8.0	16.4	41	56	15	18	20	26	*21*	88	86	31	44
Mozambique	1.6	6.0	13	33	6	17	21	35	*19*	..	68	..	26
Myanmar	8.1	13.6	24	28	7	9	11	27	*33*	..	84	..	57
Namibia	0.2	0.6	23	31	..	..	..	..	38	84	96	14	17
Nepal	1.0	2.9	7	12	..	..	..	..	26	69	73	15	22
Netherlands	12.5	14.4	88	90	14	14	14	8	*8*	100	100	100	100
New Zealand	2.6	3.3	83	86	..	..	..	30	*34*	..	..	..	..
Nicaragua	1.5	2.9	50	57	..	..	..	36	*35*	97	95	53	72
Niger	0.7	2.4	13	21	..	..	..	37	*35*	71	79	4	5
Nigeria	19.1	58.3	27	45	8	12	15	13	*15*	69	66	44	45
Norway	2.9	3.4	71	75	..	..	..	22	*23*	100	..	..	..
Oman	0.3	1.9	32	76	..	..	..	..	28	98	98	61	61
Pakistan	23.2	47.3	28	33	15	21	25	22	*22*	77	95	17	43
Panama	1.0	1.6	50	57	..	..	..	62	*73*	..	99	..	83
Papua New Guinea	0.4	0.9	13	18	..	..	..	..	28	92	92	80	80
Paraguay	1.3	3.2	42	57	22	23	26	52	*41*	96	94	91	93
Peru	11.2	19.3	65	73	25	29	30	39	*39*	77	79	21	49
Philippines	18.0	46.5	37	59	14	16	17	33	*22*	85	93	63	69
Poland	20.6	24.2	58	63	18	18	19	16	*14*	..	..	..	..
Portugal	2.9	6.6	29	66	19	57	68	46	*60*	..	..	..	..
Puerto Rico	2.1	2.9	67	76	34	36	37	51	*48*	..	..	..	..

3.10 Urbanization

	Urban population				Population in urban agglomerations of more than one million			Population in largest city		Access to improved sanitation facilities			
										Urban		Rural	
	millions		% of total population		% of total population			% of urban population		% of population		% of population	
	1980	2001	1980	2001	1980	2000	2015	1980	2001	1990	2000	1990	2000
Romania	10.9	12.4	49	55	9	9	10	18	*16*	..	86	..	10
Russian Federation	97.0	105.5	70	73	18	19	21	8	*8*	..	..	..	..
Rwanda	0.2	0.5	5	6	..	..	..	..	76	..	12	..	8
Saudi Arabia	6.2	18.5	66	87	19	25	24	17	*25*	..	100	..	100
Senegal	2.0	4.7	36	48	17	22	27	48	*46*	86	94	38	48
Sierra Leone	0.8	1.9	24	37	..	..	..	47	*43*	..	88	..	53
Singapore	2.4	4.1	100	100	100	89	83	100	*100*	..	100	..	..
Slovak Republic	2.6	3.1	52	58	..	..	..	..	15	..	100	..	100
Slovenia	0.9	1.0	48	49	..	..	..	..	26	100	..	..	..
Somalia	1.4	2.5	22	28	..	..	..	27	*48*	..	..	..	..
South Africa	13.3	24.9	48	58	27	32	36	13	*12*	93	93	80	80
Spain	27.2	32.0	73	78	20	17	17	16	*13*	..	..	..	..
Sri Lanka	3.1	4.3	22	23	..	..	..	..	16	94	97	82	93
Sudan	3.9	11.7	20	37	6	9	11	30	*24*	87	87	48	48
Swaziland	0.1	0.3	18	27	..	..	..	..	28	..	..	..	..
Sweden	6.9	7.4	83	83	17	18	18	20	*22*	100	100	100	100
Switzerland	3.6	4.9	57	67	..	..	..	20	*19*	100	100	100	100
Syrian Arab Republic	4.1	8.6	47	52	28	28	31	26	*27*	..	98	..	81
Tajikistan	1.4	1.7	34	28	..	..	..	..	30	..	97	..	88
Tanzania	2.7	11.4	15	33	5	12	18	30	*19*	84	99	84	86
Thailand	8.0	12.3	17	20	10	12	15	59	*61*	95	96	75	96
Togo	0.6	1.6	23	34	..	..	..	..	46	71	69	24	17
Trinidad and Tobago	0.7	1.0	63	74	..	..	..	..	6	..	..	..	..
Tunisia	3.3	6.4	52	66	18	20	21	35	*30*	96	96	48	62
Turkey	19.5	43.8	44	66	19	27	30	23	*21*	97	97	70	70
Turkmenistan	1.3	2.4	47	45	..	..	..	..	23	..	..	..	..
Uganda	1.1	3.3	9	15	..	..	..	42	*39*	..	93	..	77
Ukraine	30.9	33.4	62	68	14	15	17	7	*7*	..	100	..	98
United Arab Emirates	0.7	2.6	71	87	..	..	..	34	*35*	..	..	..	..
United Kingdom	50.0	52.7	89	90	25	23	23	15	*15*	100	100	100	100
United States	167.6	221.0	74	77	38	38	37	9	*8*	100	100	100	100
Uruguay	2.5	3.1	85	92	42	37	35	49	*43*	..	95	..	85
Uzbekistan	6.5	9.2	41	37	11	9	8	28	*24*	..	97	..	85
Venezuela, RB	12.0	21.5	79	87	28	29	30	21	*15*	..	71	..	48
Vietnam	10.3	19.5	19	25	14	13	14	33	*24*	52	82	23	38
West Bank and Gaza	..	..	..	..	..	..	..	..	..	..	..	..	..
Yemen, Rep.	1.6	4.5	19	25	..	..	..	15	*31*	69	89	21	21
Yugoslavia, Fed. Rep.	4.5	5.5	46	52	11	14	15	25	*30*	..	100	..	99
Zambia	2.3	4.1	40	40	9	16	22	23	*41*	86	99	48	64
Zimbabwe	1.6	4.6	22	36	9	14	19	39	*40*	70	71	50	57
World	**1,741.8 s**	**2,890.5 s**	**39 w**	**47 w**	**.. w**	**.. w**	**.. w**	**18 w**	***16* w**	**75 w**	**81 w**	**27 w**	**37 w**
Low income	381.0	772.5	24	31	..	..	..	16	*17*	58	72	20	31
Middle income	755.6	1,376.1	38	52	..	..	..	19	*15*	75	81	29	40
Lower middle income	515.6	987.4	32	46	15	17	20	16	*13*	70	80	28	39
Upper middle income	240.0	388.6	66	77	..	..	..	25	*22*	86	87	41	57
Low & middle income	1,136.6	2,148.5	32	42	..	..	..	18	*16*	68	78	24	35
East Asia & Pacific	288.6	679.9	21	37	..	..	..	13	*9*	61	72	24	34
Europe & Central Asia	249.2	298.1	59	63	16	18	20	15	*15*	..	..	..	..
Latin America & Carib.	234.1	396.9	65	76	29	32	32	27	*24*	85	86	41	52
Middle East & N. Africa	83.7	173.3	48	58	21	22	24	30	*25*	..	94	..	72
South Asia	201.1	382.5	22	28	8	12	14	9	*11*	52	66	11	21
Sub-Saharan Africa	80.0	217.8	21	32	..	..	..	27	*26*	75	76	45	45
High income	605.2	741.9	73	78	..	..	..	18	*17*	..	..	..	..
Europe EMU	210.3	237.7	73	78	26	27	27	17	*16*	..	..	..	..

About the data

The population of a city or metropolitan area depends on the boundaries chosen. For example, in 1990 Beijing, China, contained 2.3 million people in 87 square kilometers of "inner city" and 5.4 million in 158 square kilometers of "core city." The population of "inner city and inner suburban districts" was 6.3 million, and that of "inner city, inner and outer suburban districts, and inner and outer counties" was 10.8 million. (For most countries the last definition is used.)

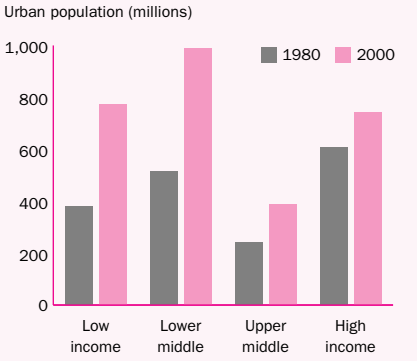
Estimates of the world's urban population would change significantly if China, India, and a few other populous nations were to change their definition of urban centers. According to China's State Statistical Bureau, by the end of 1996 urban residents accounted for about 43 percent of China's population, while in 1994 only 20 percent of the population was considered urban. In addition to the continuous migration of people from rural to urban areas, one of the main reasons for this shift was the rapid growth in the hundreds of towns reclassified as cities in recent years. Because the estimates in the table are based on national definitions of what constitutes a city or metropolitan area, cross-country comparisons should be made with caution.

To estimate urban populations, the United Nations' ratios of urban to total population were applied to the World Bank's estimates of total population (see table 2.1).

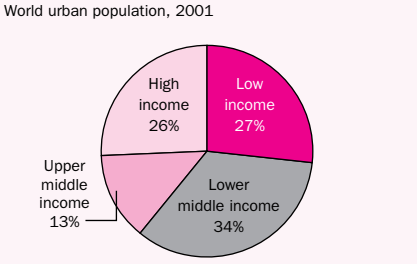
The urban population with access to improved sanitation facilities is defined as those with access to at least adequate excreta disposal facilities that can effectively prevent human, animal, and insect contact with excreta. The rural population with access is included to allow comparison of rural and urban access. This definition and the definition of urban areas vary, however, so comparisons between countries can be misleading.

3.10a

The urban population in low-income countries has doubled in the past two decades . . .



. . . surpassing the urban population in high-income countries



Low-income countries, with only 31 percent of their people in urban areas, still have a larger urban population than high-income countries.

Source: Table 3.10.

Definitions

• **Urban population** is the midyear population of areas defined as urban in each country and reported to the United Nations (see *About the data*). • **Population in urban agglomerations of more than one million** is the percentage of a country's population living in metropolitan areas that in 1990 had a population of more than one million. • **Population in largest city** is the percentage of a country's urban population living in that country's largest metropolitan area. • **Access to improved sanitation facilities** refers to the percentage of the urban or rural population with access to at least adequate excreta disposal facilities (private or shared but not public) that can effectively prevent human, animal, and insect contact with excreta. Improved facilities range from simple but protected pit latrines to flush toilets with a sewerage connection. To be effective, facilities must be correctly constructed and properly maintained.

Data sources

The data on urban population and the population in urban agglomerations and in the largest city come from the United Nations Population Division's *World Urbanization Prospects: The 2001 Revision*. The total population figures are World Bank estimates. The data on access to sanitation in urban and rural areas are from the World Health Organization.

3.11 Urban environment

	City	Urban population	Secure tenure	House price to income ratio	Work trips by public transportation	Travel time to work	Households with access to services				Wastewater treated
							Potable water	Sewerage connection	Electricity	Telephone	
		thousands	% of population		%	minutes	%	%	%	%	%
		2000	1998 [a]	1998 [a]	1998 [a]	1998 [a]	1998 [a]	1998 [a]	1998 [a]	1998 [a]	1998 [a]
Algeria	Algiers	2,562 [b]	93.2	..	..	75	..	..	..	..	80
Argentina	Buenos Aires	2,996 [b]	92.1	5.1	59	42	100	98	100	70	..
	Córdoba	1,322 [b]	85.0	6.8	44	32	99	40	99	80	49
	Rosario	1,248 [b]	..	5.7	..	22	98	67	93	76	1
Armenia	Yerevan	1,250 [b]	100.0	4.0	84	30	98	98	100	88	36
Bangladesh	Chittagong	2,301 [b]	..	8.1	27	45	44	..	95	..	..
	Dhaka	10,000 [b]	..	16.7	9	45	60	22	90	7	..
	Sylhet	242 [b]	..	6.0	10	50	29	0	93	40	..
	Tangail	152 [b]	85.7	13.9	..	30	12	0	90	12	..
Barbados	Bridgetown	..	99.7	4.4	..	..	98	5	99	78	7
Belize	Belize City	55 [b]	..	..	..	..	..	..	..	..	..
Bolivia	Santa Cruz de la Sierra	1,065 [c]	87.0	29.3	..	29	53	33	98	59	53
Bosnia and Herzegovina	Sarajevo	522 [c]	..	..	100	12	95	90	100	..	..
Brazil	Belém	1,638 [c]	..	..	..	..	..	..	..	..	..
	Icapui	..	91.7	4.5	..	30	88	..	90	33	..
	Maranguape	..	..	..	30	20	73	..	..	..	..
	Porto Alegre	3 [b]	..	..	..	..	99	87	100	..	..
	Recife	3,088 [b]	..	12.5	46	35	89	41	100	29	33
	Rio de Janeiro	10,192 [b]	..	..	..	..	88	80	10	..	..
	Santo André	1,658 [b]	80.3	23.4	43	40	98	95	100	79	..
Bulgaria	Bourgas	.. [b]	..	5.1	61	32	100	93	100	..	93
	Sofia	1,200 [b]	100.0	13.2	79	32	95	91	100	89	94
	Troyan	24 [b]	100.0	3.7	44	22	99	82	100	45	..
	Veliko Tarnovo	..	100.0	5.4	46	30	98	98	100	96	50
Burkina Faso	Bobo-Dioulasso	..	100.0	..	..	..	24	..	29	6	..
	Koudougou	..	..	..	..	..	30	..	26	7	..
	Ouagadougou	1,130 [c]	100.0	..	2	..	30	..	47	11	19
Burundi	Bujumbura	373 [b]	97.0	..	48	25	26	62	57	19	21
Cambodia	Phnom Penh	1,000 [b]	..	8.9	0	45	45	75	76	40	..
Cameroon	Douala	1,148 [b]	..	13.4	..	40	34	1	95	9	5
	Yaoundé	968 [b]	..	..	42	45	34	1	95	9	24
Canada	Hull	254 [b]	100.0	..	16	..	100	100	100	100	100
Central African Republic	Bangui	..	94.0	..	66	60	31	..	18	11	0
Chad	N'Djamena	998 [c]	..	..	35	..	42	0	13	6	21
Chile	Gran Concepción	..	..	..	57	35	100	91	95	69	6
	Santiago de Chile	5,737 [b]	..	..	60	38	100	99	99	73	3
	Tome	..	..	..	..	..	92	52	98	58	57
	Valparaiso	851 [b]	91.8	..	55	..	98	92	97	63	100
	Viña del Mar	851 [b]	92.7	..	..	..	97	97	98	65	93
Colombia	Armenia	..	94.1	5.0	42	60	90	50	99	97	..
	Marinilla	170 [b]	94.5	8.5	18	15	98	93	100	65	..
	Medellín	2,901 [b]	..	..	38	35	100	99	100	87	..
Congo, Rep	Brazzaville	989 [b]	87.9	..	55	20	56	0	52	18	..
Côte d'Ivoire	Abidjan	3,201 [b]	..	14.5	..	45	26	15	41	5	45
Croatia	Zagreb	2,497 [b]	96.5	7.8	56	31	98	100	94	..	
Cuba	Baracoa	..	96.2	..	..	..	83	3	93	32	..
	Camagüey	..	84.7	..	2	60	72	47	97	..	..
	Cienfuegos	..	96.3	4.0	..	80	100	73	100	9	2
	Havana	..	..	8.5	58	83	100	85	100	14	..
	Pinar Del Rio	..	96.4	..	..	80	97	48	100	..	..
	Santa Clara	..	98.8	..	7	48	95	42	100	43	..
Czech Republic	Brno	..	..	..	50	25	100	96	100	69	100
	Prague	1,193 [b]	99.3	..	55	22	99	100	100	100	..
Congo, Dem. Rep.	Kinshasa	5,398 [b]	94.9	..	72	57	72	0	66	1	..
Dominican Republic	Santiago de los Caballeros	691 [b]	..	..	..	30	75	80	..	71	80

Urban environment 3.11

	City	Urban population	Secure tenure	House price to income ratio	Work trips by public trans-portation	Travel time to work	Households with access to services				Wastewater treated
							Potable water	Sewerage connection	Electricity	Telephone	
		thousands	% of population		%	minutes	%	%	%	%	%
		2000	1998 [a]	1998 [a]	1998 [a]	1998 [a]	1998 [a]	1998 [a]	1998 [a]	1998 [a]	1998 [a]
Ecuador	Ambato	286 [b]	..	..	..	..	90	81	91	87	..
	Cuenca	..	91.0	4.6	..	25	97	92	97	48	82
	Guayaquil	2,317 [b]	45.8	3.4	89	45	70	42	..	44	9
	Manta	126 [b]	..	..	..	30	70	52	98	40	..
	Puyo	40 [b]	..	2.1	..	15	80	30	90	60	..
	Quito	1,531 [b]	93.8	2.4	..	33	85	70	96	55	..
	Tena	..	..	6.3	..	5	80	60	..	..	..
El Salvador	San Salvador	1,863 [b]	90.5	3.5	..	..	82	80	98	70	..
Estonia	Riik	..	99.5	..	..	..	92	90	98	55	..
	Tallin	397 [c]	98.8	6.4	..	35	98	98	100	86	100
Gabon	Libreville	523 [c]	..	..	80	30	55	0	95	45	44
Gambia, The	Banjul	50 [b]	91.8	11.4	55	22	23	12	24	..	..
Georgia	Tbilisi	1,310 [c]	100.0	9.4	..	..	..	98	100	58	..
Ghana	Accra	1,500 [b]	..	14.0	54	21	..	..	..	..	..
	Kumasi	780 [b]	77.7	13.7	51	21	65	..	95	51	..
Guatemala	Quezaltenango	333 [b]	..	4.3	..	15	60	55	80	40	..
Guinea	Conakry	1,824 [c]	..	..	26	45	30	32	54	6	..
Indonesia	Jakarta	9,489 [b]	95.5	14.6	..	..	50	65	99	..	16
	Semarang	1,076 [b]	80.2	..	..	..	34	..	85	..	..
	Surabaya	2,373 [b]	97.6	3.4	18	35	41	56	89	71	..
Iraq	Baghdad	4,797 [c]	..	..	..	..	..	..	..	..	..
Italy	Aversa	..	..	..	..	..	..	..	..	..	90
Jamaica	Kingston	655 [c]	..	..	..	..	97	..	88	..	20
	Montego Bay	..	..	..	..	..	78	..	86	..	15
Jordan	Amman	1,621 [b]	97.3	6.1	21	25	98	81	99	62	54
Kenya	Kisumu	134 [b]	97.3	8.5	43	24	38	31	49	..	65
	Mombasa	..	..	..	47	20	..	..	..	..	50
	Nairobi	2,310 [c]	..	..	71	57	89	..	..	..	52
Korea, Rep	Hanam	124 [b]	..	3.7	..	..	81	68	100	100	81
	Pusan	3,843 [b]	100.0	4.0	39	42	98	69	100	100	69
	Seoul	10,389 [b]	98.6	5.7	71	60	100	99	100	..	99
Kuwait	Kuwait City	1,165 [c]	..	6.5	21	10	100	98	100	98	..
Kyrgyz Republic	Bishkek	60 [b]	94.8	..	95	35	30	23	100	20	15
Lao	Vientiane	562 [b]	92.2	23.2	2	27	87	..	100	87	20
Latvia	Riga	775 [c]	97.4	15.6	..	..	95	93	100	70	..
Lebanon	Sin El Fil	.. [b]	..	8.3	50	10	80	30	98	80	..
Liberia	Monrovia	651 [b]	57.6	28.0	80	60	..	..	..	..	..
Libya	Tripoli	1,773 [b]	..	0.8	18	20	97	90	99	6	40
Lithuania	Vilnius	578 [b]	100.0	20.0	52	37	89	89	100	77	54
Madagascar	Antananarivo	1,507 [c]	..	..	..	..	..	..	..	..	..
Malawi	Lilongwe	765 [c]	..	..	27	5	65	12	50	10	..
Malaysia	Penang	..	..	7.2	55	40	99	..	100	98	20
Mauritania	Nouakchott	881 [c]	89.9	5.4	45	50	..	..	..	..	..
Mexico	Ciudad Juarez	1,018 [b]	..	..	24	23	89	77	96	45	..
Moldova	Chisinau	..	..	..	80	23	100	95	100	83	71
Mongolia	Ulaanbaatar	627 [b]	51.6	7.8	80	30	60	60	100	90	96
Morocco	Casablanca	3,292 [b]	..	..	..	30	83	93	91	..	..
	Rabat	646 [b]	..	..	40	20	93	97	52	..	..
Myanmar	Yangon	3,692 [b]	..	8.3	69	45	78	81	85	17	..
Nicaragua	Leon	..	98.8	..	..	15	78	..	84	21	..
Niger	Niamey	731 [c]	87.4	..	..	30	33	0	51	4	..
Nigeria	Ibadan	1,731 [c]	85.8	..	46	45	26	12	41	..	..
	Lagos	13,427 [c]	93.0	..	48	60	..	..	41	..	..
Oman	Muscat	887 [b]	..	..	..	20	80	90	89	53	..
Panama	Colón	132 [b]	..	14.2	..	15	..	..	..	..	..
Paraguay	Asunción	1,262 [c]	90.2	10.7	..	25	46	8	86	17	..

3.11 Urban environment

	City	Urban population	Secure tenure	House price to income ratio	Work trips by public transportation	Travel time to work	Households with access to services				Wastewater treated
							Potable water	Sewerage connection	Electricity	Telephone	
		thousands	% of population		%	minutes	%	%	%	%	%
		2000	1998 [a]	1998 [a]	1998 [a]	1998 [a]	1998 [a]	1998 [a]	1998 [a]	1998 [a]	1998 [a]
Peru	Cajamarca	..	90.0	3.9	..	20	86	69	81	38	62
	Huanuco	747 [b]	..	30.0	..	20	57	28	80	32	..
	Huaras	54 [b]	..	6.7	..	15	..	..	71	..	..
	Iquitos	347 [b]	97.3	5.6	25	10	73	60	82	62	..
	Lima	7,431 [b]	80.6	10.4	82	..	75	71	99	..	4
	Tacna	..	..	4.0	..	25	65	58	74	16	64
	Tumbes	..	..	..	..	20	60	35	80	25	..
Philippines	Cebu	2,189 [b]	95.0	13.3	..	35	41	92	80	25	..
Poland	Bydgoszcz	..	60.5	4.3	35	18	95	87	100	85	28
	Gdansk	893 [c]	..	4.4	56	20	99	94	100	56	100
	Katowice	3,487 [c]	27.8	1.7	29	36	99	94	100	75	67
	Poznan	..	65.5	5.8	51	25	95	96	100	86	78
Qatar	Doha	391 [c]	..	..	..	..	..	..	..	..	..
Russian Federation	Astrakhan	..	100.0	5.0	66	35	81	79	100	51	92
	Belgorod	..	100.0	4.0	..	25	90	89	100	51	96
	Kostroma	..	100.0	6.9	68	20	88	84	100	46	96
	Moscow	9,321 [c]	100.0	5.1	85	62	100	100	100	100	98
	Nizhny Novgorod	1,458 [c]	100.0	6.9	79	35	98	98	100	64	98
	Novomoscowsk	..	100.0	4.2	61	25	99	93	100	62	97
	Omsk	1,216 [c]	99.7	3.9	86	43	87	87	100	41	89
	Pushkin	..	100.0	9.6	60	15	99	99	100	89	100
	Surgut	..	100.0	4.5	81	57	98	98	100	50	93
	Veliky Novgorod	..	100.0	3.4	75	30	97	97	100	51	95
Rwanda	Kigali	358 [b]	..	11.4	32	45	36	20	57	6	20
Samoa	Apia	34 [b]	..	10.0	..	..	60	0	98	96	..
Singapore	Singapore	3,164 [b]	100.0	3.1	53	30	100	100	100	100	100
Slovenia	Ljubljana	273 [b]	98.9	7.8	20	30	100	100	100	97	98
Spain	Madrid	4,577 [b]	..	..	16	32	..	..	..	..	100
	Pamplona	..	..	..	..	..	100	..	100	..	79
Sweden	Amal	13 [b]	..	2.9	..	..	100	100	100	..	100
	Stockholm	736 [b]	..	6.0	48	28	100	100	100	..	100
	Umea	104 [b]	..	5.3	..	16	100	100	100	..	100
Switzerland	Basel	170 [b]	..	12.3	..	..	100	100	100	99	100
Syrian Arab Republic	Damascus	2,335 [b]	..	10.3	33	40	98	71	95	10	3
Thailand	Bangkok	5,647 [b]	77.2	8.8	28	60	99	100	100	60	..
	Chiang Mai	499 [b]	96.5	6.8	5	30	95	60	100	75	70
Togo	Lomé	663 [b]	64.0	..	40	30	..	70	51	18	..
Trinidad and Tobago	Port of Spain	..	78.6	..	44	..	..	..	..	..	..
Tunisia	Tunis	2,023 [b]	..	5.0	..	..	75	47	95	27	83
Turkey	Ankara	2,837 [b]	91.3	4.5	..	32	97	98	100	..	80
Uganda	Entebbe	65 [b]	74.0	10.4	65	20	48	13	42	0	30
	Jinja	92 [b]	82.0	15.4	49	12	65	43	55	5	30
Uruguay	Montevideo	1,670 [b]	88.0	5.6	60	45	98	79	100	75	34
West Bank and Gaza	Gaza	367 [b]	87.3	5.4	..	..	85	38	99	38	..
Yemen, Rep.	Aden	1,200 [b]	..	..	78	20	..	..	96	..	30
	Sana'a	1,200 [b]	..	..	78	20	30	9	96	..	30
Yugoslavia, Fed. Rep.	Belgrade	1,182 [b]	96.5	13.5	72	40	95	86	100	86	20
Zimbabwe	Bulawayo	900 [b]	99.4	..	75	15	100	100	98	..	80
	Chegutu	..	51.5	3.4	20	22	100	68	9	3	69
	Gweru	..	94.0	..	..	15	100	100	90	61	95
	Harare	1,634 [b]	99.9	..	32	45	100	100	88	42	..
	Mutare	149 [b]	..	..	70	20	88	88	74	4	100

a. Data are preliminary. b. Data are for 1998 and are from the United Nations Centre for Human Settlements. c. Data are for 2000 and are from the United Nations Population Division's *World Urbanization Prospects: The 2001 Revision*.

About the data

Despite the importance of cities and urban agglomerations as home to almost half the world's people, data on many aspects of urban life are sparse. The available data have been scattered among international agencies with different mandates, and compiling comparable data has been difficult. Even within cities it is difficult to assemble an integrated data set. Urban areas are often spread across many jurisdictions with no single agency responsible for collecting and reporting data for the entire area. Adding to the difficulties of data collection are gaps and overlaps in the data collection and reporting responsibilities of different administrative units. Creating a comprehensive, comparable international data set is further complicated by differences in the definition of an urban area and by uneven data quality.

The United Nations Global Plan of Action calls for monitoring the changing role of the world's cities and human settlements. The international agency with the mandate to assemble information on urban areas is the United Nations Centre for Human Settlements (UNCHS, or Habitat). Its Urban Indicators Programme is intended to provide data for monitoring and evaluating the performance of urban areas and for developing government policies and strategies. These data are collected through questionnaires completed by city officials in more than a hundred countries.

The table shows selected indicators for more than 160 cities from the UNCHS data set. A few more indicators are included on the *World Development Indicators* CD-ROM. These data are still preliminary and are undergoing further validation.

The selection of cities in the UNCHS database does not reflect population weights or the economic importance of cities and is therefore biased toward smaller cities. Moreover, it is based on demand for participation in the Urban Indicators Programme. As a result, the database excludes a large number of major cities. The table reflects this bias as well as the criterion of data availability for the indicators shown.

The data should be used with care. Because different data collection methods and definitions may have been used, comparisons can be misleading. In addition, the definitions used here for urban population and access to potable water are more stringent than those used for tables 3.5 and 3.10 (see *Definitions*).

Definitions

• **Urban population** refers to the population of the urban agglomeration, a contiguous inhabited territory without regard to administrative boundaries. • **Secure tenure** refers to the percentage of the population protected from involuntary removal from land or residence—including subtenancy, residence in social housing, and residences owned, purchased, or privately rented—except through due legal process. • **House price to income ratio** is the average house price divided by the average household income. • **Work trips by public transportation** are the percentage of trips to work made by bus or minibus, tram, or train. Buses or minibuses are road vehicles other than cars taking passengers on a fare-paying basis. Other means of transport commonly used in developing countries, such as taxi, ferry, rickshaw, or animal, are not included. • **Travel time to work** is the average time in minutes, for all modes, for a one-way trip to work. Train and bus times include average walking and waiting times, and car times include parking and walking to the workplace. • **Households with access to services** are the percentage of households in formal settlements with access to potable water and connections to sewerage, electricity, and telephone service. Households with access to potable water are those having access to safe or potable drinking water within 200 meters of the dwelling. Potable water is water that is free from contamination and safe to drink without further treatment. • **Wastewater treated** is the percentage of all wastewater undergoing some form of treatment.

3.11a

The use of public transportation for work trips varied widely across cities in 1998

%

Country	City	Share of total work trips	Country	City	Share of total work trips
Lao PDR	Vientiane	2	Kyrgyz Republic	Bishkek	95
Spain	Madrid	16	Russian Federation	Moscow	85
Canada	Hull	16	Armenia	Yerevan	84
Libya	Tripoli	18	Peru	Lima	82
Slovenia	Ljubljana	20	Gabon	Libreville	80
Kuwait	Kuwait City	21	Liberia	Monrovia	80
Jordan	Amman	21	Mongolia	Ulaanbaatar	80
Mexico	Ciudad Juarez	24	Moldova	Chisinau	80
Guinea	Conakry	26	Bulgaria	Sofia	79
Malawi	Lilongwe	27	Yemen, Rep.	Aden	78

Source: Table 3.11.

Data sources

The data are from the Global Urban Indicators database of the UNCHS.

3.12 Traffic and congestion

	Motor vehicles				Passenger cars		Two-wheelers		Road traffic		Fuel prices	
	per 1,000 people		per kilometer of road		per 1,000 people		per 1,000 people		million vehicle kilometers		Super $ per liter	Diesel $ per liter
	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000	2002	2002
Afghanistan	..	..	..	..	..	..	..	..	..	..	0.34	0.27
Albania	11	*47*	*3*	10	2	37	3	1	..	..	0.80	0.51
Algeria	..	..	..	..	..	..	..	..	..	..	0.22	0.10
Angola	18	..	..	..	14	..	..	..	..	..	0.19	0.13
Argentina	181	*181*	27	*30*	134	*140*	1	..	43,119	*27,458*	0.30	0.15
Armenia	5	..	2	..	1	..	..	..	..	..	0.42	0.29
Australia	530	..	11	*13*	450	*510*	18	*18*	*138,501*	..	0.50	0.48
Austria	421	*536*	30	*22*	387	*495*	71	*77*	..	..	0.84	0.73
Azerbaijan	52	*49*	7	16	36	41	*5*	1	..	..	0.37	0.16
Bangladesh	1	*1*	0	*1*	0	*0*	1	*1*	..	..	0.52	0.29
Belarus	61	*135*	13	20	59	145	..	52	*10,026*	4,964	0.50	0.36
Belgium	423	*497*	30	*35*	385	*448*	14	*25*	..	*158,759*	1.04	0.80
Benin	3	..	2	..	2	..	34	..	..	..	0.54	0.41
Bolivia	41	..	6	8	25	22	9	3	1,139	..	0.69	0.42
Bosnia and Herzegovina	114	..	24	..	101	..	..	..	..	..	0.74	0.74
Botswana	18	*68*	3	*11*	10	*29*	..	*1*	..	..	0.41	0.38
Brazil	88	..	8	17	..	137	..	28	..	..	0.55	0.31
Bulgaria	163	*266*	39	60	146	234	55	64	..	..	0.68	0.59
Burkina Faso	4	..	3	..	2	..	*9*	..	..	..	0.83	0.62
Burundi	..	..	..	..	..	..	..	..	..	..	0.58	0.54
Cambodia	1	*6*	0	31	0	26	9	134	*314*	7,210	0.63	0.44
Cameroon	10	..	3	..	6	..	..	..	..	..	0.68	0.57
Canada	605	*581*	20	*19*	468	*459*	12	*11*	..	..	0.51	0.43
Central African Republic	1	*0*	0	*0*	1	*0*	0	..	1,494	..	*0.81*	*0.65*
Chad	2	..	0	..	1	..	0	..	..	..	0.79	0.77
Chile	81	*135*	13	25	52	87	2	2	..	..	0.58	0.39
China	5	..	4	11	1	7	3	26	..	..	0.42	0.37
Hong Kong, China	66	*79*	253	*287*	42	*59*	4	*5*	8,192	*10,781*	1.47	0.77
Colombia	..	*51*	..	*19*	..	*43*	8	*12*	50,945	*41,587*	0.44	0.24
Congo, Dem. Rep.	..	..	..	..	..	..	..	..	..	..	0.70	0.69
Congo, Rep.	18	..	3	..	12	..	..	..	..	..	0.69	0.48
Costa Rica	87	*133*	7	*14*	55	*88*	14	*22*	..	*507,796*	0.64	0.44
Côte d'Ivoire	24	..	6	..	15	..	..	..	..	..	0.85	0.60
Croatia	..	..	..	44	..	257	..	15	..	13,764	0.89	0.74
Cuba	*37*	*32*	*16*	*6*	*18*	*16*	*19*	*16*	..	..	0.50	0.27
Czech Republic	246	*362*	46	67	228	335	113	73	..	..	0.81	0.71
Denmark	368	*411*	27	31	320	357	9	13	36,304	45,165	1.09	0.94
Dominican Republic	75	..	48	..	21	..	..	..	..	..	0.49	0.27
Ecuador	35	*46*	8	*14*	31	*43*	*2*	*2*	10,306	14,449	1.30	0.90
Egypt, Arab Rep.	29	..	33	..	21	..	6	..	..	..	0.19	0.08
El Salvador	33	*61*	14	*36*	17	*30*	0	*5*	2,002	3,646	0.46	0.33
Eritrea	1	..	1	..	1	..	..	..	..	..	0.36	0.25
Estonia	211	*397*	22	11	154	339	66	5	..	6,412	0.58	0.56
Ethiopia	1	*1*	2	3	1	1	0	*0*	..	1,642	0.52	0.32
Finland	441	*462*	29	*31*	386	*403*	12	*35*	39,750	*46,010*	1.12	0.80
France	494	*564*	32	38	405	476	*55*	*0*	422,000	519,400	1.05	0.80
Gabon	32	..	4	..	19	..	..	..	..	..	0.53	0.37
Gambia, The	13	..	5	..	6	..	..	..	..	..	0.46	0.40
Georgia	107	*58*	27	15	89	46	5	1	4,620	..	0.48	0.41
Germany	405	..	53	..	386	*516*	18	*56*	446,000	*589,500*	1.03	0.82
Ghana	..	..	..	..	..	..	..	..	..	..	0.28	0.23
Greece	248	*348*	22	*31*	171	*254*	120	*203*	..	*77,954*	0.78	0.68
Guatemala	..	*57*	..	*45*	..	*52*	..	*12*	..	3,455	1.23	0.92
Guinea	4	..	1	..	2	..	..	..	..	..	0.66	0.56
Guinea-Bissau	7	..	2	..	4	..	..	..	..	..	..	..
Haiti	..	..	..	..	..	..	..	..	..	..	0.54	0.30

Traffic and congestion 3.12

	Motor vehicles				Passenger cars		Two-wheelers		Road traffic		Fuel prices	
	per 1,000 people		per kilometer of road		per 1,000 people		per 1,000 people		million vehicle kilometers		Super $ per liter	Diesel $ per liter
	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000	2002	2002
Honduras	22	*62*	9	*28*	..	*52*	..	*15*	*3,288*	..	0.63	0.46
Hungary	212	*272*	21	*15*	188	*238*	16	*14*	22,898	..	0.94	0.85
India	4	*8*	2	*3*	2	*5*	15	*29*	..	..	0.66	0.41
Indonesia	16	*25*	10	*14*	7	*14*	34	*63*	..	..	0.27	0.19
Iran, Islamic Rep.	34	..	14	..	25	..	*36*	..	..	..	0.07	0.02
Iraq	14	..	6	..	1	..	..	..	..	..	0.02	0.01
Ireland	270	..	10	*14*	227	*296*	6	*11*	24,205	..	0.90	0.80
Israel	210	*270*	74	107	174	228	8	12	18,212	35,863	0.90	0.62
Italy	529	*591*	99	*73*	476	*545*	*45*	*125*	344,726	..	1.05	0.86
Jamaica	..	..	..	..	..	..	..	..	..	..	0.52	0.44
Japan	469	*560*	52	*62*	283	492	146	110	628,581	*765,056*	0.91	0.66
Jordan	60	..	26	..	..	..	*0*	..	*1,098*	..	0.52	0.17
Kazakhstan	76	*84*	8	*12*	50	*65*	..	*10*	18,248	*3,215*	0.35	0.29
Kenya	12	..	5	..	10	..	1	..	5,170	..	0.70	0.56
Korea, Dem. Rep.	..	..	..	..	..	..	..	..	..	..	0.55	0.41
Korea, Rep.	79	*239*	60	*128*	48	*168*	32	*59*	30,464	*67,266*	*0.92*	0.51
Kuwait	..	..	..	..	..	..	..	..	..	..	0.20	0.18
Kyrgyz Republic	44	*39*	10	*10*	44	*39*	..	*4*	5,220	..	0.39	0.25
Lao PDR	9	..	3	..	6	..	*18*	..	..	..	0.36	0.30
Latvia	135	*262*	6	9	106	235	76	9	3,932	..	0.70	0.65
Lebanon	321	*336*	183	..	300	*313*	13	*15*	..	..	0.65	0.25
Lesotho	11	..	4	..	3	..	..	..	..	..	0.50	0.47
Liberia	14	..	4	..	7	..	..	..	..	..	..	..
Libya	..	..	..	..	..	..	..	..	..	..	0.10	0.08
Lithuania	160	*338*	12	17	133	334	52	6	..	..	0.69	0.59
Macedonia, FYR	132	..	30	..	121	..	1	..	3,102	..	0.85	0.63
Madagascar	6	..	2	..	4	..	..	..	41,500	..	1.08	0.65
Malawi	4	..	4	..	2	..	..	..	..	..	0.66	0.62
Malaysia	124	*200*	26	*69*	101	181	167	230	..	..	0.35	0.19
Mali	3	..	2	..	2	..	..	..	..	..	0.69	0.55
Mauritania	10	..	3	..	7	..	..	..	..	..	0.63	0.39
Mauritius	59	*98*	35	49	44	*73*	54	*96*	..	..	..	..
Mexico	119	*151*	41	*44*	82	107	3	..	55,095	..	0.62	0.47
Moldova	53	*70*	17	*24*	48	*54*	45	..	..	*538*	0.45	0.31
Mongolia	21	*30*	1	2	6	18	22	10	340	40	0.38	0.37
Morocco	37	*52*	15	21	28	*41*	1	*1*	..	..	0.87	0.55
Mozambique	4	..	2	0	3	..	..	..	1,889	..	0.46	0.43
Myanmar	..	..	..	..	..	..	..	..	..	..	0.33	0.12
Namibia	71	..	1	2	39	..	1	..	1,896	2,706	0.45	0.43
Nepal	..	..	..	..	..	..	..	..	..	..	0.66	0.34
Netherlands	405	*427*	58	*58*	368	*383*	44	*25*	90,150	*109,955*	1.12	0.81
New Zealand	524	*540*	19	29	436	580	24	21	..	..	0.55	0.33
Nicaragua	19	*10*	5	8	10	12	3	5	108	523	0.58	0.53
Niger	6	..	4	5	5	..	..	..	178	240	0.77	0.55
Nigeria	*30*	..	*21*	14	*12*	..	*5*	..	*2,927,931*	2,701,208	0.20	0.19
Norway	458	*505*	22	25	380	412	48	56	..	*30,148*	1.23	1.18
Oman	130	..	9	..	83	..	3	..	..	..	0.31	0.29
Pakistan	6	*8*	4	*4*	4	*5*	8	*15*	18,933	*218,779*	0.52	0.35
Panama	75	*113*	18	*27*	60	*83*	2	*3*	..	..	0.51	0.36
Papua New Guinea	..	..	..	..	..	..	..	..	..	..	0.53	0.34
Paraguay	..	..	..	..	..	..	..	..	..	..	0.56	0.34
Peru	..	*43*	..	*15*	..	*27*	..	..	..	..	0.21	0.14
Philippines	10	*31*	4	*11*	7	*10*	6	*14*	*6,189*	*9,548*	0.35	0.27
Poland	168	*286*	18	33	138	259	36	21	59,608	138,100	0.83	0.68
Portugal	222	*348*	34	..	162	*321*	5	*77*	28,623	*93,020*	0.97	0.71
Puerto Rico	..	..	..	..	..	..	..	..	..	..	*0.34*	*0.32*

3.12 Traffic and congestion

	Motor vehicles				Passenger cars		Two-wheelers		Road traffic		Fuel prices	
	per 1,000 people		per kilometer of road		per 1,000 people		per 1,000 people		million vehicle kilometers		Super $ per liter	Diesel $ per liter
	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000	2002	2002
Romania	72	*154*	11	*17*	56	*133*	13	*14*	23,907	*36,884*	0.64	0.57
Russian Federation	*87*	*153*	*14*	48	*65*	140	..	*43*	..	*60,950*	0.35	0.25
Rwanda	2	..	1	2	1	..	..	..	..	..	0.84	0.84
Saudi Arabia	165	..	19	..	98	..	0	..	..	..	0.24	0.10
Senegal	11	..	6	8	8	..	0	..	..	..	0.75	0.53
Sierra Leone	10	..	4	2	7	*2*	2	*0*	*996*	529	0.51	0.50
Singapore	130	*132*	142	*170*	89	*97*	40	*34*	..	..	0.85	0.38
Slovak Republic	194	*260*	57	*33*	163	*229*	61	*8*	..	0	0.74	0.70
Slovenia	306	*455*	42	46	289	426	8	6	5,620	9,245	0.76	0.67
Somalia	2	..	1	0	1	..	..	..	..	..	..	..
South Africa	139	*143*	26	*11*	97	*94*	8	*4*	..	..	0.43	0.40
Spain	360	*467*	43	*53*	309	*404*	79	*90*	100,981	*201,896*	0.83	0.72
Sri Lanka	21	*36*	4	7	7	*12*	24	*44*	3,468	*15,630*	0.54	0.31
Sudan	9	..	21	28	8	..	..	..	..	..	0.30	0.24
Swaziland	66	*70*	18	17	35	*34*	3	*3*	..	..	0.47	0.44
Sweden	464	*478*	29	21	426	451	11	31	61,040	69,200	1.06	0.96
Switzerland	491	*526*	46	54	449	494	114	102	48,660	53,506	0.89	0.93
Syrian Arab Republic	26	*30*	10	*11*	10	*9*	..	..	..	..	0.53	0.18
Tajikistan	3	..	1	..	0	..	..	..	..	..	0.36	0.24
Tanzania	5	..	2	2	1	..	..	..	..	..	0.67	0.61
Thailand	46	..	36	..	14	..	86	..	45,769	..	0.36	0.32
Togo	24	..	11	..	16	..	8	..	..	..	0.56	0.46
Trinidad and Tobago	..	..	..	..	..	..	..	..	..	..	0.40	0.21
Tunisia	48	..	19	40	23	54	..	1	..	1,092,675	0.29	0.19
Turkey	50	*85*	8	*14*	34	*63*	10	*15*	27,041	*49,846*	1.02	0.78
Turkmenistan	..	..	..	..	..	..	..	..	..	..	0.02	0.01
Uganda	2	*5*	..	*4*	1	*2*	0	*3*	..	..	0.83	0.70
Ukraine	63	..	19	..	63	*104*	..	*49*	59,500	*61,200*	0.47	0.34
United Arab Emirates	121	..	52	..	97	..	..	..	..	..	0.29	0.30
United Kingdom	400	*424*	64	*62*	341	*389*	14	*3*	399,000	*462,400*	1.18	1.20
United States	758	*759*	30	*34*	573	*475*	17	*15*	2,527,441	2,653,043	0.40	0.39
Uruguay	138	*174*	45	*63*	122	*158*	74	*110*	..	..	0.46	0.20
Uzbekistan	..	..	..	..	..	..	..	..	..	..	0.38	0.26
Venezuela, RB	..	..	..	..	..	..	..	..	..	*563*	0.05	0.05
Vietnam	..	..	..	..	..	..	45	..	..	..	0.34	0.27
West Bank and Gaza	..	..	..	..	..	..	..	..	..	..	0.99	0.52
Yemen, Rep.	34	..	8	..	14	..	..	..	8,681	11,476	0.21	0.10
Yugoslavia, Fed. Rep.	137	*190*	31	*36*	133	*150*	3	*3*	..	..	0.74	0.66
Zambia	14	..	3	..	8	..	..	..	..	..	0.72	0.60
Zimbabwe	..	..	..	..	..	..	..	..	..	..	..	..
World	**120 w**	***176* w**	**.. w**	**.. w**	**91 w**	***141* w**	**.. w**	**.. w**	**.. w**	**.. w**	**0.56 m**	**0.43 m**
Low income	9	*10*	..	..	6	*9*	..	..	..	..	0.54	0.41
Middle income	39	65	..	..	25	49	..	..	..	..	0.54	0.38
Lower middle income	19	32	..	..	11	23	..	..	..	..	0.51	0.37
Upper middle income	127	193	..	..	114	153	..	..	..	..	0.57	0.40
Low & middle income	25	*57*	..	..	16	*45*	..	..	..	..	0.54	0.39
East Asia & Pacific	9	16	..	..	4	10	..	..	..	..	0.36	0.31
Europe & Central Asia	98	204	..	..	82	171	..	..	..	..	0.64	0.56
Latin America & Carib.	92	158	..	..	..	119	..	..	..	..	0.54	0.36
Middle East & N. Africa	57	..	..	..	31	..	..	..	..	..	0.30	0.17
South Asia	4	*8*	..	..	2	*5*	..	..	..	..	0.54	0.34
Sub-Saharan Africa	24	..	..	..	14	..	..	..	..	..	0.59	0.48
High income	514	*586*	..	..	396	*443*	..	..	..	..	0.89	0.68
Europe EMU	453	*558*	..	..	379	*496*	..	..	..	..	1.00	0.80

Traffic and congestion

About the data

Traffic congestion in urban areas constrains economic productivity, damages people's health, and degrades the quality of their lives. The particulate air pollution emitted by motor vehicles—the dust and soot in exhaust—is proving to be far more damaging to human health than was once believed. (For information on suspended particulates and other air pollutants, see table 3.13.)

In recent years ownership of passenger cars has increased, and the expansion of economic activity has led to the transport by road of more goods and services over greater distances (see table 5.9). These developments have increased demand for roads and vehicles, adding to urban congestion, air pollution, health hazards, traffic accidents, and injuries.

Congestion, the most visible cost of expanding vehicle ownership, is reflected in the indicators in the table. Other relevant indicators—such as average vehicle speed in major cities or the cost of traffic congestion, which takes a heavy toll on economic productivity—are not included here because data are incomplete or difficult to compare.

The data in the table—except for those on fuel prices—are compiled by the International Road Federation (IRF) through questionnaires sent to national organizations. The IRF uses a hierarchy of sources to gather as much information as possible. The primary sources are national road associations. Where such an association lacks data or does not respond, other agencies are contacted, including road directorates, ministries of transport or public works, and central statistical offices. As a result, the compiled data are of uneven quality. The coverage of each indicator may differ across countries because of differences in definitions. Comparability also is limited when time-series data are reported. Moreover, the data do not capture the quality or age of vehicles or the condition or width of roads. Thus comparisons over time and between countries should be made with caution.

The data on fuel prices are compiled by the German Agency for Technical Cooperation (GTZ) from its global network of regional offices and representatives as well as other sources, including the Allgemeiner Deutscher Automobil Club (for Europe) and a project of the Latin American Energy Organization (OLADE, for Latin America). Local prices have been converted to U.S. dollars using the exchange rate on the survey date as listed in the international monetary table of the *Financial Times*. For countries with multiple exchange rates, the market, parallel, or black market rate was used rather than the official exchange rate.

Definitions

• **Motor vehicles** include cars, buses, and freight vehicles but not two-wheelers. Population figures refer to the midyear population in the year for which data are available. Roads refer to motorways, highways, main or national roads, and secondary or regional roads. A motorway is a road specially designed and built for motor traffic that separates the traffic flowing in opposite directions. • **Passenger cars** refer to road motor vehicles, other than two-wheelers, intended for the carriage of passengers and designed to seat no more than nine people (including the driver). • **Two-wheelers** refer to mopeds and motorcycles. • **Road traffic** is the number of vehicles multiplied by the average distances they travel. • **Fuel prices** refer to the pump prices of the most widely sold grade of gasoline and of diesel fuel. Prices have been converted from the local currency to U.S. dollars (see *About the data*).

3.12a

The 10 countries with the fewest passenger cars per 1,000 people in 2002—and the 10 with the most

Per 1,000 people

Country	Passenger cars	Country	Passenger cars
Central African Republic	0 [a]	New Zealand	580
Bangladesh	1 [b]	Italy	545
Ethiopia	1	Germany	516
Sierra Leone	2	Australia	510
Uganda	2	Austria	495
Pakistan	5	Switzerland	494
India	5	Japan	492
China	7	France	476
Syrian Arab Republic	9	United States	475
Philippines	10	Canada	459
Sri Lanka	12	Sweden	451
World (average)	141		

a. One for every 4,000 people.
b. One for every 2,000 people.

Source: Table 3.12.

Data sources

The data on vehicles and traffic are from the IRF's electronic files and its annual *World Road Statistics*. The data on fuel prices are from the GTZ's electronic files.

3.13 Air pollution

	City	City population	Particulate matter	Sulfur dioxide	Nitrogen dioxide
		thousands	micrograms per cubic meter	micrograms per cubic meter	micrograms per cubic meter
		2000	1999	1990–98 [a]	1990–98 [a]
Argentina	Cordoba City	1,370	52	..	97
Australia	Melbourne	3,293	15	..	30
	Perth	1,245	15	5	19
	Sydney	3,855	22	28	81
Austria	Vienna	1,904	39	14	42
Belgium	Brussels	983	31	20	48
Brazil	Rio de Janeiro	5,902	40	129	..
	São Paulo	9,984	46	43	83
Bulgaria	Sofia	1,177	83	39	122
Canada	Montreal	3,519	22	10	42
	Toronto	4,535	26	17	43
	Vancouver	1,880	15	14	37
Chile	Santiago	4,522	73	29	81
China	Anshan	3,132	99	115	88
	Beijing	9,302	106	90	122
	Changchun	3,766	88	21	64
	Chengdu	4,401	103	77	74
	Chongquing	3,945	147	340	70
	Dalian	4,389	60	61	100
	Guangzhu	495	74	57	136
	Guiyang	2,103	84	424	53
	Harbin	4,545	91	23	30
	Jinan	3,037	112	132	45
	Kunming	2,037	84	19	33
	Lanzhou	2,044	109	102	104
	Liupanshui	2,330	70	102	..
	Nanchang	1,594	94	69	29
	Pinxiang	1,754	80	75	..
	Quingdao	2,316	..	190	64
	Shanghai	10,367	87	53	73
	Shenyang	5,881	120	99	73
	Taiyuan	2,811	105	211	55
	Tianjin	7,333	149	82	50
	Urumqi	1,467	61	60	70
	Wuhan	4,842	94	40	43
	Zhengzhou	2,214	116	63	95
	Zibo	3,139	88	198	43
Colombia	Bogota	5,442	33	..	..
Croatia	Zagreb	908	39	31	..
Cuba	Havana	2,270	28	1	5
Czech Republic	Prague	1,211	27	14	33
Denmark	Copenhagen	1,371	24	7	54
Ecuador	Guayaquil	2,120	26	15	..
	Quito	1,598	34	22	..
Egypt, Arab Rep.	Cairo	7,941	178	69	..
Finland	Helsinki	1,095	22	4	35
France	Paris	9,851	15	14	57
Germany	Berlin	3,555	25	18	26
	Frankfurt	668	22	11	45
	Munich	1,275	22	8	53
Ghana	Accra	1,938	31	..	..
Greece	Athens	3,229	50	34	64
Hungary	Budapest	1,958	26	39	51
Iceland	Reykjavik	164	21	5	42

About the data

In many towns and cities exposure to air pollution is the main environmental threat to human health. Long-term exposure to high levels of soot and small particles in the air contributes to a wide range of health effects, including respiratory diseases, lung cancer, and heart disease. Particulate pollution, on its own or in combination with sulfur dioxide, leads to an enormous burden of ill health.

Emissions of sulfur dioxide and nitrogen oxides lead to the deposition of acid rain and other acidic compounds over long distances. Acid deposition changes the chemical balance of soils and can lead to the leaching of trace minerals and nutrients critical to trees and plants.

Where coal is the primary fuel for power plants, steel mills, industrial boilers, and domestic heating, the result is usually high levels of urban air pollution—especially particulates and sometimes sulfur dioxide—and, if the sulfur content of the coal is high, widespread acid deposition. Where coal is not an important primary fuel or is used by plants with effective dust control, the worst emissions of air pollutants stem from the combustion of petroleum products.

The data on sulfur dioxide and nitrogen dioxide concentrations are based on reports from urban monitoring sites. Annual means (measured in micrograms per cubic meter) are average concentrations observed at these sites. Coverage is not comprehensive because not all cities have monitoring systems.

The data on particulate matter concentrations are new estimates, for selected cities, of average annual concentrations in residential areas away from air pollution "hotspots," such as industrial districts and transport corridors. The data have been extracted from a complete set of estimates developed by the World Bank's Development Research Group and Environment Department in a study of annual ambient concentrations of particulate matter in world cities with populations exceeding 100,000 (Pandey and others 2003).

Pollutant concentrations are sensitive to local conditions, and even in the same city different monitoring sites may register different concentrations. Thus these data should be considered only a general indication of air quality in each city, and cross-country comparisons should be made with caution. The current World Health Organization (WHO) air quality guidelines for annual mean concentrations are 50 micrograms per cubic meter for sulfur dioxide and 40 for nitrogen dioxide. The WHO has set no guidelines for particulate matter concentrations below which there are no appreciable health effects.

Air pollution 3.13

	City	City population	Particulate matter	Sulfur dioxide	Nitrogen dioxide
		thousands	micrograms per cubic meter	micrograms per cubic meter	micrograms per cubic meter
		2000	1999	1998 [a]	1998 [a]
India	Ahmedabad	4,154	104	30	21
	Bangalore	5,180	56	..	..
	Calcutta	13,822	153	49	34
	Chennai	6,002	..	15	17
	Delhi	10,558	187	24	41
	Hyderabad	5,448	51	12	17
	Kanpur	2,546	136	15	14
	Lucknow	2,093	136	26	25
	Mumbai	15,797	79	33	39
	Nagpur	2,087	69	6	13
	Pune	3,128	58		
Indonesia	Jakarta	10,845	103	..	..
Iran, Islamic Rep.	Tehran	7,689	71	209	..
Ireland	Dublin	991	23	20	..
Italy	Milan	1,381	36	31	248
	Rome	2,713	35	..	..
	Torino	969	53	..	..
Japan	Osaka	2,626	39	19	63
	Tokyo	12,483	43	18	68
	Yokohama	3,366	32	100	13
Kenya	Nairobi	2,383	49	..	..
Korea, Rep	Pusan	4,075	43	60	51
	Seoul	11,548	45	44	60
	Taegu	2,417	49	81	62
Malaysia	Kuala Lumpur	1,530	24	24	..
Mexico	Mexico City	18,017	69	74	130
Netherlands	Amsterdam	1,131	37	10	58
New Zealand	Auckland	989	15	3	20
Norway	Oslo	805	23	8	43
Philippines	Manila	10,432	60	33	..
Poland	Lodz	873	45	21	43
	Warsaw	1,716	49	16	32
Portugal	Lisbon	3,318	30	8	52
Romania	Bucharest	2,070	25	10	71
Russian Federation	Moscow	8,811	27	109	..
	Omsk	1,206	28	20	34
Singapore	Singapore	3,163	41	20	30
Slovak Republic	Bratislava	456	22	21	27
South Africa	Cape Town	2,942	15	21	72
	Durban	1,364	29	31	..
	Johannesburg	2,344	30	19	31
Spain	Barcelona	1,645	43	11	43
	Madrid	3,068	37	24	66
Sweden	Stockholm	916	15	3	20
Switzerland	Zurich	980	24	11	39
Thailand	Bangkok	7,296	82	11	23
Turkey	Ankara	3,702	53	55	46
	Istanbul	9,286	62	120	..
Ukraine	Kiev	2,622	45	14	51
United Kingdom	Birmingham	2,344	17	9	45
	London	7,812	23	25	77
	Manchester	2,325	19	26	49
United States	Chicago	9,024	27	14	57
	Los Angeles	16,195	38	9	74
	New York	20,951	23	26	79
Venezuela, RB	Caracas	3,488	18	33	57

a. Data are for the most recent year available.

Definitions

• **City population** is the number of residents of the city or metropolitan area as defined by national authorities and reported to the United Nations. • **Particulate matter** refers to fine suspended particulates less than 10 microns in diameter that are capable of penetrating deep into the respiratory tract and causing significant health damage. The state of a country's technology and pollution controls is an important determinant of particulate matter concentrations. • **Sulfur dioxide** is an air pollutant produced when fossil fuels containing sulfur are burned. It contributes to acid rain and can damage human health, particularly that of the young and the elderly. • **Nitrogen dioxide** is a poisonous, pungent gas formed when nitric oxide combines with hydrocarbons and sunlight, producing a photochemical reaction. These conditions occur in both natural and anthropogenic activities. Nitrogen dioxide is emitted by bacteria, motor vehicles, industrial activities, nitrogenous fertilizers, combustion of fuels and biomass, and aerobic decomposition of organic matter in soils and oceans.

Data sources

City population data are from United Nations Population Division. The data on sulfur dioxide and nitrogen dioxide concentrations are from the WHO's Healthy Cities Air Management Information System and the World Resources Institute, which relies on various national sources as well as, among others, the United Nations Environment Programme (UNEP) and WHO's *Urban Air Pollution in Megacities of the World* (1992), the Organisation for Economic Co-operation and Development's (OECD) *OECD Environmental Data: Compendium 1999*, the U.S. Environmental Protection Agency's *National Air Quality and Emissions Trends Report 1995*, AIRS Executive International database, and the United Nations Centre for Human Settlements' (UNCHS) Urban Indicators database. The data on particulate matter concentrations are from a recent World Bank study by Kiran D. Pandey, Katharine Bolt, Uwe Deichman, Kirk Hamilton, Bart Ostro, and David Wheeler, "The Human Cost of Air Pollution: New Estimates for Developing Countries" (2003).

3.14 Government commitment

	Environmental strategy or action plan	Country environmental profile	Biodiversity assessment, strategy, or action plan	Participation in treaties [a]				
				Climate change	Ozone layer	CFC control	Law of the Sea [b]	Biological diversity
Afghanistan	..	..	..	2002	..	..	..	2002
Albania	1993	..	..	1995	1999	1999	..	1994
Algeria	2001	..	..	1994	1992	1992	1996	1995
Angola	..	..	..	2000	2000	2000	1994	1998
Argentina	1992	..	..	1994	1990	1990	1996	1995
Armenia	..	..	..	1994	1999	1999	2002	1993
Australia	1992	..	1994	1994	1987	1989	1995	1993
Austria	..	..	..	1994	1987	1989	1995	1994
Azerbaijan	1998	..	..	1995	1996	1996	..	2000 [c]
Bangladesh	1991	1989	1990	1994	1990	1990	2001	1994
Belarus	..	..	..	2000	1986	1988	..	1993
Belgium	..	..	..	1996	1988	1988	1998	1997
Benin	1993	..	..	1994	1993	1993	1997	1994
Bolivia	1994	1986	1988	1995	1994	1994	1995	1995
Bosnia and Herzegovina	..	..	..	2000	1992	1992	1994	2002
Botswana	1990	1986	1991	1994	1991	1991	1994	1996
Brazil	..	..	1988	1994	1990	1990	1994	1994
Bulgaria	..	..	1994	1995	1990	1990	1996	1996
Burkina Faso	1993	1994	..	1994	1989	1989	..	1993
Burundi	1994	1981	1989	1997	1997	1997	..	1997
Cambodia	1999	..	..	1996	2001	2001	..	1995
Cameroon	..	1989	1989	1995	1989	1989	1994	1995
Canada	1990	..	1994	1994	1986	1988	..	1993
Central African Republic	..	..	..	1995	1993	1993	..	1995
Chad	1990	1982	..	1994	1989	1994	..	1994
Chile	..	1987	1993	1995	1990	1990	1997	1994
China	1994	..	1994	1994	1989	1991	1996	1993
Hong Kong, China	..	..	..	..	..	..	..	..
Colombia	1998	1990	1988	1995	1990	1993	..	1995
Congo, Dem. Rep.	..	1986	1990	1995	1994	1994	1994	1995
Congo, Rep.	..	..	1990	1997	1994	1994	..	1996
Costa Rica	1990	1987	1992	1994	1991	1991	1994	1994
Côte d'Ivoire	1994	..	1991	1995	1993	1993	1994	1995
Croatia	2001	1998	2000	1996	1991	1991	1994	1997
Cuba	..	..	..	1994	1992	1992	1994	1994
Czech Republic	1994	..	..	1994	1993	1993	1996	1994
Denmark	1994	..	..	1994	1988	1998	..	1994
Dominican Republic	..	1984	1995	1999	1993	1993	..	1996
Ecuador	1993	1987	1995	1994	1990	1990	..	1993
Egypt, Arab Rep.	1992	1992	1988	1995	1988	1988	1994	1994
El Salvador	1994	1985	1988	1996	1992	1992	..	1994
Eritrea	1995	..	..	1995	..	..	..	1996
Estonia	1998	..	..	1994	1996	1996	..	1994
Ethiopia	1994	..	1991	1994	1994	1994	..	1994
Finland	1995	..	..	1994	1986	1988	1996	1994
France	1990	..	..	1994	1987	1988	1996	1994
Gabon	..	..	1990	1998	1994	1994	..	2000
Gambia, The	1992	1981	1989	1994	1990	1990	1998	1994
Georgia	1998	..	..	1994	1996	1996	1996	1994
Germany	..	..	..	1994	1988	1988	1994	1994
Ghana	1992	1985	1988	1995	1989	1989	1994	1994
Greece	..	..	..	1994	1988	1988	1995	1994
Guatemala	1994	1984	1988	1996	1987	1989	1997	1995
Guinea	1994	1983	1988	1994	1992	1992	1994	1993
Guinea-Bissau	1993	..	1991	1996	2002	2002	1994	1996
Haiti	1999	1985	..	1996	2000	2000	1996	1996

3.14a Status of national environmental action plans

Completed

Albania	Ghana	Niger
Algeria	Grenada	Nigeria
Armenia	Guinea	Pakistan
Azerbaijan	Guinea-Bissau	Papua New Guinea
Bangladesh	Guyana	Poland
Belarus	Haiti	Romania
Benin	Honduras	Russian Federation
Bhutan	India	Rwanda
Bolivia	Indonesia	São Tomé and Principe
Botswana	Iran, Islamic Rep.	Senegal
Bulgaria	Kazakhstan	Seychelles
Burkina Faso	Kenya	Sierra Leone
Burundi	Kiribati	Slovak Republic
Cambodia	Kyrgyz Republic	Slovenia
Cameroon	Lao PDR	Solomon Islands
Cape Verde	Latvia	South Africa
China	Lebanon	Sri Lanka
Colombia	Lesotho	St. Kitts and Nevis
Comoros	Lithuania	Swaziland
Congo, Dem. Rep.	Macedonia, FYR	Syrian Arab Rep.
Congo, Rep.	Madagascar	Tanzania
Costa Rica	Malawi	Togo
Côte d'Ivoire	Maldives	Tonga
Croatia	Mali	Tunisia
Czech Republic	Mauritania	Turkey
Djibouti	Mauritius	Uganda
Egypt, Arab Rep.	Mexico	Ukraine
El Salvador	Moldova	Uruguay
Equatorial Guinea	Mongolia	Uzbekistan
Eritrea	Montserrat	Vanuatu
Estonia	Morocco	West Bank and Gaza
Ethiopia	Mozambique	Vietnam
Gabon	Namibia	Yemen, Rep.
Gambia, The	Nepal	Zambia
Georgia	Nicaragua	

Under preparation

Argentina	Ecuador	Tajikistan
Belize	Korea, Rep.	Turkmenistan
Central African Republic	Malaysia	Zimbabwe
Dominican Republic	Paraguay	

Note: Status is as of February 2003.
Source: World Bank Environmentally and Socially Sustainable Development Network Advisory Service, World Resources Institute, and International Institute for Environment and Development.

Government commitment 3.14

	Environmental strategies or action plans	Country environmental profile	Biodiversity assessments, strategies or action plans	Participation in treaties [a]				
				Climate change	Ozone layer	CFC control	Law of the Sea [b]	Biological diversity
Honduras	1993	1989	..	1996	1993	1993	1994	1995
Hungary	1995	..	..	1994	1988	1989	2002	1994
India	1993	1989	1994	1994	1991	1992	1995	1994
Indonesia	1993	1994	1993	1994	1992	1992	1994	1994
Iran, Islamic Rep.	..	..	..	1996	1990	1990	..	1996
Iraq	..	..	..	..	..	..	1994	..
Ireland	..	..	..	1994	1988	1988	..	1996
Israel	..	..	..	1996	1992	1992	..	1995
Italy	..	..	..	1994	1988	1988	1995	1994
Jamaica	1994	1987	..	1995	1993	1993	1994	1995
Japan	..	..	..	1994	1988	1988	1996	1993
Jordan	1991	1979	..	1994	1989	1989	1995	1994
Kazakhstan	..	..	..	1995	1998	1998	..	1994
Kenya	1994	1989	1992	1994	1988	1988	1994	1994
Korea, Dem. Rep.	..	..	..	1995	1995	1995	..	1995
Korea, Rep.	..	..	..	1994	1992	1992	1996	1995
Kuwait	..	..	..	1995	1992	1992	1994	2002
Kyrgyz Republic	1995	..	..	2000	2000	2000	..	1996
Lao PDR	1995	..	..	1995	1998	1998	1998	1996
Latvia	..	..	..	1995	1995	1995	..	1996
Lebanon	..	..	..	1995	1993	1993	1995	1995
Lesotho	1989	1982	..	1995	1994	1994	..	1995
Liberia	..	..	..	2002	1996	1996	..	2000
Libya	..	..	..	1999	1990	1990	..	2001
Lithuania	..	..	..	1995	1995	1995	..	1996
Macedonia, FYR	..	..	..	1998	1994	1994	1994	1997 [c]
Madagascar	1988	..	1991	1996	1996	1996	2001	1996
Malawi	1994	1982	..	1994	1991	1991	..	1994
Malaysia	1991	1979	1988	1994	1989	1989	1997	1994
Mali	..	1991	1989	1995	1994	1994	1994	1995
Mauritania	1988	1984	..	1994	1994	1994	1996	1996
Mauritius	1990	..	..	1994	1992	1992	1994	1993
Mexico	..	..	1988	1994	1987	1988	1994	1993
Moldova	2002	..	..	1995	1996	1996	..	1996
Mongolia	1995	..	..	1994	1996	1996	1997	1993
Morocco	..	1980	1988	1996	1995	1995	..	1995
Mozambique	1994	..	..	1995	1994	1994	1997	1995
Myanmar	..	1982	1989	1995	1993	1993	1996	1995
Namibia	1992	..	..	1995	1993	1993	1994	1997
Nepal	1993	1983	..	1994	1994	1994	1998	1994
Netherlands	1994	..	..	1994	1988	1988	1996	1994
New Zealand	1994	..	..	1994	1987	1988	1996	1993
Nicaragua	1994	1981	..	1996	1993	1993	2000	1996
Niger	..	1985	1991	1995	1992	1992	..	1995
Nigeria	1990	..	1992	1994	1988	1988	1994	1994
Norway	..	..	1994	1994	1986	1988	1996	1993
Oman	..	1981	..	1995	1999	1999	1994	1995
Pakistan	1994	1994	1991	1994	1992	1992	1997	1994
Panama	1990	1980	..	1995	1989	1989	1996	1995
Papua New Guinea	1992	1994	1993	1994	1992	1992	1997	1993
Paraguay	..	1985	..	1994	1992	1992	1994	1994
Peru	..	1988	1988	1994	1989	1993	..	1993
Philippines	1989	1992	1989	1994	1991	1991	1994	1994
Poland	1993	..	1991	1994	1990	1990	1998	1996
Portugal	1995	..	..	1994	1988	1988	1997	1994
Puerto Rico	..	..	..	..	..	..	..	..

3.14b

States that have signed the Kyoto Protocol of the Convention on Climate Change

Completed

Antigua and Barbuda [a]	Greece [a]	Niue [a]
Argentina [a]	Grenada [a]	Norway [a]
Australia	Guatemala [a]	Palau [a]
Austria [a]	Guinea [a]	Panama [a]
Azerbaijan [a]	Honduras [a]	Papua New Guinea [a]
Bahamas, The [a]	Hungary [a]	Paraguay [a]
Bangladesh [a]	Iceland [a]	Peru [a]
Barbados [a]	India [a]	Philippines
Belgium [a]	Indonesia	Poland [a]
Benin [a]	Ireland [a]	Portugal
Bhutan [a]	Israel	Romania [a]
Bolivia [a]	Italy [a]	Russian Federation
Brazil [a]	Jamaica [a]	Samoa [a]
Bulgaria [a]	Japan	Senegal [a]
Burundi [a]	Jordan [a]	Seychelles [a]
Cambodia [a]	Kazakhstan	Slovak Republic [a]
Canada [a]	Kiribati [a]	Slovenia [a]
Chile [a]	Korea, Rep. [a]	Solomon Islands
China	Latvia [a]	South Africa [a]
Colombia [a]	Lesotho [a]	Spain [a]
Cook Islands [a]	Liechtenstein	Sri Lanka [a]
Costa Rica [a]	Lithuania [a]	St. Lucia
Croatia	Luxembourg [a]	St. Vincent and the Grenadines
Cuba [a]	Malawi [a]	Sweden [a]
Cyprus [a]	Malaysia [a]	Switzerland
Czech Republic	Maldives [a]	Thailand [a]
Denmark [a]	Mali [a]	Trinidad and Tobago [a]
Djibouti [a]	Malta [a]	Tunisia [a]
Dominican Republic [a]	Marshall Islands	Turkmenistan [a]
Ecuador [a]	Mauritius [a]	Tuvalu [a]
Egypt, Arab Rep.	Mexico [a]	Uganda [a]
El Salvador [a]	Micronesia [a]	Ukraine
Equatorial Guinea [a]	Monaco	United Kingdom [a]
Estonia [a]	Mongolia [a]	United States
Fiji [a]	Morocco [a]	Uruguay [a]
Finland [a]	Nauru [a]	Uzbekistan [a]
France	Netherlands [a]	Vanuatu [a]
Gambia, The [a]	New Zealand [a]	Vietnam [a]
Georgia [a]	Nicaragua [a]	Zambia
Germany [a]	Niger	

Note: Status is as of January 2003.
a. Ratification or accession signed.
Source: Secretariat of the United Nations Framework Convention on Climate Change.

3.14 Government commitment

	Environmental strategies or action plans	Country environmental profile	Biodiversity assessments, strategies or action plans	Participation in treaties [a]				
				Climate change	Ozone layer	CFC control	Law of the Sea [b]	Biological diversity
Romania	1995	..	..	1994	1993	1993	1997	1994
Russian Federation	1999	..	1994	1995	1986	1988	1997	1995
Rwanda	1991	1987	..	1998	2001	2001	..	1996
Saudi Arabia	..	..	..	1995	1993	1993	..	2001
Senegal	1984	1990	1991	1995	1993	1993	1994	1995
Sierra Leone	1994	..	..	1995	2001	2001	1995	1995
Singapore	1993	1988	1995	1997	1989	1989	1994	1996
Slovak Republic	..	..	..	1994	1993	1993	1996	1994
Slovenia	1994	..	..	1996	1992	1992	1994	1996
Somalia	..	..	..	..	2001	2001	1994	..
South Africa	1993	..	..	1997	1990	1990	1997	2000
Spain	..	..	..	1994	1988	1989	1997	1994
Sri Lanka	1994	1983	1991	1994	1989	1989	1994	1994
Sudan	..	1989	..	1994	1993	1993	1994	1996
Swaziland	..	..	..	1997	1992	1992	..	1995
Sweden	..	..	..	1994	1986	1988	1996	1994
Switzerland	..	..	..	1994	1987	1988	..	1995
Syrian Arab Republic	1999	1981	..	1996	1989	1989	..	1996
Tajikistan	..	..	..	1998	1996	1998	..	1997
Tanzania	1994	1989	1988	1996	1993	1993	1994	1996
Thailand	..	1992	..	1995	1989	1989	..	..
Togo	1991	..	..	1995	1991	1991	1994	1996
Trinidad and Tobago	..	..	..	1994	1989	1989	1994	1996
Tunisia	1994	1980	1988	1994	1989	1989	1994	1993
Turkey	1998	1982	..	..	1991	1991	..	1997
Turkmenistan	..	..	..	1995	1993	1993	..	1996
Uganda	1994	1982	1988	1994	1988	1988	1994	1993
Ukraine	1999	..	..	1997	1986	1988	1999	1995
United Arab Emirates	..	..	..	1996	1989	1989	..	2000
United Kingdom	1995	..	1994	1994	1987	1988	1997	1994
United States	1995	..	1995	1994	1986	1988	..	..
Uruguay	..	..	..	1994	1989	1991	1994	1994
Uzbekistan	..	..	..	1994	1993	1993	..	1995
Venezuela	..	..	..	1995	1988	1989	..	1994
Vietnam	..	..	1993	1995	1994	1994	1994	1995
West Bank and Gaza	..	..	..	..	..	..	..	..
Yemen, Rep.	1996	1990	1992	1996	1996	1996	1994	1996
Yugoslavia, Fed. Rep.	..	..	..	2001	1992	1992	2001	..
Zambia	1994	1988	..	1994	1990	1990	1994	1993
Zimbabwe	1987	1982	..	1994	1992	1992	1994	1995

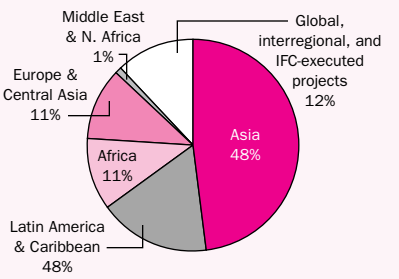
a. The year shown for a country refers to the year in which a treaty entered into force in that country. b. Convention became effective November 16, 1994. c. Ratification of the treaty.

3.14c

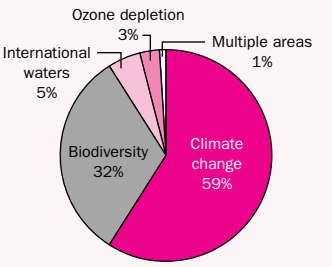
Global focus on biodiversity and climate change

Allocation of funds for Global Environment Facility programs, February 1995–January 2003
Total allocation: $7,269 million

By region



By focal area



Source: Global Environment Facility data.

Government commitment

About the data

National environmental strategies and participation in international treaties on environmental issues provide some evidence of government commitment to sound environmental management. But the signing of these treaties does not always imply ratification, nor does it guarantee that governments will comply with treaty obligations.

In many countries efforts to halt environmental degradation have failed, primarily because governments have neglected to make this issue a priority, a reflection of competing claims on scarce resources. To address this problem, many countries are preparing national environmental strategies—some focusing narrowly on environmental issues, and others integrating environmental, economic, and social concerns. Among such initiatives are conservation strategies and environmental action plans. Some countries have also prepared country environmental profiles and biodiversity strategies and profiles.

National conservation strategies—promoted by the World Conservation Union (IUCN)—provide a comprehensive, cross-sectoral analysis of conservation and resource management issues to help integrate environmental concerns with the development process. Such strategies discuss current and future needs, institutional capabilities, prevailing technical conditions, and the status of natural resources in a country.

National environmental action plans, supported by the World Bank and other development agencies, describe a country's main environmental concerns, identify the principal causes of environmental problems, and formulate policies and actions to deal with them (table 3.14a). These plans are a continuing process in which governments develop comprehensive environmental policies, recommend specific actions, and outline the investment strategies, legislation, and institutional arrangements required to implement them.

Country environmental profiles identify how national economic and other activities can stay within the constraints imposed by the need to conserve natural resources. Some profiles consider issues of equity, justice, and fairness. Biodiversity profiles—prepared by the World Conservation Monitoring Centre and the IUCN—provide basic background on species diversity, protected areas, major ecosystems and habitat types, and legislative and administrative support. In an effort to establish a scientific baseline for measuring progress in biodiversity conservation, the United Nations Environment Programme (UNEP) coordinates global biodiversity assessments.

To address global issues, many governments have also signed international treaties and agreements launched in the wake of the 1972 United Nations Conference on Human Environment in Stockholm and the 1992 United Nations Conference on Environment and Development (the Earth Summit) in Rio de Janeiro:

- The Framework Convention on Climate Change aims to stabilize atmospheric concentrations of greenhouse gases at levels that will prevent human activities from interfering dangerously with the global climate.
- The Vienna Convention for the Protection of the Ozone Layer aims to protect human health and the environment by promoting research on the effects of changes in the ozone layer and on alternative substances (such as substitutes for chlorofluorocarbons) and technologies, monitoring the ozone layer, and taking measures to control the activities that produce adverse effects.
- The Montreal Protocol for CFC Control requires that countries help protect the earth from excessive ultraviolet radiation by cutting chlorofluorocarbon consumption by 20 percent over their 1986 level by 1994 and by 50 percent over their 1986 level by 1999, with allowances for increases in consumption by developing countries.
- The United Nations Convention on the Law of the Sea, which became effective in November 1994, establishes a comprehensive legal regime for seas and oceans, establishes rules for environmental standards and enforcement provisions, and develops international rules and national legislation to prevent and control marine pollution.
- The Convention on Biological Diversity promotes conservation of biodiversity among nations through scientific and technological cooperation, access to financial and genetic resources, and transfer of ecologically sound technologies.

To help developing countries comply with their obligations under these agreements, the Global Environment Facility (GEF) was created to focus on global improvement in biodiversity, climate change, international waters, and ozone layer depletion. The UNEP, United Nations Development Programme (UNDP), and the World Bank manage the GEF according to the policies of its governing body of country representatives. The World Bank is responsible for the GEF Trust Fund and is chair of the GEF.

Definitions

• **Environmental strategies and action plans** provide a comprehensive, cross-sectoral analysis of conservation and resource management issues to help integrate environmental concerns with the development process. They include national conservation strategies, national environmental action plans, national environmental management strategies, and national sustainable development strategies. The year shown for a country refers to the year in which a strategy or action plan was adopted. • **Country environmental profiles** identify how national economic and other activities can stay within the constraints imposed by the need to conserve natural resources. The year shown for a country refers to the year in which a profile was completed. • **Biodiversity assessments, strategies, and action plans** include biodiversity profiles (see *About the data*). • **Participation in treaties** covers five international treaties (see *About the data*). • **Climate change** refers to the Framework Convention on Climate Change (signed in New York in 1992). • **Ozone layer** refers to the Vienna Convention for the Protection of the Ozone Layer (signed in 1985). • **CFC control** refers to the Montreal Protocol for CFC Control (formally, the Protocol on Substances That Deplete the Ozone Layer, signed in 1987). • **Law of the Sea** refers to the United Nations Convention on the Law of the Sea (signed in Montego Bay, Jamaica, in 1982). • **Biological diversity** refers to the Convention on Biological Diversity (signed at the Earth Summit in Rio de Janeiro in 1992). The year shown for a country refers to the year in which a treaty entered into force in that country.

Data sources

The data are from the Secretariat of the United Nations Framework Convention on Climate Change; the Ozone Secretariat of the UNEP; the World Resources Institute; the UNEP; the U.S. National Aeronautics and Space Administration's Socioeconomic Data and Applications Center, Center for International Earth Science Information Network; and the World Resources Institute, International Institute for Environment and Development, and IUCN's *1996 World Directory of Country Environmental Studies*.

3.15 Understanding savings

	Gross national savings	Consumption of fixed capital	Net national savings	Education expenditure	Energy depletion	Mineral depletion	Net forest depletion	Carbon dioxide emissions damage	Particulate emissions damage	Adjusted net savings
	% of GNI 2001	% of GNI 2001	% of GNI 2001	% of GNI 2001	% of GNI 2001	% of GNI 2001	% of GNI 2001	% of GNI 2001	% of GNI 2001	% of GNI 2001
Afghanistan	..	..	..	..	..	..	..	..	..	..
Albania	13.9	9.2	4.7	2.8	1.0	0.0	0.0	0.3	0.1	6.1
Algeria	..	11.0	..	4.5	33.6	0.0	0.1	1.3	0.7	..
Angola	35.0	10.5	24.5	4.4	35.0	0.0	0.0	0.7	..	–6.8 [a]
Argentina	12.8	12.0	0.8	3.2	2.6	0.1	0.0	0.3	1.6	–0.6
Armenia	9.2	8.2	1.0	1.8	0.0	0.1	0.0	1.2	2.0	–0.5
Australia	18.9	16.1	2.8	5.4	1.6	1.6	0.0	0.6	0.1	4.3
Austria	21.2	14.5	6.7	5.0	0.1	0.0	0.0	0.2	0.2	11.2
Azerbaijan	21.5	15.0	6.5	3.0	41.7	0.0	0.0	5.3	1.0	–38.5
Bangladesh	20.8	6.1	14.7	1.7	1.6	0.0	0.8	0.4	0.3	13.3
Belarus	20.0	9.2	10.8	5.5	2.5	0.0	0.0	3.7	0.0	10.1
Belgium	24.9	14.3	10.6	3.1	0.0	0.0	0.0	0.3	0.2	13.2
Benin	11.6	8.0	3.6	2.7	0.1	0.0	1.3	0.4	0.3	4.2
Bolivia	9.4	9.3	0.1	5.5	7.3	0.7	0.0	1.0	0.7	–4.1
Bosnia and Herzegovina	..	8.9	..	..	0.1	0.0	0.0	0.8	0.4	..
Botswana	34.7	12.0	22.7	5.6	0.0	0.3	0.0	0.6	..	27.4 [a]
Brazil	17.0	10.9	6.1	4.8	2.3	1.0	0.0	0.4	0.2	7.0
Bulgaria	14.6	10.0	4.6	3.1	0.3	0.4	0.0	2.4	2.1	2.5
Burkina Faso	11.5	7.2	4.3	2.4	0.0	0.0	1.3	0.3	0.5	4.6
Burundi	5.4	6.4	–1.0	3.1	0.0	0.1	11.4	0.2	0.1	–9.7
Cambodia	14.8	7.8	7.0	1.8	0.0	0.0	1.7	0.1	0.1	6.9
Cameroon	17.0	9.0	8.0	2.3	7.3	0.0	0.0	0.4	0.7	1.9
Canada	23.2	13.0	10.2	7.0	5.0	0.1	0.0	0.5	0.2	11.4
Central African Republic	17.1	7.5	9.6	1.6	0.0	0.0	0.0	0.2	0.4	10.6
Chad	4.5	7.2	–2.7	2.0	0.0	0.0	0.0	0.1	..	–0.8 [a]
Chile	20.3	10.0	10.3	3.4	0.3	4.8	0.0	0.6	1.0	7.0
China	40.1	9.2	30.9	2.0	2.8	0.2	0.1	2.2	1.0	26.6
Hong Kong, China	32.0	12.8	19.2	2.8	0.0	0.0	0.0	0.1	0.0	21.9
Colombia	14.8	10.3	4.5	3.1	6.6	0.1	0.0	0.5	0.1	0.3
Congo, Dem. Rep.	..	8.4	..	0.9	2.0	0.1	0.0	0.3	0.0	..
Congo, Rep.	44.4	12.9	31.5	6.0	54.6	0.0	0.0	0.8	..	–17.9 [a]
Costa Rica	15.1	5.8	9.3	5.1	0.0	0.0	0.4	0.3	0.3	13.4
Côte d'Ivoire	8.8	9.1	–0.3	4.5	0.0	0.0	0.6	0.7	0.6	2.3
Croatia	20.4	11.4	9.0	..	1.1	0.0	0.0	0.7	0.3	..
Cuba	..	..	..	6.1	..	..	..	..	..	..
Czech Republic	26.0	11.6	14.4	4.6	0.1	0.0	0.0	1.4	0.1	17.4
Denmark	24.6	15.3	9.3	8.2	0.5	0.0	0.0	0.2	0.1	16.7
Dominican Republic	20.6	5.4	15.2	1.7	0.0	0.1	0.0	0.8	0.2	15.8
Ecuador	23.1	10.6	12.5	3.2	19.0	0.0	0.0	0.9	0.1	–4.3
Egypt, Arab Rep.	15.4	9.6	5.8	4.4	4.5	0.0	0.2	0.8	1.4	3.3
El Salvador	15.0	10.3	4.7	2.2	0.0	0.0	0.6	0.3	0.2	5.8
Eritrea	..	6.9	..	1.4	0.0	0.0	0.0	0.5	0.5	..
Estonia	22.8	14.4	8.4	6.3	0.6	0.0	0.0	2.4	0.2	11.5
Ethiopia	14.0	6.3	7.7	4.0	0.0	0.1	13.0	0.6	0.3	–2.3
Finland	27.0	16.4	10.6	7.1	0.0	0.0	0.0	0.3	0.1	17.3
France	21.3	12.6	8.7	5.6	0.0	0.0	0.0	0.2	0.0	14.1
Gabon	40.7	12.4	28.3	2.2	30.2	0.0	0.0	0.6	0.1	–0.4
Gambia, The	5.7	7.8	–2.1	3.6	0.0	0.0	0.5	0.5	0.7	–0.2
Georgia	6.6	16.1	–9.5	2.5	0.6	0.0	0.0	1.1	2.5	–11.2
Germany	20.6	14.9	5.7	4.4	0.1	0.0	0.0	0.3	0.1	9.6
Ghana	17.2	7.3	9.9	4.0	0.0	1.2	3.0	0.8	0.2	8.7
Greece	17.9	8.7	9.2	3.0	0.1	0.0	0.0	0.5	0.7	10.9
Guatemala	10.5	9.9	0.6	1.6	0.8	0.0	1.0	0.3	0.2	–0.1
Guinea	21.0	8.2	12.8	2.0	0.0	4.1	1.9	0.3	0.6	7.9
Guinea-Bissau	–3.5	7.5	–11.0	..	0.0	0.0	0.0	0.8	..	..
Haiti	26.0	1.8	24.2	1.5	0.0	0.0	0.9	0.2	0.2	24.4

3.15 Understanding savings

	Gross national savings	Consumption of fixed capital	Net national savings	Education expenditure	Energy depletion	Mineral depletion	Net forest depletion	Carbon dioxide emissions damage	Particulate emissions damage	Adjusted net savings
	% of GNI 2001	% of GNI 2001	% of GNI 2001	% of GNI 2001	% of GNI 2001	% of GNI 2001	% of GNI 2001	% of GNI 2001	% of GNI 2001	% of GNI 2001
Honduras	25.9	5.6	20.3	3.5	0.0	0.1	0.0	0.5	0.2	23.0
Hungary	23.4	11.5	11.9	4.3	0.6	0.0	0.0	0.8	0.4	14.4
India	22.9	9.6	13.3	3.2	1.9	0.4	0.0	1.7	0.7	11.8
Indonesia	23.6	5.4	18.2	0.6	12.0	1.2	0.0	1.1	0.5	4.0
Iran, Islamic Rep.	35.3	10.0	25.3	3.2	31.4	0.2	0.0	1.8	0.7	–5.6
Iraq	..	..	..	..	..	..	..	..	..	..
Ireland	27.4	12.3	15.1	5.5	0.0	0.1	0.0	0.4	0.1	20.0
Israel	*14.9*	13.2	1.7	6.6	0.0	0.0	0.0	0.4	0.0	7.9
Italy	20.5	13.6	6.9	4.7	0.1	0.0	0.0	0.3	0.2	11.0
Jamaica	22.2	11.2	11.0	5.8	0.0	1.9	0.0	0.9	0.3	13.7
Japan	27.1	15.9	11.2	3.6	0.0	0.0	0.0	0.2	0.4	14.2
Jordan	24.4	10.5	13.9	5.6	0.0	0.0	0.0	1.1	0.7	17.7
Kazakhstan	20.1	10.2	9.9	4.4	30.2	0.0	0.0	4.5	0.4	–20.8
Kenya	10.5	8.0	2.5	6.3	0.0	0.0	0.1	0.5	0.2	8.0
Korea, Dem. Rep.	..	..	..	..	..	..	..	..	..	..
Korea, Rep.	28.8	11.9	16.9	3.7	0.0	0.0	0.0	0.7	0.8	19.1
Kuwait	30.2	6.7	23.5	5.0	48.4	0.0	0.0	0.8	2.0	–22.7
Kyrgyz Republic	16.0	8.0	8.0	5.5	1.0	0.0	0.0	2.7	0.2	9.6
Lao PDR	..	8.2	..	1.8	0.0	0.0	0.0	0.2	0.2	..
Latvia	20.4	10.7	9.7	6.2	0.0	0.0	0.0	0.7	0.3	14.9
Lebanon	–4.9	10.3	–15.2	2.5	0.0	0.0	0.0	0.6	0.6	–13.9
Lesotho	20.5	6.5	14.0	6.6	0.0	0.0	2.3	0.0	0.4	17.9
Liberia	..	8.1	..	..	0.0	0.2	2.7	1.1	0.0	..
Libya	..	..	..	..	..	..	..	..	..	..
Lithuania	17.0	10.1	6.9	5.3	0.4	0.0	0.0	0.9	0.7	10.2
Macedonia, FYR	7.2	9.9	–2.7	4.4	0.0	0.0	0.0	2.2	0.3	–0.8
Madagascar	11.5	7.7	3.8	1.9	0.0	0.0	0.0	0.3	0.2	5.2
Malawi	–2.0	7.0	–9.0	4.5	0.0	0.0	1.6	0.3	0.2	–6.6
Malaysia	39.0	11.9	27.1	4.1	11.2	0.0	0.3	1.1	0.1	18.5
Mali	9.4	7.8	1.6	2.1	0.0	0.0	0.0	0.1	0.5	3.1
Mauritania	25.9	8.1	17.8	3.7	0.0	19.2	0.8	2.2	..	–0.7 [a]
Mauritius	27.0	10.8	16.2	3.3	0.0	0.0	0.0	0.4	..	19.1 [a]
Mexico	18.1	10.6	7.5	4.6	5.2	0.1	0.0	0.4	0.5	5.9
Moldova	12.0	7.3	4.7	9.4	0.0	0.0	0.0	3.5	0.5	10.1
Mongolia	21.7	10.9	10.8	5.7	0.0	4.3	0.0	5.0	0.5	6.7
Morocco	27.7	9.6	18.1	4.9	0.0	0.3	0.2	0.7	0.2	21.6
Mozambique	29.5	7.7	21.8	3.8	0.0	0.0	0.0	0.3	0.4	24.9
Myanmar	..	..	..	0.9	*0.0*	..	..	..	..	..
Namibia	27.8	12.7	15.1	8.5	0.0	0.3	0.0	0.0	0.2	23.1
Nepal	31.7	2.3	29.4	3.2	0.0	0.0	2.6	0.4	0.1	29.5
Netherlands	27.3	14.6	12.7	4.9	0.7	0.0	0.0	0.3	0.4	16.2
New Zealand	21.4	10.7	10.7	6.9	1.6	0.0	0.0	0.4	0.0	15.6
Nicaragua	..	..	..	3.6	*0.0*	..	..	..	0.0	..
Niger	2.7	7.0	–4.3	2.3	0.0	0.0	3.7	0.4	0.4	–6.5
Nigeria	25.5	8.4	17.1	0.5	43.0	0.0	0.0	0.7	0.8	–26.9
Norway	36.8	16.2	20.6	6.8	5.6	0.0	0.0	0.1	0.1	21.6
Oman	..	*9.8*	..	4.1	*51.8*	*0.0*	*0.0*	*0.7*	..	..
Pakistan	19.4	7.7	11.7	2.3	5.0	0.0	0.8	1.1	1.0	6.1
Panama	24.4	7.9	16.5	4.8	0.0	0.0	0.0	0.6	0.3	20.4
Papua New Guinea	*18.4*	8.9	9.5	..	11.6	11.1	0.0	0.5	0.0	..
Paraguay	10.6	9.5	1.1	3.9	0.0	0.0	0.0	0.4	0.4	4.2
Peru	16.9	10.3	6.6	2.6	1.0	1.2	0.0	0.3	0.6	6.1
Philippines	24.9	8.1	16.8	2.9	0.0	0.1	0.8	0.7	0.4	17.7
Poland	18.7	11.2	7.5	7.5	0.4	0.1	0.0	1.3	0.7	12.5
Portugal	19.4	15.3	4.1	5.6	0.0	0.0	0.0	0.4	0.4	8.9
Puerto Rico	..	7.4	..	..	0.0	0.0	0.0	0.2	..	..

3.15 Understanding savings

	Gross national savings	Consumption of fixed capital	Net national savings	Education expenditure	Energy depletion	Mineral depletion	Net forest depletion	Carbon dioxide emissions damage	Particulate emissions damage	Adjusted net savings
	% of GNI 2001	% of GNI 2001	% of GNI 2001	% of GNI 2001	% of GNI 2001	% of GNI 2001	% of GNI 2001	% of GNI 2001	% of GNI 2001	% of GNI 2001
Romania	16.0	9.9	6.1	3.6	3.9	0.1	0.0	1.5	0.2	4.0
Russian Federation	32.3	10.4	21.9	3.6	31.0	0.3	0.0	3.4	0.6	–9.8
Rwanda	12.2	7.2	5.0	3.5	0.0	0.0	4.2	0.3	0.0	4.0
Saudi Arabia	28.0	10.0	18.0	7.2	42.5	0.0	0.0	0.8	1.0	–19.1
Senegal	14.5	8.4	6.1	3.4	0.0	0.0	0.3	0.6	..	8.6 [a]
Sierra Leone	–9.9	6.9	–16.8	0.9	0.0	0.0	5.3	0.4	0.4	–22.0
Singapore	44.8	14.1	30.7	2.3	0.0	0.0	0.0	0.5	0.4	32.1
Slovak Republic	23.3	11.0	12.3	4.6	0.1	0.0	0.0	1.3	0.1	15.4
Slovenia	*24.8*	12.0	12.8	5.4	0.1	0.0	0.0	0.6	0.2	17.3
Somalia	..	..	..	..	..	..	..	..	..	..
South Africa	13.9	13.3	0.6	7.5	1.3	1.0	0.3	2.0	0.2	3.3
Spain	22.8	12.9	9.9	4.6	0.0	0.0	0.0	0.3	0.4	13.8
Sri Lanka	23.2	5.0	18.2	2.9	0.0	0.0	0.5	0.3	0.3	20.0
Sudan	7.6	9.0	–1.4	0.9	0.0	0.0	0.0	0.2	0.6	–1.3
Swaziland	14.6	9.2	5.4	6.5	0.0	0.0	0.0	0.2	0.1	11.6
Sweden	20.7	14.1	6.6	8.3	0.1	0.1	0.0	0.2	0.0	14.5
Switzerland	31.3	14.3	17.0	4.9	0.0	0.0	0.0	0.1	0.2	21.6
Syrian Arab Republic	28.5	9.7	18.8	2.6	28.8	0.0	0.0	1.7	0.8	–9.9
Tajikistan	*1.7*	7.1	–5.4	2.0	..	0.0	0.0	3.9	0.2	..
Tanzania	8.6	7.6	1.0	2.4	0.0	0.3	0.0	0.2	0.2	2.7
Thailand	28.7	15.1	13.6	3.5	1.4	0.0	0.2	1.1	0.4	14.0
Togo	4.9	7.7	–2.8	4.3	0.0	0.0	4.4	0.6	0.3	–3.8
Trinidad and Tobago	27.4	12.2	15.2	3.4	23.4	0.0	0.0	2.1	0.0	–6.9
Tunisia	24.6	10.0	14.6	6.6	4.1	0.0	0.1	0.7	0.3	16.0
Turkey	16.7	7.0	9.7	2.2	0.4	0.1	0.0	0.8	1.2	9.4
Turkmenistan	36.3	9.5	26.8	..	..	0.0	0.0	5.1	0.3	..
Uganda	13.8	7.6	6.2	1.9	0.0	0.0	6.2	0.2	0.0	1.7
Ukraine	24.7	19.1	5.6	6.3	8.0	0.0	0.0	6.8	1.0	–3.9
United Arab Emirates	..	..	..	..	..	..	..	..	..	..
United Kingdom	14.9	11.5	3.4	5.4	1.0	0.0	0.0	0.3	0.1	7.4
United States	17.5	11.9	5.6	5.4	1.1	0.0	0.0	0.4	0.3	9.2
Uruguay	10.9	11.5	–0.6	3.0	0.0	0.0	0.2	0.2	1.9	0.1
Uzbekistan	18.8	8.3	10.5	9.4	49.8	0.0	0.0	7.3	0.6	–37.8
Venezuela, RB	22.4	7.2	15.2	4.4	23.1	0.3	0.0	0.6	0.0	–4.4
Vietnam	32.6	8.0	24.6	2.8	7.0	0.0	0.9	1.0	0.4	18.1
West Bank and Gaza	..	8.5	..	..	0.0	0.0	..	0.0	..	..
Yemen, Rep.	32.3	9.0	23.3	..	36.4	0.0	0.0	1.3	0.5	..
Yugoslavia, Fed. Rep.	8.0	9.2	–1.2	..	0.6	0.2	0.0	2.7	0.2	..
Zambia	5.6	8.2	–2.6	2.1	0.0	1.3	0.0	0.4	..	–2.2 [a]
Zimbabwe	6.8	9.0	–2.2	7.8	0.3	0.3	0.0	1.1	0.5	3.4
World	**23.9 w**	**12.6 w**	**11.3 w**	**4.7 w**	**2.1 w**	**0.1 w**	**0.0 w**	**0.5 w**	**0.3 w**	**12.9 w**
Low income	22.1	8.8	13.3	2.8	6.6	0.4	0.3	1.6	0.6	6.6
Middle income	25.8	10.2	15.6	3.8	7.8	0.3	0.1	1.3	0.7	9.3
Lower middle income	31.2	9.8	21.4	3.0	8.1	0.2	0.1	1.9	0.8	13.3
Upper middle income	19.6	10.6	8.9	4.8	7.5	0.4	0.0	0.6	0.6	4.7
Low & middle income	25.2	9.9	15.2	3.7	7.6	0.3	0.1	1.3	0.7	8.9
East Asia & Pacific	36.8	9.3	27.5	2.2	3.9	0.3	0.2	1.9	0.8	22.6
Europe & Central Asia	24.4	10.5	13.9	4.5	11.9	0.1	..	2.3	0.7	3.5
Latin America & Carib.	17.1	10.4	6.7	4.2	4.8	0.5	0.0	0.4	0.5	4.6
Middle East & N. Africa	26.9	10.0	16.9	5.1	25.8	0.1	0.1	1.1	0.9	–5.9
South Asia	22.5	9.0	13.5	3.0	2.1	0.3	0.2	1.5	0.7	11.8
Sub-Saharan Africa	15.0	10.4	4.6	4.7	7.9	0.5	0.7	1.1	0.4	–1.3
High income	23.3	13.2	10.1	5.0	0.8	0.0	..	0.3	0.3	13.7
Europe EMU	21.4	*13.8*	7.6	*4.7*	*0.1*	*0.0*	..	*0.3*	..	11.8

a. Adjusted net savings do not include particulate emissions damage.

Understanding savings

About the data

Adjusted net savings measure the change in value of a specified set of assets, excluding capital gains. If a country's net savings are positive and the accounting includes a sufficiently broad range of assets, economic theory suggests that the present value of social welfare is increasing. Conversely, persistently negative adjusted net savings indicate that an economy is on an unsustainable path.

Adjusted net savings are derived from standard national accounting measures of gross national savings by making four adjustments. First, estimates of capital consumption of produced assets are deducted to obtain net national savings. Second, current expenditures on education are added to net national savings (in standard national accounting these expenditures are treated as consumption). Third, estimates of the depletion of a variety of natural resources are deducted to reflect the decline in asset values associated with their extraction and harvest. And fourth, deductions are made for damage from carbon dioxide and particulate emissions. (In earlier editions of the *World Development Indicators* these adjustments were made to gross domestic savings and adjusted net savings were referred to as genuine savings.)

The exercise treats education expenditures as an addition to savings effort. But because of the wide variability in the effectiveness of government education expenditures, these figures cannot be construed as the value of investments in human capital. The accounting for human capital is also incomplete because depreciation of human capital is not estimated.

There are also gaps in the accounting of natural resource depletion and pollution costs. Key estimates missing on the resource side include the value of fossil water extracted from aquifers, net depletion of fish stocks, and depletion and degradation of soils. Important pollutants affecting human health and economic assets are excluded because no internationally comparable data are widely available on damage from ground-level ozone or from sulfur oxides. For the first time, however, the table includes values for damage from particulate emissions, based on new estimates developed by the World Bank (Pandey and others 2003).

Estimates of resource depletion are based on the calculation of unit resource rents. An economic rent represents an excess return to a given factor of production—that is, in this case the returns from resource extraction or harvest are higher than the normal rate of return on capital. Natural resources give rise to rents because they are not produced; in contrast, for produced goods and services competitive forces will expand supply until economic profits are driven to zero. For each type of resource and each country, unit resource rents are derived by taking the difference between world prices and the average unit extraction or harvest costs (including a "normal" return on capital). Unit rents are then multiplied by the physical quantity extracted or harvested in order to arrive at a depletion figure. This figure is one of a range of depletion estimates that are possible, depending on the assumptions made about future quantities, prices, and costs, and there is reason to believe that it is at the high end of the range. Some of the largest depletion estimates in the table should therefore be viewed with caution.

A positive net depletion figure for forest resources implies that the harvest rate exceeds the rate of natural growth; this is not the same as deforestation, which represents a change in land use (see *Definitions* for table 3.4). In principle, there should be an addition to savings in countries where growth exceeds harvest, but empirical estimates suggest that most of this net growth is in forested areas that cannot be exploited economically at present. Because the depletion estimates reflect only timber values, they ignore all the external and nontimber benefits associated with standing forests.

Pollution damage from emissions of carbon dioxide is calculated as the marginal social cost per unit multiplied by the increase in the stock of carbon dioxide. The unit damage figure represents the present value of global damage to economic assets and to human welfare over the time the unit of pollution remains in the atmosphere.

Pollution damage from particulate emissions was estimated by valuing the human health effects from exposure to particulate matter less than 10 microns in diameter. The estimates were calculated as willingness to pay to avoid mortality attributable to particulate emissions (in particular, mortality relating to cardiopulmonary disease in adults, lung cancer in adults, and acute respiratory infections in children).

Definitions

• **Gross national savings** are calculated as the difference between gross national income and public and private consumption, plus net current transfers. • **Consumption of fixed capital** represents the replacement value of capital used up in the process of production. • **Net national savings** are equal to gross national savings less the value of consumption of fixed capital. • **Education expenditure** refers to current operating expenditures in education, including wages and salaries and excluding capital investments in buildings and equipment. • **Energy depletion** is equal to the product of unit resource rents and the physical quantities of energy extracted. It covers coal, crude oil, and natural gas. • **Mineral depletion** is equal to the product of unit resource rents and the physical quantities of minerals extracted. It refers to tin, gold, lead, zinc, iron, copper, nickel, silver, bauxite, and phosphate. • **Net forest depletion** is calculated as the product of unit resource rents and the excess of roundwood harvest over natural growth. • **Carbon dioxide emissions damage** is estimated to be $20 per ton of carbon (the unit damage in 1995 U.S. dollars) times the number of tons of carbon emitted. • **Particulate emissions damage** is calculated as the willingness to pay to avoid mortality attributable to particulate emissions. • **Adjusted net savings** are equal to net national savings plus education expenditure and minus energy depletion, mineral depletion, net forest depletion, and carbon dioxide and particulate emissions damage.

Data sources

Gross national savings are derived from the World Bank's national accounts data files, described in the *Economy* section. Consumption of fixed capital is from the United Nations Statistics Division's *National Accounts Statistics: Main Aggregates and Detailed Tables, 1997*, extrapolated to 2001. The education expenditure data are from the United Nations Statistics Division's *Statistical Yearbook 1997*, extrapolated to 2001. The wide range of data sources and estimation methods used to arrive at resource depletion estimates are described in a World Bank working paper, "Estimating National Wealth" (Kunte and others 1998). The unit damage figure for carbon dioxide emissions is from Fankhauser (1995). The estimates of damage from particulate emissions are from Pandey and others (2003). The conceptual underpinnings of the savings measure appear in Hamilton and Clemens (1999).