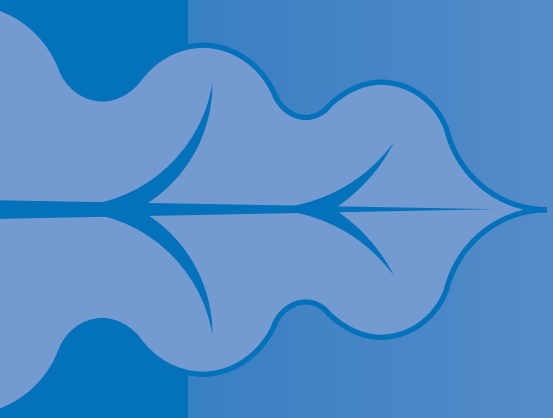
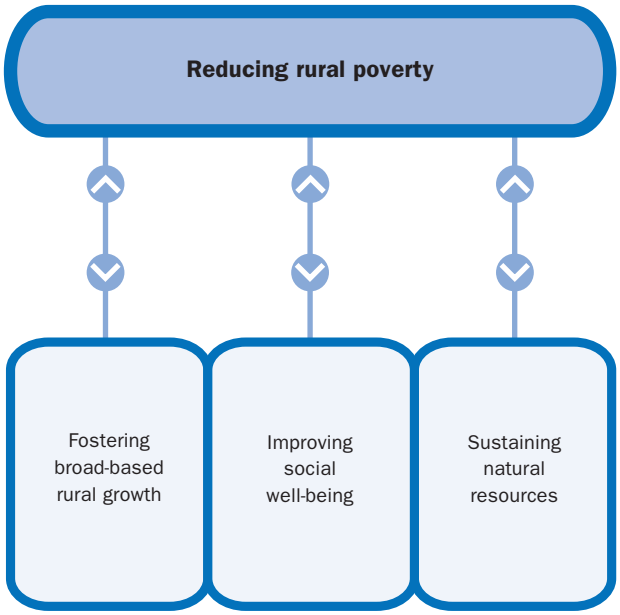


# ENVIRONMENT

## Environment and the rural poor






# To reduce rural poverty . . .

Poverty is overwhelmingly rural, with some 70 percent of the poorest people in developing countries living in rural areas. Although the number and proportion of poor people in cities are expected to grow rapidly in the next decades, the majority of the poor will continue to live in the countryside. So reducing poverty and ending hunger require more attention to the rural economy and to rural development.

But there's a problem: most countries—in their development strategies and in their allocations of resources—favor cities. Rural people, especially women and ethnic minorities, have little political clout, so they cannot influence public policy to attract more public investment to rural areas. Reducing rural poverty requires dealing with the entire rural space—with all of rural society and with both farm and nonfarm aspects of the economy.

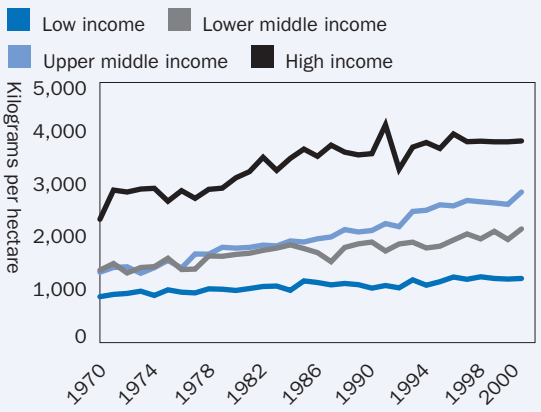
What will contribute most to faster growth in rural economies and to more poverty reduction? Three things: fostering broad-based rural growth, improving social well-being (in part by managing risk and reducing vulnerability), and sustaining natural resources. Each country's priorities will depend on its level of development—and its success on a policy and institutional environment conducive to rural development.

## Agricultural yields growing, but low-income countries lagging

It took more than 1,000 years for the United Kingdom to increase wheat yields from 0.5 to 2 tons a hectare (in the 1950s) but only 40 years to triple yields to 6 tons a hectare. What made such a dramatic breakthrough possible? Massive public investment in agricultural research—research that has allowed most industrial and many developing countries to sustain food surpluses.

**Farmers in the world's poorest countries are still untouched by yield increases**

Cereal yields by income level, 1970–2000




Source: World Bank and FAO.

About 900 million of the world's poor people live in rural areas, most of them farmers, many of them untouched by the yield advances in industrial countries. Yet for many poorer developing countries agriculture is the main source of economic growth, and agricultural growth is the cornerstone of poverty reduction.

Increasing the productivity of agriculture is thus essential for these countries. A 10 percent increase in crop yields can reduce the proportion of people living on less than $1 a day by between 6 and 12 percent (Thirtle and others 2000). Imagine what a tripling of yields might do.

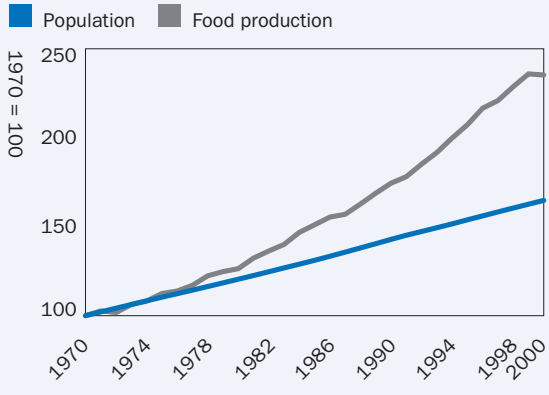
# Increase agricultural productivity.

## Food production outpaces population, but malnourishment persists

The rise in food production has outpaced population growth in all regions except Africa. And this has been achieved with only small increases in cropland. For example, Asia doubled cereal production after 1970 with only 4 percent more cropland (Hazell 2001).

**Food production outpaces population growth**

Growth in global food production and population 1970–2000




Source: World Bank and FAO.

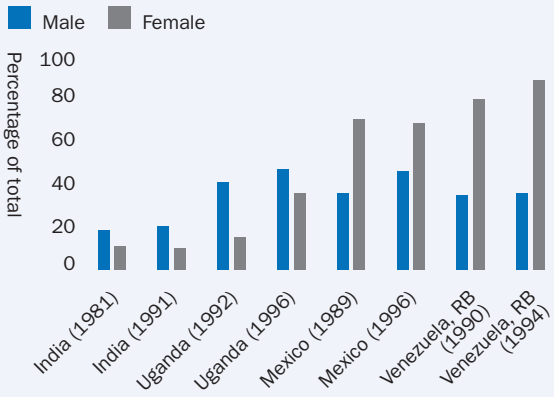
Because of such productivity gains (and the food aid from industrial countries that subsidize agriculture), food prices have been falling. Even so, more than 150 million children under five are malnourished—because of low incomes and poor food distribution.

## Agriculture is not enough

As economies develop, activities off the farm become much more important, providing jobs and reducing poverty. Workers follow a diverse array of opportunities, often sending much of their income back home. The new activities, generally linked to agriculture and infrastructure, contribute 30–50 percent of total income in rural areas.

**Nonfarm economic activities are important in rural areas**

Nonfarm rural employment by gender, selected countries




Source: Lanjouw and Lanjouw 2001.

The new activities off the farm provide work in the slack periods of the agricultural cycle. Studies of African farm households suggest that 15–65 percent of farmers also work off the farm and that 15–40 percent of family labor hours go to such income-generating activities. And these are underestimates. Much nonfarm activity in developing countries, especially that of women, is not taken into account. Activities such as clothing production, food processing, and education for the household are not included in figures on income generation.



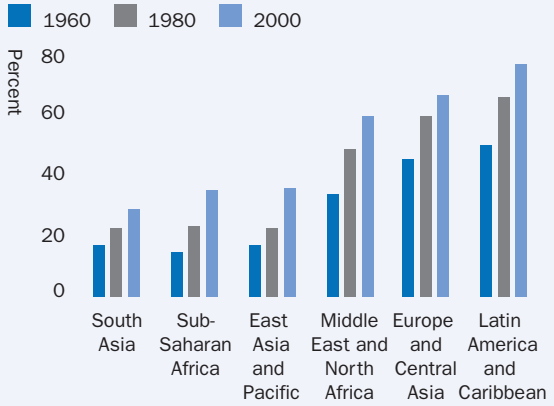
# Boost the nonfarm economy.

## Rapid urban growth affects the rural space

In the next 30 years almost all population growth will be concentrated in urban areas. The pace will be fastest in developing countries, where the urban population is forecast to increase from 1.94 billion to 3.88 billion. The number of people in African cities will jump from 297 million to 766 million, or more than the total population today. In Asia the urban population will almost double from 1.35 billion to 2.61 billion.

**Urban populations are growing faster**

Urban population as share of total, by region




Source: World Bank and UN.

Rapid urbanization has strengthened the links between rural and urban economies, blurring the distinction between them, in part because rural workers now take advantage of the new opportunities in small towns and cities.

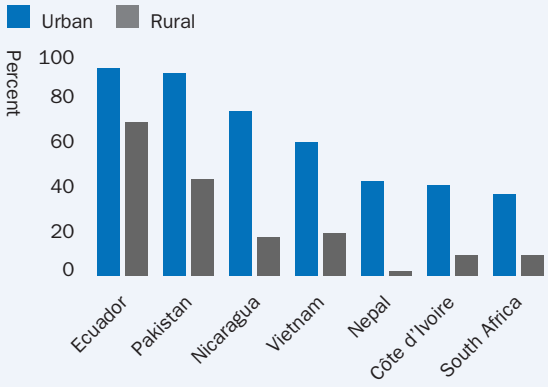
But it has also increased air and water pollution and traffic congestion. Such environmental problems stretch beyond urban boundaries, affecting rural people as well. Industrial effluents in rivers can poison agriculture downstream. And in some parts of the world urban sprawl is encroaching on prime agricultural land.

## Rural infrastructure is lagging

Rural residents are often more deprived of health and education than they are of income, since their access to those services is often limited and the services available are lower in quality than those in urban areas. They are also deprived of physical infrastructure, again of low quality if it is available. This "urban bias" imposes substantial costs on almost all rural economic activity.

**Access to electricity is much higher in urban than in rural areas**

Share of households with access to electricity, selected countries, latest available data




Source: Komives, Whittington, and Wu 2000.

Dependence on the weather makes the rural poor more vulnerable to economic shocks. Nor are they spared a country's financial shocks, which often hurt them as much as urban dwellers, sometimes even more. Better social and physical infrastructure can do much to help reduce their vulnerability, to manage their risks, and to improve their well-being.

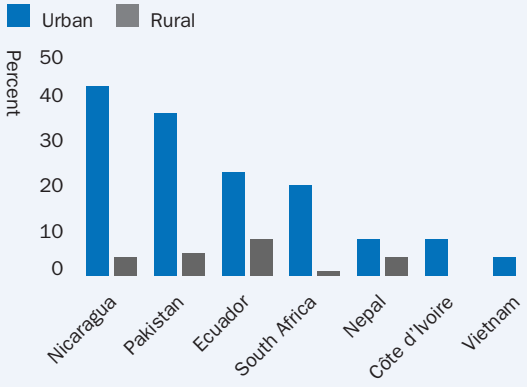
# Improve physical and social infrastructure.

## Limited infrastructure hurts rural well-being

The availability of transport, energy, water supply, sanitation, and communication services in rural areas remains limited. Access to electricity, in-house water supply, and telephones is on average two to five times higher in urban areas than in rural (Komives, Whittington, and Wu 2000). That is bad for markets, which thrive on good transport and information. It is also bad for households. The lack of safe water is a major contributor to diarrhea,

**And access to in-house water supply is even higher**

Share of households with access to in-house water, selected countries, latest available data




Source: Komives, Whittington, and Wu 2000.

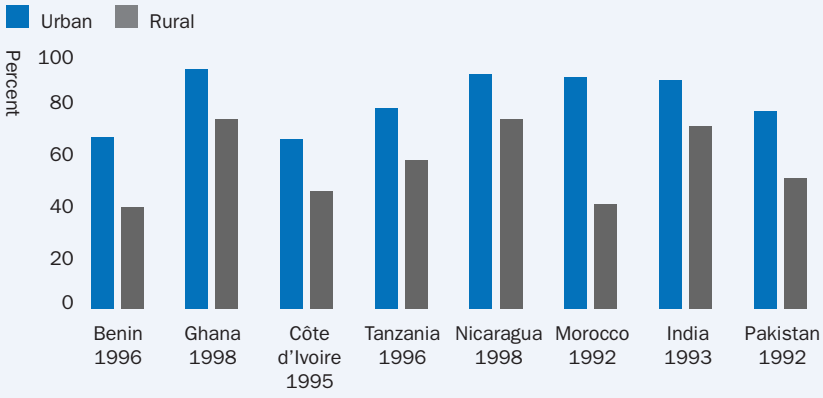
a frequent cause of death among children in rural areas. Also contributing to illness for the rural poor is their lack of access to appropriate sanitation. Globally, the number of people with access to improved sanitation increased from 2.9 billion in 1990 to 3.7 billion in 2000. But 2.4 billion people still lack access. Most—2 billion of them—live in rural areas.

## Schooling helps

Education—by enabling individuals and households to harness knowledge, increase and diversify incomes, manage risks, and increase social mobility—offers the prospect of breaking out of the cycle of poverty. In the rural space it also improves agricultural productivity and efficiency. And it is good for taking advantage of opportunities off the farm. But investments in education can bring even more benefits for development, as improved women's education is associated with lower fertility and slower population growth.

**Rural education still lags**

Net primary enrollment ratio for 10-year-olds, selected countries




Source: Moulton 2001.



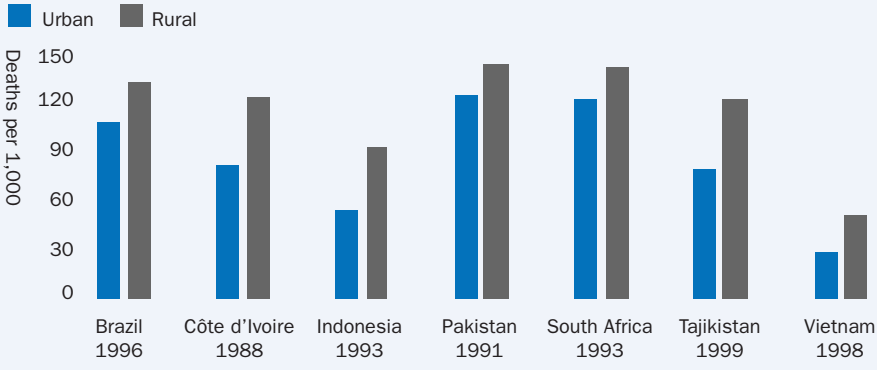
# Narrow the urban and rural access gap,

## So do better health and nutrition

Poverty exposes people to illness and disease. And illness and disease push families into poverty—a vicious cycle. Rural communities routinely report that poor health afflicts their poorest members. Disease and illness also reduce labor productivity and economic growth, by keeping adults out of the labor force and reducing the intensity of their work effort. And child malnutrition even affects future work, since it increases the risks of illness and death in adulthood. Another vicious cycle.

**The risk of dying young is high among the extreme poor**

Under-five mortality rate among those living on less than $1 a day, selected countries



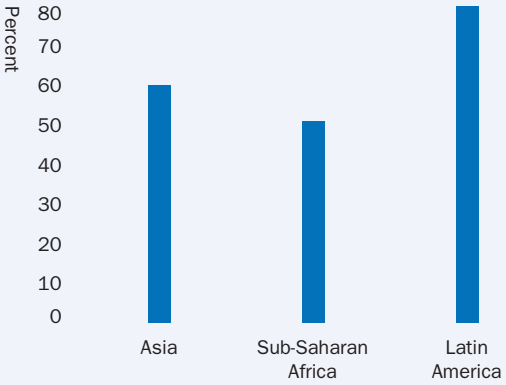

Source: Wagstaff and Alderman 2001.

## Degrading natural resources affects the poor most

Whether the world will continue to feed itself depends in large part on the future of the world's natural resource base. That depends, in turn, on whether poverty is reduced, for poverty and environmental degradation are often closely linked. Natural resources provide fundamental support to life and economic processes in the rural space. Soils are the food of agriculture. Forests protect water sources and provide income for more than 1.6 billion people. Biodiversity, the basis for protecting and improving domestic plant and animal varieties, safeguards food security.

**The poorest live in ecologically vulnerable areas**

Proportion of poor among those living in vulnerable areas, latest available data




Source: Leach and Means 1992.

Degradation of those resources affects the rural poor more than others because they tend to rely on fragile natural resources for their livelihoods. At the margin of subsistence, living in ecologically vulnerable areas, the rural poor do have some assets, among them their social ties and their understanding of local conditions. What they lack is support from national institutions to nurture those assets—because the assets are often invisible to decision-makers.

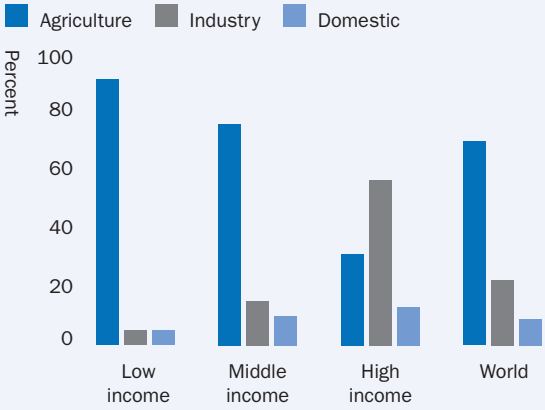
# while protecting natural resources for the long-term

## Water in higher demand

Some countries have abundant, untapped stores of water to support growth well into the future. Others are already using most of their water, and major increases in supplies will be expensive. The situation is getting more serious: each year 80 million additional people will tap the earth's water.

**Agriculture draws 60–90 percent of freshwater**

Water use by sector and income level, latest available data




Source: Table 3.5.

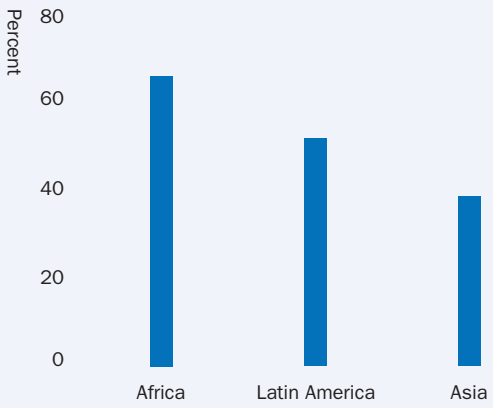
In the past century global water withdrawals have increased almost tenfold. Agriculture now accounts for 60–90 percent of the withdrawals of freshwater in developing economies, but the growing amounts for industrial and domestic uses produce much more value per cubic meter (Shiklovanov 1993). Far from plentiful, rural water has to be shared by the growing cities, the burgeoning rural areas, and a thirsty environment. Needed are greater efficiency in the use of water and fair allocations to balance the limited supply with rising demand.

## Demand for land, increasing

Land degradation reduces agricultural productivity and is thus a major factor affecting food security and poverty reduction in rural areas. Soil fertility declined about 13 percent between 1945 and 1990, a global average disguising far worse figures for Central America (37 percent) and Africa (25 percent). Although the global food supply is not seriously threatened in the short term, trends in Africa are of great concern.

**Soil degradation threatens the world's ability to feed itself**

Share of degraded cropland, 1997




Source: IFPRI 1999.

Doubling food production by 2050 to meet the needs of a growing population will create more pressure, with heavy environmental costs: pesticide pollution, water table depletion, biodiversity loss, and soil degradation, all the result of inappropriate land-use systems. To manage such assaults will require institutions that allow diverse stakeholders to come together to diagnose problems, balance conflicting interests, and agree on courses of action.



**sustainability of food supply and rural livelihoods.**

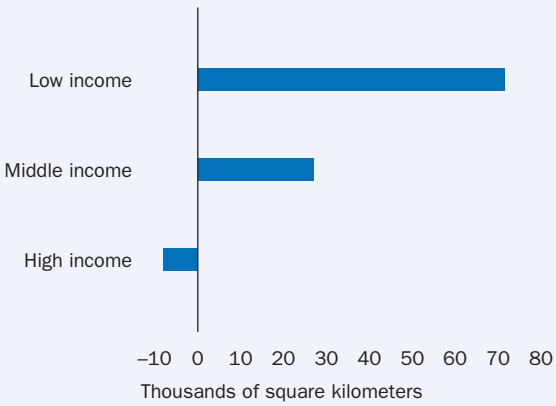
## Forests shrinking, species disappearing

Of the world's 1.2 billion extreme poor living on less than $1 a day, 90 percent depend on forests and their products. But the forests are shrinking, as is the diversity of the plants and animals they support.

At the beginning of the 20th century the earth's forested area was about 5 billion hectares. Since then it has shrunk to 3.9 billion hectares—an area roughly twice that of cropland. Caused by the growing demand for forest products and for agricultural land, the loss is concentrated in developing countries. Low-income countries lost about 8 percent of their forest in the 1990s alone. The industrial world is actually gaining about 3.6 million hectares of forestland each year, mainly from abandoned cropland that is returning to forest on its own, as in Russia, and from the spread of commercial plantations.

**Forests are disappearing in low-income countries**

Average area deforested annually, 1990–2000




Source: Table 3.4.

But loss of biologically diverse areas may not be reversed, despite increases in protected areas. 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.

# 3.1 | Rural environment and land use

| | Rural population | | | Rural population density | Land area | Land use | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | % of total | | 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 | |
| | 1980 | 2000 | 1980-2000 | 1999 | 1999 | 1980 | 1999 | 1980 | 1999 | 1980 | 1999 |
| Afghanistan | 84 | 78 [a] | 2.2 | 257 | 652 | 12.1 | 12.1 | 0.2 | 0.2 | 87.7 | 87.6 |
| Albania | 66 | 61 | 0.8 | 359 | 27 | 21.4 | 21.1 | 4.3 | 4.5 | 74.4 | 74.5 |
| Algeria | 57 | 40 | 0.7 | 157 | 2,382 | 2.9 | 3.2 | 0.3 | 0.2 | 96.8 | 96.6 |
| Angola | 79 | 66 | 2.2 | 283 | 1,247 | 2.3 | 2.4 | 0.4 | 0.4 | 97.3 | 97.2 |
| Argentina | 17 | 11 | -1.0 | 16 | 2,737 | 9.1 | 9.1 | 0.8 | 0.8 | 90.1 | 90.1 |
| Armenia | 34 | 30 | 0.4 | 233 | 28 | .. | 17.6 | .. | 2.3 | .. | 80.1 |
| Australia | 14 | 15 | 1.7 | 6 | 7,682 | 5.7 | 6.2 | 0.0 | 0.0 | 94.2 | 93.7 |
| Austria | 35 | 35 | 0.4 | 205 | 83 | 18.6 | 16.9 | 1.2 | 1.0 | 80.2 | 82.1 |
| Azerbaijan | 47 | 43 | 0.8 | 200 | 87 | .. | 19.9 | .. | 3.0 | .. | 77.1 |
| Bangladesh | 86 | 76 | 1.5 | 1,209 | 130 | 68.3 | 62.2 | 2.0 | 2.6 | 29.6 | 35.2 |
| Belarus | 44 | 30 | -1.7 | 49 | 207 | .. | 29.8 | .. | 0.6 | .. | 69.6 |
| Belgium | 5 | 3 | -2.5 | 35 | 33 [b] | 23.2 [b] | 24.8 [b] | 0.4 [b] | 0.6 [b] | 76.4 [b] | 74.6 [b] |
| Benin | 73 | 58 | 1.8 | 210 | 111 | 13.6 | 15.4 | 0.8 | 1.4 | 85.7 | 83.3 |
| Bolivia | 55 | 35 | 0.0 | 150 | 1,084 | 1.7 | 1.8 | 0.2 | 0.2 | 98.1 | 98.0 |
| Bosnia and Herzegovina | 65 | 57 | -0.8 | 445 | 51 | .. | 9.8 | .. | 2.9 | .. | 87.3 |
| Botswana | 85 | 50 | 0.2 | 233 | 567 | 0.7 | 0.6 | 0.0 | 0.0 | 99.3 | 99.4 |
| Brazil | 34 | 19 | -1.3 | 61 | 8,457 | 4.6 | 6.3 | 1.2 | 1.4 | 94.2 | 92.3 |
| Bulgaria | 39 | 30 | -1.6 | 59 | 111 | 34.6 | 38.9 | 3.2 | 1.9 | 62.2 | 59.2 |
| Burkina Faso | 92 | 82 | 1.8 | 265 | 274 | 10.0 | 12.4 | 0.1 | 0.2 | 89.8 | 87.4 |
| Burundi | 96 | 91 | 2.2 | 792 | 26 | 35.8 | 30.0 | 10.1 | 12.9 | 54.0 | 57.2 |
| Cambodia | 88 | 84 | 2.6 | 268 | 177 | 11.3 | 21.0 | 0.4 | 0.6 | 88.3 | 78.4 |
| Cameroon | 69 | 51 | 1.2 | 127 | 465 | 12.7 | 12.8 | 2.2 | 2.6 | 85.1 | 84.6 |
| Canada | 24 | 23 | 0.8 | 15 | 9,221 | 4.9 | 4.9 | 0.0 | 0.0 | 95.0 | 95.0 |
| Central African Republic | 65 | 59 | 1.9 | 112 | 623 | 3.0 | 3.1 | 0.1 | 0.1 | 96.9 | 96.8 |
| Chad | 81 | 76 | 2.4 | 163 | 1,259 | 2.5 | 2.8 | 0.0 | 0.0 | 97.5 | 97.2 |
| Chile | 19 | 15 | 0.5 | 118 | 749 | 5.1 | 2.6 | 0.3 | 0.4 | 94.6 | 96.9 |
| China [c] | 80 | 68 | 0.4 | 691 | 9,327 | 10.4 | 13.3 | 0.4 | 1.2 | 89.3 | 85.5 |
| Hong Kong, China | 9 | 0 | .. | *0* | *1* | 7.0 | *5.1* | *1.0* | *1.0* | *92.0* | *93.9* |
| Colombia | 36 | 25 | 0.2 | 508 | 1,039 | 3.6 | 2.0 | 1.4 | 2.2 | 95.0 | 95.8 |
| Congo, Dem. Rep. | 71 | 70 | 3.1 | 518 | 2,267 | 2.9 | 3.0 | 0.4 | 0.5 | 96.6 | 96.5 |
| Congo, Rep. | 59 | 38 | 0.7 | 642 | 342 | 0.4 | 0.5 | 0.1 | 0.1 | 99.5 | 99.4 |
| Costa Rica | 57 | 48 | 1.7 | 806 | 51 | 5.5 | 4.4 | 4.4 | 5.5 | 90.1 | 90.1 |
| Côte d'Ivoire | 65 | 54 | 2.4 | 286 | 318 | 6.1 | 9.3 | 7.2 | 13.8 | 86.6 | 76.9 |
| Croatia | 50 | 42 | -1.1 | 128 | 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 | 84 | 77 | .. | 40.1 | .. | 3.1 | .. | 56.9 |
| Denmark | 16 | 15 | -0.2 | 35 | 42 | 62.3 | 54.1 | 0.3 | 0.2 | 37.4 | 45.7 |
| Dominican Republic | 50 | 35 | 0.2 | 274 | 48 | 22.1 | 22.1 | 7.2 | 10.3 | 70.6 | 67.5 |
| Ecuador | 53 | 38 | 0.6 | 302 | 277 | 5.6 | 5.7 | 3.3 | 5.2 | 91.1 | 89.2 |
| Egypt, Arab Rep. | 56 | 55 | 2.1 | 1,217 | 995 | 2.3 | 2.8 | 0.2 | 0.5 | 97.5 | 96.7 |
| El Salvador | 58 | 53 | 1.1 | 590 | 21 | 26.9 | 27.0 | 11.7 | 12.1 | 61.4 | 60.9 |
| Eritrea | 87 | 81 | 2.4 | 654 | 101 | .. | 4.9 | .. | 0.0 | .. | 95.0 |
| Estonia | 30 | 31 | -0.2 | 39 | 42 | .. | 26.5 | .. | 0.4 | .. | 73.1 |
| Ethiopia | 90 | 82 | 2.3 | 520 | 1,000 | .. | 10.0 | .. | 0.7 | .. | 89.3 |
| Finland | 40 | 33 | -0.6 | 79 | 305 | 7.8 | 7.1 | 0.0 | 0.0 | 92.2 | 92.9 |
| France | 27 | 24 | 0.0 | 78 | 550 | 31.8 | 33.4 | 2.5 | 2.1 | 65.7 | 64.5 |
| Gabon | 50 | 19 | -2.1 | 73 | 258 | 1.1 | 1.3 | 0.6 | 0.7 | 98.2 | 98.1 |
| Gambia, The | 80 | 68 | 2.7 | 442 | 10 | 15.5 | 19.5 | 0.4 | 0.5 | 84.1 | 80.0 |
| Georgia | 48 | 39 | -1.1 | 251 | 70 | .. | 11.4 | .. | 3.8 | .. | 84.7 |
| Germany | 17 | 13 | -1.4 | 88 | 357 | 33.7 | 33.1 | 1.4 | 0.6 | 64.9 | 66.2 |
| Ghana | 69 | 62 | 2.4 | 325 | 228 | 8.4 | 15.8 | 7.5 | 7.5 | 84.2 | 76.7 |
| Greece | 42 | 40 | 0.2 | 153 | 129 | 22.5 | 21.4 | 7.9 | 8.6 | 69.6 | 70.0 |
| Guatemala | 63 | 60 | 2.3 | 488 | 108 | 11.7 | 12.5 | 4.4 | 5.0 | 83.9 | 82.4 |
| Guinea | 81 | 67 | 1.6 | 556 | 246 | 2.9 | 3.6 | 1.8 | 2.4 | 95.4 | 94.0 |
| Guinea-Bissau | 83 | 76 | 1.8 | 300 | 28 | 9.1 | 10.7 | 1.1 | 1.8 | 89.9 | 87.6 |
| Haiti | 76 | 64 | 1.1 | 905 | 28 | 19.8 | 20.3 | 12.5 | 12.7 | 67.7 | 67.0 |
| Honduras | 65 | 53 | 1.9 | 229 | 112 | 13.9 | 13.1 | 1.8 | 3.2 | 84.3 | 83.7 |

| | Rural population | | | Rural population density | Land area | Land use | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | % of total | | 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 | |
| | 1980 | 2000 | 1980-2000 | 1999 | 1999 | 1980 | 1999 | 1980 | 1999 | 1980 | 1999 |
| Hungary | 43 | 36 | -1.2 | 76 | 92 | 54.4 | 52.1 | 3.3 | 2.4 | 42.2 | 45.4 |
| India | 77 | 72 | 1.6 | 444 | 2,973 | 54.8 | 54.4 | 1.8 | 2.7 | 43.4 | 42.9 |
| Indonesia | 78 | 59 | 0.4 | 694 | 1,812 | 9.9 | 9.9 | 4.4 | 7.2 | 85.6 | 82.9 |
| Iran, Islamic Rep. | 50 | 38 | 1.1 | 141 | 1,622 | 8.0 | 10.7 | 0.5 | 1.2 | 91.5 | 88.1 |
| Iraq | 35 | 23 | 0.9 | 104 | 437 | 12.0 | 11.9 | 0.4 | 0.8 | 87.6 | 87.3 |
| Ireland | 45 | 41 | 0.1 | 144 | 69 | 16.1 | 15.6 | 0.0 | 0.0 | 83.9 | 84.3 |
| Israel | 11 | 9 | 1.1 | 155 | 21 | 15.8 | 17.0 | 4.3 | 4.3 | 80.0 | 78.7 |
| Italy | 33 | 33 | 0.0 | 223 | 294 | 32.2 | 29.1 | 10.0 | 9.8 | 57.7 | 61.2 |
| Jamaica | 53 | 44 | 0.1 | 661 | 11 | 12.5 | 16.1 | 9.7 | 9.2 | 77.8 | 74.7 |
| Japan | 24 | 21 | -0.2 | 600 | 365 | 13.3 | 12.4 | 1.6 | 1.0 | 85.1 | 86.7 |
| Jordan | 40 | 26 | 1.8 | 512 | 89 | 3.4 | 2.7 | 0.4 | 1.6 | 96.2 | 95.6 |
| Kazakhstan | 46 | 44 | -0.3 | 22 | 2,700 | .. | 11.1 | .. | 0.1 | .. | 88.8 |
| Kenya | 84 | 67 | 1.8 | 499 | 569 | 6.7 | 7.0 | 0.8 | 0.9 | 92.5 | 92.1 |
| Korea, Dem. Rep. | 43 | 40 | 0.9 | 522 | 120 | 13.4 | 14.1 | 2.4 | 2.5 | 84.2 | 83.4 |
| Korea, Rep. | 43 | 18 | -3.3 | 520 | 99 | 20.9 | 17.2 | 1.4 | 2.0 | 77.8 | 80.8 |
| Kuwait | 10 | 2 | -5.2 | 808 | 18 | 0.1 | 0.3 | 0.0 | 0.1 | 99.9 | 99.6 |
| Kyrgyz Republic | 62 | 67 | 1.9 | 236 | 192 | .. | 7.1 | .. | 0.3 | .. | 92.5 |
| Lao PDR | 87 | 77 | 1.9 | 454 | 231 | 3.4 | 3.8 | 0.1 | 0.3 | 96.5 | 95.9 |
| Latvia | 32 | 31 | -0.5 | 40 | 62 | .. | 29.8 | .. | 0.5 | .. | 69.7 |
| Lebanon | 26 | 10 | -2.9 | 255 | 10 | 20.5 | 17.6 | 8.9 | 12.5 | 70.6 | 69.9 |
| Lesotho | 87 | 72 | 1.1 | 450 | 30 | 9.6 | 10.7 | .. | .. | .. | .. |
| Liberia | 65 | 55 | 1.7 | 892 | 96 | 1.3 | 2.0 | 2.5 | 2.1 | 96.1 | 96.0 |
| Libya | 31 | 12 | -1.8 | 37 | 1,760 | 1.0 | 1.0 | 0.2 | 0.2 | 98.8 | 98.8 |
| Lithuania | 39 | 32 | -0.6 | 40 | 65 | .. | 45.3 | .. | 0.9 | .. | 53.8 |
| Macedonia, FYR | 47 | 38 | -0.6 | 132 | 25 | .. | 23.1 | .. | 1.9 | .. | 75.0 |
| Madagascar | 82 | 71 | 2.1 | 417 | 582 | 4.3 | 4.4 | 0.9 | 0.9 | 94.8 | 94.7 |
| Malawi | 91 | 85 | 2.2 | 458 | 94 | 16.1 | 19.9 | 0.9 | 1.3 | 83.0 | 78.7 |
| Malaysia | 58 | 43 | 1.1 | 541 | 329 | 3.0 | 5.5 | 11.6 | 17.6 | 85.4 | 76.9 |
| Mali | 82 | 70 | 1.7 | 162 | 1,220 | 1.6 | 3.8 | 0.0 | 0.0 | 98.3 | 96.2 |
| Mauritania | 73 | 42 | 0.0 | 230 | 1,025 | 0.2 | 0.5 | 0.0 | 0.0 | 99.8 | 99.5 |
| Mauritius | 58 | 59 | 1.1 | 691 | 2 | 49.3 | 49.3 | 3.4 | 3.0 | 47.3 | 47.8 |
| Mexico | 34 | 26 | 0.5 | 100 | 1,909 | 12.1 | 13.0 | 0.8 | 1.3 | 87.1 | 85.7 |
| Moldova | 60 | 54 | -0.2 | 128 | 33 | .. | 55.0 | .. | 11.3 | .. | 33.7 |
| Mongolia | 48 | 41 | 1.1 | 75 | 1,567 | 0.8 | 0.8 | 0.0 | 0.0 | 99.2 | 99.2 |
| Morocco | 59 | 44 | 0.5 | 148 | 446 | 16.9 | 19.0 | 1.1 | 2.1 | 82.0 | 78.8 |
| Mozambique | 87 | 60 | 0.0 | 339 | 784 | 3.7 | 4.0 | 0.3 | 0.3 | 96.0 | 95.7 |
| Myanmar | 76 | 72 | 1.5 | 359 | 658 | 14.6 | 14.5 | 0.7 | 0.9 | 84.8 | 84.6 |
| Namibia | 77 | 69 | 2.3 | 146 | 823 | 0.8 | 1.0 | 0.0 | 0.0 | 99.2 | 99.0 |
| Nepal | 94 | 88 | 2.0 | 686 | 143 | 16.0 | 20.3 | 0.2 | 0.5 | 83.8 | 79.2 |
| Netherlands | 12 | 11 | 0.1 | 185 | 34 | 23.3 | 27.0 | 0.9 | 1.0 | 75.7 | 72.0 |
| New Zealand | 17 | 13 | -0.1 | 33 | 268 | 9.3 | 5.8 | 3.7 | 6.4 | 86.9 | 87.8 |
| Nicaragua | 47 | 35 | 1.4 | 72 | 121 | 9.5 | 20.2 | 1.5 | 2.4 | 89.1 | 77.4 |
| Niger | 87 | 79 | 2.8 | 168 | 1,267 | 2.8 | 3.9 | 0.0 | 0.0 | 97.2 | 96.1 |
| Nigeria | 73 | 56 | 1.6 | 250 | 911 | 30.6 | 31.0 | 2.8 | 2.8 | 66.6 | 66.3 |
| Norway | 30 | 25 | -0.5 | 126 | 307 | 2.7 | 2.9 | .. | .. | .. | .. |
| Oman | 69 | 16 | -3.4 | 2,595 | 212 | 0.1 | 0.1 | 0.1 | 0.3 | 99.8 | 99.6 |
| Pakistan | 72 | 63 | 1.9 | 403 | 771 | 25.9 | 27.5 | 0.4 | 0.8 | 73.7 | 71.6 |
| Panama | 50 | 42 | 1.1 | 240 | 74 | 5.8 | 6.7 | 1.6 | 2.1 | 92.5 | 91.2 |
| Papua New Guinea | 87 | 83 | 2.3 | .. | 453 | 0.0 | 0.1 | 1.1 | 1.3 | 98.9 | 98.5 |
| Paraguay | 58 | 44 | 1.4 | 109 | 397 | 4.1 | 5.5 | 0.3 | 0.2 | 95.6 | 94.2 |
| Peru | 35 | 27 | 0.6 | 188 | 1,280 | 2.5 | 2.9 | 0.3 | 0.4 | 97.2 | 96.7 |
| Philippines | 63 | 41 | 0.2 | 566 | 298 | 17.5 | 18.6 | 14.8 | 15.1 | 67.7 | 66.3 |
| Poland | 42 | 34 | -0.6 | 96 | 304 | 48.0 | 46.2 | 1.1 | 1.1 | 50.9 | 52.7 |
| Portugal | 71 | 36 | -3.3 | 189 | 92 | 26.5 | 21.5 | 7.8 | 8.1 | 65.7 | 70.4 |
| Puerto Rico | 33 | 25 | -0.4 | 2,798 | 9 | 8.3 | 3.9 | 7.3 | 5.2 | 84.3 | 90.9 |
| Romania | 51 | 44 | -0.7 | 106 | 230 | 42.7 | 40.5 | 2.9 | 2.2 | 54.4 | 57.3 |
| Russian Federation | 30 | 27 | -0.3 | 31 | 16,889 | .. | 7.4 | .. | 0.1 | .. | 92.5 |

# 3.1 Rural environment and land use

| | Rural population | | | Rural population density | Land area | Land use | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | % of total | | 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 | |
| | 1980 | 2000 | 1980-2000 | 1999 | 1999 | 1980 | 1999 | 1980 | 1999 | 1980 | 1999 |
| Rwanda | 95 | 94 | 2.4 | 901 | 25 | 30.8 | 35.1 | 10.3 | 10.1 | 58.9 | 54.8 |
| Saudi Arabia | 34 | 14 | -0.4 | 84 | 2,150 | 0.9 | 1.7 | 0.0 | 0.1 | 99.1 | 98.2 |
| Senegal | 64 | 53 | 1.7 | 222 | 193 | 12.2 | 11.6 | 0.0 | 0.2 | 87.8 | 88.2 |
| Sierra Leone | 76 | 63 | 1.3 | 653 | 72 | 6.3 | 6.8 | 0.7 | 0.8 | 93.0 | 92.5 |
| Singapore | 0 | 0 | .. | 0 | 1 | 3.3 | 1.6 | 9.8 | 0.0 | 86.9 | 98.4 |
| Slovak Republic | 48 | 43 | -0.2 | 158 | 48 | .. | 30.4 | .. | 2.8 | .. | 66.8 |
| Slovenia | 52 | 50 | 0.0 | 577 | 20 | .. | 8.5 | .. | 1.5 | .. | 90.0 |
| Somalia | 78 | 73 | 1.2 | 592 | 627 | 1.6 | 1.7 | 0.0 | 0.0 | 98.4 | 98.3 |
| South Africa | 52 | 45 | 1.5 | 129 | 1,221 | 10.2 | 12.1 | 0.7 | 0.8 | 89.1 | 87.1 |
| Spain | 27 | 22 | -0.7 | 65 | 499 | 31.1 | 27.4 | 9.9 | 9.7 | 59.0 | 62.9 |
| Sri Lanka | 78 | 76 | 1.2 | 1,660 | 65 | 13.2 | 13.6 | 15.9 | 15.8 | 70.9 | 70.6 |
| Sudan | 80 | 64 | 1.3 | 119 | 2,376 | 5.2 | 7.0 | 0.0 | 0.1 | 94.8 | 92.9 |
| Swaziland | 82 | 74 | 2.5 | 448 | 17 | 10.8 | 9.8 | 0.2 | 0.7 | 89.0 | 89.5 |
| Sweden | 17 | 17 | 0.3 | 54 | 412 | 7.2 | 6.7 | .. | .. | .. | .. |
| Switzerland | 43 | 32 | -0.8 | 556 | 40 | 9.9 | 10.5 | 0.5 | 0.6 | 89.6 | 88.9 |
| Syrian Arab Republic | 53 | 46 | 2.3 | 154 | 184 | 28.5 | 25.6 | 2.5 | 4.4 | 69.1 | 70.1 |
| Tajikistan | 66 | 73 | 2.7 | 611 | 141 | .. | 5.2 | .. | 0.9 | .. | 93.9 |
| Tanzania | 85 | 72 | 2.1 | 640 | 884 | 3.5 | 4.2 | 1.0 | 1.0 | 95.5 | 94.7 |
| Thailand | 83 | 78 | 1.0 | 323 | 511 | 32.3 | 28.8 | 3.5 | 6.5 | 64.2 | 64.8 |
| Togo | 77 | 67 | 2.2 | 134 | 54 | 35.9 | 40.4 | 1.6 | 1.8 | 62.6 | 57.7 |
| Trinidad and Tobago | 37 | 26 | -0.8 | 455 | 5 | 13.6 | 14.6 | 9.0 | 9.2 | 77.4 | 76.2 |
| Tunisia | 49 | 35 | 0.3 | 117 | 155 | 20.5 | 18.3 | 9.7 | 14.5 | 69.7 | 67.2 |
| Turkey | 56 | 25 | -2.2 | 69 | 770 | 32.9 | 31.4 | 4.1 | 3.3 | 63.0 | 65.3 |
| Turkmenistan | 53 | 55 | 3.2 | 173 | 470 | .. | 3.5 | .. | 0.1 | .. | 96.4 |
| Uganda | 91 | 86 | 2.4 | 368 | 197 | 20.7 | 25.7 | 8.1 | 8.9 | 71.2 | 65.4 |
| Ukraine | 38 | 32 | -1.0 | 49 | 579 | .. | 56.4 | .. | 1.6 | .. | 42.0 |
| United Arab Emirates | 29 | 14 | 1.6 | 498 | 84 | 0.2 | 1.0 | 0.1 | 0.6 | 99.7 | 98.4 |
| United Kingdom | 11 | 11 | 0.0 | 106 | 241 | 28.7 | 24.6 | 0.3 | 0.2 | 71.0 | 75.2 |
| United States | 26 | 23 | 0.4 | 36 | 9,159 | 20.6 | 19.3 | 0.2 | 0.2 | 79.2 | 80.5 |
| Uruguay | 15 | 9 | -2.0 | 23 | 175 | 8.0 | 7.2 | 0.3 | 0.3 | 91.7 | 92.5 |
| Uzbekistan | 59 | 63 | 2.5 | 342 | 414 | .. | 10.8 | .. | 0.9 | .. | 88.3 |
| Venezuela, RB | 21 | 13 | -0.1 | 116 | 882 | 3.2 | 3.0 | 0.9 | 1.0 | 95.9 | 96.0 |
| Vietnam | 81 | 76 | 1.6 | 1,031 | 325 | 18.2 | 17.7 | 1.9 | 4.9 | 79.8 | 77.4 |
| West Bank and Gaza | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Yemen, Rep. | 81 | 75 | 3.2 | 833 | 528 | 2.6 | 2.9 | 0.2 | 0.2 | 97.2 | 96.8 |
| Yugoslavia, Fed. Rep. | 54 | 48 | -0.2 | .. | .. | 28.0 | .. | 2.9 | .. | 69.1 | .. |
| Zambia | 60 | 56 | 2.4 | 105 | 743 | 6.9 | 7.1 | 0.0 | 0.0 | 93.1 | 92.9 |
| Zimbabwe | 78 | 65 | 1.9 | 252 | 387 | 6.5 | 8.3 | 0.3 | 0.3 | 93.3 | 91.3 |
| **World** | **60 w** | **53 w** | **0.9 w** | **524 w** | **130,100 s** | **10.2 w** | **10.5 w** | **0.9 w** | **1.0 w** | **88.9 w** | **88.5 w** |
| **Low income** | 76 | 68 | 1.6 | 510 | 32,536 | 11.8 | 13.2 | 1.0 | 1.4 | 87.1 | 85.4 |
| **Middle income** | 62 | 50 | 0.3 | 589 | 66,644 | 7.9 | 8.8 | 1.0 | 1.0 | 91.0 | 90.2 |
| Lower middle income | 69 | 58 | 0.5 | 642 | 43,596 | 8.8 | 9.2 | 1.0 | 0.9 | 90.2 | 89.9 |
| Upper middle income | 38 | 24 | -0.6 | 184 | 23,048 | 7.0 | 8.0 | 1.1 | 1.3 | 91.9 | 90.7 |
| **Low & middle income** | 68 | 59 | 1.0 | 545 | 99,180 | 9.5 | 10.2 | 1.0 | 1.2 | 89.5 | 88.6 |
| East Asia & Pacific | 78 | 65 | 0.5 | 694 | 15,969 | 10.1 | 11.8 | 1.5 | 2.6 | 88.4 | 85.5 |
| Europe & Central Asia | 41 | 35 | -0.4 | 125 | 23,771 | 37.1 | 11.7 | 3.1 | 0.4 | 59.8 | 87.9 |
| Latin America & Carib. | 35 | 25 | 0.0 | 252 | 20,062 | 5.8 | 6.6 | 1.1 | 1.3 | 93.1 | 92.1 |
| Middle East & N. Africa | 52 | 41 | 1.4 | 543 | 10,995 | 4.5 | 5.1 | 0.4 | 0.8 | 95.1 | 94.1 |
| South Asia | 78 | 72 | 1.6 | 542 | 4,781 | 42.5 | 42.4 | 1.5 | 2.1 | 56.1 | 55.4 |
| Sub-Saharan Africa | 77 | 66 | 1.9 | 377 | 23,603 | 5.5 | 6.5 | 0.7 | 0.9 | 93.8 | 92.6 |
| **High income** | 25 | 21 | -0.1 | 180 | 30,920 | 12.0 | 11.6 | 0.5 | 0.5 | 87.5 | 87.9 |
| Europe EMU | 27 | 23 | -0.5 | 140 | 2,537 | 26.2 | 25.1 | 4.6 | 4.4 | 69.2 | 70.5 |

a. Estimate does not account for recent refugee flows. b. Includes Luxembourg. c. Includes Taiwan, China.

## 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, 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 three, 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. Furthermore, 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).

### Table 3.1a

**The 10 economies with the highest rural population density in 1999 — and the 10 with the lowest**

People per sq. km of arable land

| | Rural population density | | Rural population density |
|---|---|---|---|
| Puerto Rico | 2,798 | United States | 36 |
| Oman | 2,595 | Belgium | 35 |
| Sri Lanka | 1,660 | Denmark | 35 |
| Egypt, Arab Rep. | 1,217 | New Zealand | 33 |
| Bangladesh | 1,209 | Russian Federation | 31 |
| Vietnam | 1,031 | Uruguay | 23 |
| Haiti | 905 | Kazakhstan | 22 |
| Rwanda | 901 | Argentina | 16 |
| Liberia | 892 | Canada | 15 |
| Yemen, Rep. | 833 | Australia | 6 |

*Source:* Table 3.1.

## 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.

## 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 1999 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 | 1997-99 | 1979-81 | 1997-99 | 1979-81 | 1999-2001 | 1979-81 | 1997-99 | 1979-81 | 1997-99 | 1979-81 | 1997-99 |
| Afghanistan | 0.50 | 0.32 | 31.1 | 29.6 | 3,037 | 2,345 | 62 | 7 | 0 | 0 | 1 | 1 |
| Albania | 0.22 | 0.17 | 53.0 | 48.6 | 367 | 213 | 1,556 | 228 | 15 | 11 | 173 | 140 |
| Algeria | 0.37 | 0.26 | 3.4 | 6.8 | 2,968 | 1,903 | 277 | 152 | 27 | 38 | 68 | 121 |
| Angola | 0.41 | 0.24 | 2.2 | 2.1 | 705 | 888 | 49 | 10 | 4 | 3 | 35 | 34 |
| Argentina | 0.89 | 0.69 | 5.7 | 5.7 | 11,154 | 10,803 | 46 | 322 | 132 | 191 | 73 | 112 |
| Armenia | .. | 0.13 | .. | 51.3 | .. | 182 | .. | 160 | .. | 73 | .. | 354 |
| Australia | 2.97 | 2.69 | 3.5 | 4.6 | 15,986 | 16,347 | 269 | 446 | 751 | 707 | 75 | 63 |
| Austria | 0.20 | 0.17 | 0.2 | 0.3 | 1,062 | 839 | 2,615 | 1,774 | 945 | 1,672 | 2,084 | 2,522 |
| Azerbaijan | .. | 0.21 | .. | 74.1 | .. | 615 | .. | 105 | .. | 35 | .. | 194 |
| Bangladesh | 0.10 | 0.06 | 17.1 | 46.1 | 10,823 | 11,568 | 459 | 1,491 | 0 | 0 | 5 | 7 |
| Belarus | .. | 0.61 | .. | 1.8 | .. | 2,406 | .. | 1,417 | .. | 111 | .. | 140 |
| Belgium[a] | 0.08 | 0.08 | 1.7 | 4.6 | 426 | 334 | 5,323 | 3,766 | 917 | 1,222 | 1,416 | 1,312 |
| Benin | 0.43 | 0.29 | 0.3 | 0.6 | 525 | 841 | 11 | 262 | 0 | 0 | 1 | 1 |
| Bolivia | 0.35 | 0.24 | 6.6 | 5.9 | 559 | 780 | 23 | 34 | 4 | 4 | 21 | 29 |
| Bosnia and Herzegovina | .. | 0.13 | .. | 0.4 | .. | 401 | .. | 653 | .. | 280 | .. | 580 |
| Botswana | 0.44 | 0.22 | 0.5 | 0.3 | 153 | 128 | 32 | 123 | 9 | 19 | 54 | 175 |
| Brazil | 0.32 | 0.32 | 3.3 | 4.4 | 20,612 | 17,807 | 915 | 1,099 | 31 | 59 | 139 | 151 |
| Bulgaria | 0.43 | 0.52 | 28.3 | 17.7 | 2,110 | 1,905 | 2,334 | 381 | 66 | 73 | 161 | 58 |
| Burkina Faso | 0.39 | 0.32 | 0.4 | 0.7 | 2,026 | 2,957 | 26 | 141 | 0 | 0 | 0 | 6 |
| Burundi | 0.22 | 0.12 | 4.5 | 6.7 | 203 | 203 | 11 | 37 | 0 | 0 | 1 | 2 |
| Cambodia | 0.29 | 0.32 | 5.8 | 7.1 | 1,241 | 2,037 | 45 | 27 | 0 | 0 | 6 | 4 |
| Cameroon | 0.68 | 0.42 | 0.2 | 0.5 | 1,021 | 844 | 56 | 72 | 0 | 0 | 1 | 1 |
| Canada | 1.86 | 1.51 | 1.3 | 1.6 | 19,561 | 17,454 | 416 | 582 | 824 | 1,717 | 144 | 156 |
| Central African Republic | 0.81 | 0.54 | .. | .. | 194 | 153 | 5 | 3 | 0 | 0 | 0 | 0 |
| Chad | 0.70 | 0.48 | 0.4 | 0.6 | 907 | 2,000 | 6 | 40 | 0 | 0 | 1 | 0 |
| Chile | 0.34 | 0.13 | 31.1 | 78.4 | 820 | 580 | 338 | 2,323 | 43 | 55 | 90 | 272 |
| China | 0.10 | 0.10 | 45.1 | 39.0 | 94,647 | 87,077 | 1,494 | 2,911 | 2 | 1 | 76 | 60 |
| Hong Kong, China | 0.00 | *0.00* | *37.5* | *33.3* | 0 | 0 | .. | .. | 0 | *0* | 10 | *8* |
| Colombia | 0.13 | 0.05 | 7.7 | 20.4 | 1,361 | 1,075 | 812 | 2,848 | 8 | 6 | 77 | 103 |
| Congo, Dem. Rep. | 0.25 | 0.14 | 0.1 | 0.1 | 1,115 | 2,100 | 12 | 2 | 0 | 0 | 3 | 4 |
| Congo, Rep. | 0.08 | 0.06 | 0.6 | 0.5 | 19 | 3 | 27 | 270 | 2 | 1 | 49 | 41 |
| Costa Rica | 0.12 | 0.06 | 12.1 | 20.9 | 136 | 86 | 2,650 | 8,323 | 22 | 21 | 210 | 311 |
| Côte d'Ivoire | 0.24 | 0.19 | 1.0 | 1.0 | 1,008 | 1,621 | 261 | 306 | 1 | 1 | 16 | 13 |
| Croatia | .. | 0.32 | .. | 0.2 | .. | 604 | .. | 1,558 | .. | 13 | .. | 19 |
| Cuba | 0.27 | 0.33 | 22.9 | 19.5 | 224 | 202 | 2,024 | 510 | 78 | 97 | 259 | 215 |
| Czech Republic | .. | 0.30 | .. | 0.7 | .. | 1,646 | .. | 951 | .. | 171 | .. | 274 |
| Denmark | 0.52 | 0.44 | 14.5 | 19.6 | 1,818 | 1,515 | 2,453 | 1,763 | 973 | 1,119 | 708 | 570 |
| Dominican Republic | 0.19 | 0.13 | 11.7 | 17.2 | 149 | 150 | 572 | 954 | 3 | 4 | 20 | 22 |
| Ecuador | 0.20 | 0.13 | 24.8 | 28.8 | 419 | 904 | 471 | 1,024 | 6 | 7 | 40 | 57 |
| Egypt, Arab Rep. | 0.06 | 0.05 | 100.0 | 100.0 | 2,007 | 2,715 | 2,864 | 4,043 | 4 | 10 | 158 | 303 |
| El Salvador | 0.12 | 0.09 | 4.3 | 4.8 | 422 | 405 | 1,376 | 1,570 | 5 | 4 | 61 | 61 |
| Eritrea | .. | 0.12 | .. | 4.8 | .. | 374 | .. | 168 | .. | 0 | .. | 12 |
| Estonia | .. | 0.80 | .. | 0.4 | .. | 337 | .. | 260 | .. | 538 | .. | 453 |
| Ethiopia | .. | 0.16 | .. | 1.8 | .. | 7,020 | .. | 155 | .. | 0 | .. | 3 |
| Finland | 0.50 | 0.42 | 2.5 | 3.0 | 1,190 | 1,180 | 2,022 | 1,441 | 721 | 1,242 | 892 | 898 |
| France | 0.32 | 0.31 | 4.6 | 10.3 | 9,804 | 9,032 | 3,260 | 2,649 | 737 | 1,303 | 836 | 694 |
| Gabon | 0.42 | 0.28 | 2.4 | 3.0 | 6 | 17 | 20 | 6 | 5 | 7 | 43 | 46 |
| Gambia, The | 0.26 | 0.16 | 0.6 | 1.0 | 54 | 141 | 136 | 82 | 0 | 0 | 3 | 2 |
| Georgia | .. | 0.15 | .. | 44.2 | .. | 375 | .. | 467 | .. | 21 | .. | 138 |
| Germany | 0.15 | 0.14 | 3.7 | 4.0 | 7,692 | 6,951 | 4,249 | 2,485 | 624 | 959 | 1,340 | 906 |
| Ghana | 0.18 | 0.20 | 0.2 | 0.2 | 902 | 1,305 | 104 | 45 | 1 | 1 | 19 | 10 |
| Greece | 0.30 | 0.26 | 24.2 | 37.3 | 1,600 | 1,266 | 1,927 | 1,741 | 120 | 299 | 485 | 875 |
| Guatemala | 0.19 | 0.13 | 5.0 | 6.8 | 716 | 687 | 726 | 1,570 | 3 | 2 | 32 | 32 |
| Guinea | 0.16 | 0.12 | 7.9 | 6.4 | 708 | 744 | 16 | 31 | 0 | 0 | 2 | 6 |
| Guinea-Bissau | 0.34 | 0.26 | 6.0 | 4.9 | 142 | 132 | 24 | 17 | 0 | 0 | 1 | 1 |
| Haiti | 0.10 | 0.07 | 7.9 | 8.2 | 416 | 457 | 62 | 192 | 0 | 0 | 3 | 3 |
| Honduras | 0.44 | 0.25 | 4.1 | 4.1 | 421 | 465 | 163 | 983 | 5 | 7 | 21 | 34 |

| | 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 | 1997-99 | 1979-81 | 1997-99 | 1979-81 | 1999-2001 | 1979-81 | 1997-99 | 1979-81 | 1997-99 | 1979-81 | 1997-99 |
| Hungary | 0.47 | 0.48 | 3.6 | 4.2 | 2,878 | 2,671 | 2,906 | 832 | 59 | 168 | 111 | 192 |
| India | 0.24 | 0.17 | 22.8 | 33.6 | 104,349 | 100,602 | 345 | 1,058 | 2 | 6 | 24 | 92 |
| Indonesia | 0.12 | 0.09 | 16.2 | 15.5 | 11,825 | 15,149 | 645 | 1,415 | 0 | 1 | 5 | 39 |
| Iran, Islamic Rep. | 0.36 | 0.27 | 35.5 | 39.8 | 8,062 | 7,424 | 430 | 647 | 17 | 41 | 57 | 149 |
| Iraq | 0.40 | 0.23 | 32.1 | 63.6 | 2,159 | 2,712 | 172 | 735 | 23 | 75 | 44 | 95 |
| Ireland | 0.33 | 0.29 | .. | .. | 425 | 279 | 5,373 | 6,391 | 606 | 1,048 | 1,289 | 1,638 |
| Israel | 0.08 | 0.06 | 49.3 | 45.3 | 129 | 74 | 2,384 | 3,474 | 294 | 327 | 809 | 698 |
| Italy | 0.17 | 0.15 | 19.3 | 24.1 | 5,082 | 4,192 | 2,295 | 2,151 | 370 | 1,115 | 1,117 | 1,966 |
| Jamaica | 0.06 | 0.07 | 10.1 | 9.1 | 4 | 2 | 1,231 | 1,339 | 9 | 11 | 208 | 177 |
| Japan | 0.04 | 0.04 | 56.0 | 54.6 | 2,724 | 2,048 | 4,131 | 3,207 | 209 | 690 | 2,723 | 4,675 |
| Jordan | 0.14 | 0.05 | 11.0 | 19.5 | 158 | 42 | 404 | 963 | 48 | 29 | 153 | 196 |
| Kazakhstan | .. | 1.99 | .. | 7.6 | .. | 11,991 | .. | 12 | .. | 54 | .. | 26 |
| Kenya | 0.23 | 0.14 | 0.9 | 1.5 | 1,692 | 1,828 | 160 | 346 | 1 | 1 | 17 | 36 |
| Korea, Dem. Rep. | 0.09 | 0.08 | 58.9 | 73.0 | 1,625 | 1,258 | 4,688 | 1,032 | 13 | 20 | 275 | 441 |
| Korea, Rep. | 0.05 | 0.04 | 59.6 | 60.7 | 1,689 | 1,174 | 3,920 | 5,323 | 1 | 60 | 14 | 908 |
| Kuwait | 0.00 | 0.00 | 83.3 | 90.5 | 0 | 1 | 4,500 | 1,833 | 3 | 11 | 220 | 137 |
| Kyrgyz Republic | .. | 0.28 | .. | 75.0 | .. | 648 | .. | 218 | .. | 46 | .. | 181 |
| Lao PDR | 0.24 | 0.17 | 13.3 | 17.8 | 751 | 742 | 35 | 79 | 0 | 1 | 7 | 12 |
| Latvia | .. | 0.75 | .. | 1.1 | .. | 421 | .. | 252 | .. | 328 | .. | 301 |
| Lebanon | 0.07 | 0.04 | 28.3 | 38.6 | 34 | 39 | 1,663 | 3,384 | 28 | 120 | 141 | 312 |
| Lesotho | 0.22 | 0.16 | .. | .. | 203 | 170 | 150 | 171 | 6 | 6 | 47 | 62 |
| Liberia | 0.07 | 0.06 | 0.5 | 0.7 | 203 | 158 | 363 | .. | 0 | 0 | 24 | 17 |
| Libya | 0.58 | 0.37 | 10.7 | 21.2 | 538 | 327 | 357 | 302 | 101 | 303 | 134 | 181 |
| Lithuania | .. | 0.79 | .. | 0.3 | .. | 975 | .. | 521 | .. | 381 | .. | 332 |
| Macedonia, FYR | .. | 0.29 | .. | 8.6 | .. | 220 | .. | 729 | .. | 416 | .. | 913 |
| Madagascar | 0.28 | 0.18 | 21.5 | 35.1 | 1,309 | 1,374 | 31 | 29 | 1 | 1 | 11 | 14 |
| Malawi | 0.25 | 0.19 | 1.1 | 1.4 | 1,155 | 1,541 | 203 | 271 | 0 | 0 | 8 | 8 |
| Malaysia | 0.07 | 0.08 | 6.7 | 4.8 | 729 | 714 | .. | .. | 4 | 24 | 77 | 238 |
| Mali | 0.31 | 0.45 | 4.5 | 3.0 | 1,346 | 2,397 | 61 | 84 | 0 | 1 | 5 | 6 |
| Mauritania | 0.14 | 0.20 | 22.8 | 9.8 | 125 | 249 | 57 | 12 | 1 | 1 | 13 | 8 |
| Mauritius | 0.10 | 0.09 | 15.0 | 18.2 | 0 | 0 | 2,547 | 3,319 | 4 | 6 | 33 | 37 |
| Mexico | 0.34 | 0.26 | 20.3 | 23.8 | 9,356 | 10,952 | 570 | 706 | 16 | 20 | 54 | 69 |
| Moldova | .. | 0.42 | .. | 14.1 | .. | 765 | .. | 279 | .. | 82 | .. | 245 |
| Mongolia | 0.71 | 0.56 | 3.0 | 6.4 | 559 | 226 | 83 | 33 | 32 | 21 | 82 | 53 |
| Morocco | 0.39 | 0.32 | 15.0 | 13.1 | 4,414 | 4,904 | 268 | 369 | 7 | 10 | 34 | 49 |
| Mozambique | 0.24 | 0.18 | 2.1 | 3.2 | 1,077 | 1,731 | 107 | 24 | 1 | 1 | 20 | 18 |
| Myanmar | 0.28 | 0.21 | 10.4 | 16.7 | 5,133 | 6,817 | 111 | 173 | 1 | 1 | 9 | 10 |
| Namibia | 0.66 | 0.49 | 0.6 | 0.9 | 195 | 323 | 0 | 2 | 10 | 11 | 39 | 39 |
| Nepal | 0.16 | 0.13 | 22.5 | 38.2 | 2,251 | 3,305 | 98 | 324 | 0 | 0 | 10 | 16 |
| Netherlands | 0.06 | 0.06 | 58.5 | 60.0 | 225 | 213 | 8,620 | 5,374 | 561 | 596 | 2,238 | 1,712 |
| New Zealand | 0.80 | 0.41 | 5.2 | 8.7 | 193 | 132 | 1,965 | 4,241 | 619 | 437 | 367 | 489 |
| Nicaragua | 0.39 | 0.51 | 6.0 | 3.2 | 266 | 387 | 392 | 172 | 6 | 7 | 19 | 11 |
| Niger | 0.62 | 0.49 | 0.7 | 1.3 | 3,872 | 7,455 | 10 | 3 | 0 | 0 | 0 | 0 |
| Nigeria | 0.39 | 0.23 | 0.7 | 0.8 | 6,048 | 18,765 | 59 | 61 | 1 | 2 | 3 | 11 |
| Norway | 0.20 | 0.20 | .. | .. | 311 | 337 | 3,146 | 2,252 | 824 | 1,266 | 1,603 | 1,567 |
| Oman | 0.01 | 0.01 | 92.7 | 80.5 | 2 | 2 | 840 | 4,356 | 1 | 1 | 76 | 94 |
| Pakistan | 0.24 | 0.16 | 72.7 | 81.7 | 10,693 | 12,364 | 525 | 1,261 | 5 | 12 | 50 | 150 |
| Panama | 0.22 | 0.18 | 5.0 | 5.3 | 166 | 165 | 692 | 731 | 27 | 20 | 122 | 100 |
| Papua New Guinea | 0.01 | 0.01 | .. | .. | 2 | 3 | 3,827 | 1,700 | 1 | 1 | 699 | 193 |
| Paraguay | 0.52 | 0.42 | 3.4 | 2.9 | 307 | 548 | 44 | 297 | 14 | 24 | 45 | 75 |
| Peru | 0.19 | 0.15 | 32.3 | 28.6 | 732 | 1,189 | 381 | 602 | 5 | 5 | 37 | 36 |
| Philippines | 0.11 | 0.08 | 12.8 | 15.5 | 6,790 | 6,611 | 636 | 1,315 | 1 | 1 | 20 | 21 |
| Poland | 0.41 | 0.36 | 0.7 | 0.7 | 7,875 | 8,569 | 2,393 | 1,135 | 112 | 291 | 425 | 932 |
| Portugal | 0.25 | 0.19 | 20.1 | 24.6 | 1,099 | 584 | 1,113 | 1,297 | 72 | 236 | 351 | 840 |
| Puerto Rico | 0.02 | 0.01 | 27.2 | 49.6 | 1 | 0 | .. | .. | .. | .. | .. | .. |
| Romania | 0.44 | 0.41 | 21.9 | 29.2 | 6,340 | 5,687 | 1,448 | 325 | 39 | 92 | 150 | 177 |
| Russian Federation | .. | 0.86 | .. | 3.7 | .. | 40,539 | .. | 110 | .. | 97 | .. | 67 |

# 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 | 1997-99 | 1979-81 | 1997-99 | 1979-81 | 1999-2001 | 1979-81 | 1997-99 | 1979-81 | 1997-99 | 1979-81 | 1997-99 |
| Rwanda | 0.15 | 0.10 | 0.4 | 0.4 | 239 | 233 | 3 | 4 | 0 | 0 | 1 | 1 |
| Saudi Arabia | 0.20 | 0.18 | 28.9 | 42.8 | 388 | 625 | 228 | 925 | 2 | 12 | 10 | 26 |
| Senegal | 0.42 | 0.25 | 2.6 | 3.1 | 1,216 | 1,360 | 104 | 116 | 0 | 0 | 2 | 2 |
| Sierra Leone | 0.14 | 0.10 | 4.1 | 5.4 | 434 | 235 | 58 | 23 | 0 | 0 | 6 | 2 |
| Singapore | 0.00 | 0.00 | .. | .. | .. | .. | .. | .. | 3 | 22 | 220 | 650 |
| Slovak Republic | .. | 0.27 | .. | 10.9 | .. | .. | .. | 716 | .. | *91* | .. | 169 |
| Slovenia | .. | 0.09 | .. | 1.0 | .. | 97 | .. | 4,442 | .. | 4,231 | .. | 6,090 |
| Somalia | 0.15 | 0.13 | 13.3 | 18.8 | 638 | 464 | 9 | 5 | 1 | 1 | 17 | 18 |
| South Africa | 0.45 | 0.36 | 8.4 | 8.5 | 6,760 | 4,735 | 874 | 527 | 94 | 53 | 140 | 59 |
| Spain | 0.42 | 0.35 | 14.8 | 19.5 | 7,391 | 6,598 | 1,012 | 1,626 | 200 | 618 | 335 | 621 |
| Sri Lanka | 0.06 | 0.05 | 28.3 | 33.7 | 864 | 907 | 1,800 | 2,677 | 4 | 2 | 141 | 84 |
| Sudan | 0.64 | 0.56 | 14.4 | 11.5 | 4,447 | 7,068 | 51 | 41 | 2 | 2 | 8 | 6 |
| Swaziland | 0.30 | 0.17 | 34.0 | 38.3 | 70 | 61 | 1,050 | 327 | 29 | 25 | 173 | 174 |
| Sweden | 0.36 | 0.31 | .. | .. | 1,505 | 1,191 | 1,654 | 1,021 | 715 | 1,064 | 623 | 620 |
| Switzerland | 0.06 | 0.06 | 6.2 | 5.7 | 172 | 185 | 4,623 | 2,882 | 494 | 648 | 2,428 | 2,692 |
| Syrian Arab Republic | 0.60 | 0.31 | 9.6 | 21.6 | 2,642 | 2,977 | 250 | 754 | 29 | 67 | 54 | 195 |
| Tajikistan | .. | 0.12 | .. | 82.4 | .. | 391 | .. | 657 | .. | 37 | .. | 404 |
| Tanzania | 0.16 | 0.12 | 3.1 | 3.3 | 2,834 | 3,544 | 110 | 81 | 1 | 1 | 35 | 20 |
| Thailand | 0.35 | 0.25 | 16.4 | 26.0 | 10,625 | 11,684 | 177 | 1,102 | 1 | 10 | 11 | 147 |
| Togo | 0.77 | 0.52 | 0.3 | 0.3 | 416 | 796 | 14 | 77 | 0 | 0 | 0 | 0 |
| Trinidad and Tobago | 0.06 | 0.06 | 1.7 | 2.5 | 4 | 4 | 1,064 | 1,036 | 50 | 53 | 337 | 360 |
| Tunisia | 0.51 | 0.31 | 4.9 | 7.5 | 1,416 | 1,368 | 212 | 377 | 30 | 38 | 79 | 123 |
| Turkey | 0.57 | 0.40 | 9.6 | 15.8 | 13,499 | 13,204 | 529 | 831 | 38 | 62 | 169 | 358 |
| Turkmenistan | .. | 0.33 | .. | .. | .. | 732 | .. | 651 | .. | 80 | .. | 307 |
| Uganda | 0.32 | 0.24 | 0.1 | 0.1 | 752 | 1,366 | 1 | 6 | 0 | 1 | 6 | 9 |
| Ukraine | .. | 0.65 | .. | 7.2 | .. | 12,616 | .. | 151 | .. | 94 | .. | 114 |
| United Arab Emirates | 0.01 | 0.03 | .. | 57.4 | 0 | 1 | 2,250 | 4,153 | 6 | 4 | 106 | 34 |
| United Kingdom | 0.12 | 0.10 | 2.0 | 1.7 | 3,930 | 3,140 | 3,191 | 3,453 | 726 | 914 | 744 | 810 |
| United States | 0.83 | 0.64 | 10.8 | 12.5 | 72,639 | 58,055 | 1,092 | 1,127 | 1,230 | 1,546 | 253 | 271 |
| Uruguay | 0.48 | 0.38 | 5.4 | 13.8 | 614 | 554 | 564 | 1,041 | 171 | 173 | 236 | 262 |
| Uzbekistan | .. | 0.19 | .. | 88.3 | .. | 1,413 | .. | 1,912 | .. | 59 | .. | 380 |
| Venezuela, RB | 0.19 | 0.11 | 10.0 | 16.3 | 814 | 688 | 711 | 934 | 50 | 60 | 133 | 186 |
| Vietnam | 0.11 | 0.07 | 25.6 | 41.3 | 5,962 | 8,299 | 302 | 3,179 | 1 | 5 | 38 | 218 |
| West Bank and Gaza | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Yemen, Rep. | 0.16 | 0.09 | 19.9 | 29.0 | 865 | 639 | 93 | 183 | 3 | 2 | 33 | 37 |
| Yugoslavia, Fed. Rep. | 0.73 | .. | 1.9 | .. | 4,310 | *2,048* | 1,261 | .. | 140 | .. | 616 | .. |
| Zambia | 0.89 | 0.54 | 0.4 | 0.9 | 595 | 811 | 145 | 93 | 3 | 2 | 9 | 11 |
| Zimbabwe | 0.35 | 0.27 | 3.1 | 3.5 | 1,633 | 1,787 | 610 | 552 | 7 | 7 | 66 | 72 |
| **World** | **0.25 w** | **0.23 w** | **17.7 w** | **19.8 w** | **588,601 s** | **670,080 s** | **870 w** | **1,013 w** | **19 w** | **20 w** | **172 w** | **188 w** |
| **Low income** | 0.22 | 0.18 | 19.9 | 25.8 | 199,694 | 257,986 | 290 | 669 | 2 | 5 | 20 | 70 |
| **Middle income** | 0.18 | 0.22 | 23.4 | 20.3 | 233,883 | 279,983 | 985 | 1,111 | 8 | 11 | 103 | 126 |
| Lower middle income | 0.13 | 0.20 | 33.6 | 23.8 | 155,654 | 203,551 | 1,060 | 1,181 | 5 | 7 | 83 | 96 |
| Upper middle income | 0.34 | 0.29 | 10.4 | 12.8 | 78,229 | 76,432 | 888 | 959 | 39 | 82 | 137 | 206 |
| **Low & middle income** | 0.20 | 0.20 | 21.7 | 22.6 | 433,577 | 537,969 | 644 | 924 | 5 | 8 | 62 | 102 |
| East Asia & Pacific | 0.12 | 0.10 | 36.9 | 38.1 | 141,593 | 141,801 | 1,154 | 2,407 | 2 | 2 | 55 | 74 |
| Europe & Central Asia | 0.16 | 0.59 | 10.6 | 10.4 | 37,380 | 110,208 | 1,445 | 337 | .. | 100 | 223 | 166 |
| Latin America & Carib. | 0.32 | 0.27 | 11.8 | 13.9 | 49,846 | 49,106 | 586 | 854 | 25 | 36 | 95 | 118 |
| Middle East & N. Africa | 0.29 | 0.20 | 25.8 | 36.4 | 25,653 | 25,677 | 421 | 715 | 12 | 24 | 61 | 122 |
| South Asia | 0.23 | 0.16 | 28.7 | 40.9 | 132,128 | 131,199 | 360 | 1,051 | 2 | 5 | 25 | 91 |
| Sub-Saharan Africa | 0.32 | 0.24 | 4.0 | 4.2 | 46,978 | 79,978 | 158 | 134 | 3 | 1 | 23 | 16 |
| **High income** | 0.46 | 0.40 | 9.8 | 11.6 | 155,024 | 132,111 | 1,314 | 1,265 | 519 | 942 | 387 | 428 |
| Europe EMU | 0.23 | 0.21 | 13.4 | 18.3 | 35,999 | 31,478 | 2,704 | 2,306 | 452 | 868 | 896 | 950 |

a. Includes Luxembourg.

## 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 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.

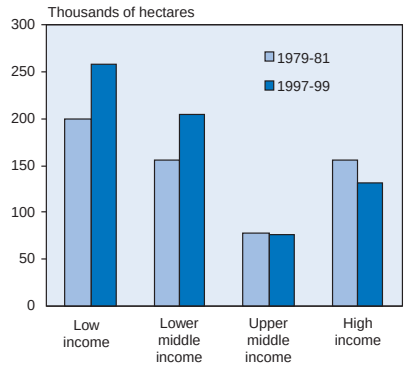
The data shown here and in table 3.3 are collected by the Food and Agriculture Organization (FAO) through annual questionnaires. The FAO tries to impose standard definitions and reporting methods, but exact consistency across countries and over time is not possible. Data on agricultural employment in 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.

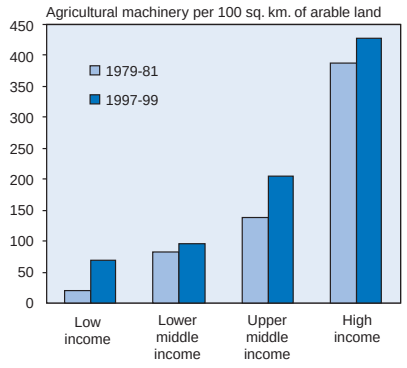
To smooth annual fluctuations in agricultural activity, the indicators in the table have been averaged over three years.

### Figure 3.2

**The land under cereal production is increasing in low-income economies**




**...but their use of agricultural machinery lags far behind other economies'.**




*Source:* Table 3.2.

## 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 land used for permanent crops (see table 3.1). • **Land under cereal production** refers to harvested areas, although some countries report only sown or cultivated area. • **Fertilizer consumption** measures 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 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1989-91 = 100 | | 1989-91 = 100 | | 1989-91 = 100 | | kilograms per hectare | | Agriculture value added per worker 1995 $ | |
| | 1979-81 | 1998-2000 | 1979-81 | 1998-2000 | 1979-81 | 1998-2000 | 1979-81 | 1998-2000 | 1979-81 | 1998-2000 |
| Afghanistan | .. | .. | .. | .. | .. | .. | 1,337 | 1,145 | .. | .. |
| Albania | .. | .. | .. | .. | .. | .. | 2,500 | 2,664 | 1,184 | 1,978 |
| Algeria | 77.5 | 126.2 | 67.6 | 130.9 | 55.0 | 124.5 | 656 | 846 | 1,357 | 1,962 |
| Angola | 101.9 | 148.5 | 90.0 | 144.1 | 83.8 | 135.6 | 526 | 646 | .. | 121 |
| Argentina | 83.5 | 160.0 | 91.7 | 137.5 | 101.1 | 106.7 | 2,184 | 3,448 | 7,148 | 10,243 |
| Armenia | .. | 97.9 | .. | 75.5 | .. | 60.5 | .. | 1,532 | .. | 5,477 |
| Australia | 79.9 | 165.4 | 91.3 | 140.8 | 85.6 | 112.2 | 1,321 | 2,034 | 20,354 | 33,765 |
| Austria | 92.8 | 102.3 | 92.2 | 105.3 | 94.5 | 105.6 | 4,131 | 5,646 | 11,197 | 28,523 |
| Azerbaijan | .. | 47.4 | .. | 65.8 | .. | 75.5 | .. | 2,056 | .. | 847 |
| Bangladesh | 80.0 | 117.4 | 79.2 | 119.8 | 81.3 | 137.7 | 1,938 | 2,927 | 217 | 296 |
| Belarus | .. | 87.0 | .. | 61.9 | .. | 60.2 | .. | 1,942 | .. | 3,832 |
| Belgium [a] | 84.9 | 141.4 | 88.5 | 114.5 | 88.8 | 112.7 | 4,861 | 7,594 | 21,868 | 55,874 |
| Benin | 53.8 | 175.3 | 63.1 | 151.3 | 69.0 | 119.7 | 698 | 1,056 | 311 | 586 |
| Bolivia | 71.2 | 151.6 | 70.9 | 137.4 | 75.5 | 129.0 | 1,183 | 1,520 | .. | 1,035 |
| Bosnia and Herzegovina | .. | .. | .. | .. | .. | .. | .. | 3,490 | .. | 7,970 |
| Botswana | 86.4 | 75.6 | 87.2 | 94.2 | 87.5 | 96.8 | 203 | 196 | 630 | 688 |
| Brazil | 75.3 | 122.9 | 69.5 | 137.9 | 67.9 | 150.3 | 1,496 | 2,665 | 2,048 | 4,356 |
| Bulgaria | 107.7 | 65.7 | 105.5 | 70.0 | 96.3 | 63.0 | 3,853 | 2,846 | 2,754 | 6,252 |
| Burkina Faso | 59.3 | 143.4 | 62.7 | 135.5 | 59.9 | 138.5 | 575 | 868 | 134 | 180 |
| Burundi | 79.9 | 89.7 | 79.9 | 90.3 | 82.3 | 81.5 | 1,081 | 1,283 | 177 | 141 |
| Cambodia | 55.2 | 138.2 | 48.9 | 141.3 | 27.3 | 150.5 | 1,025 | 1,875 | .. | 403 |
| Cameroon | 86.5 | 130.7 | 79.9 | 129.6 | 61.1 | 118.7 | 849 | 1,551 | 834 | 1,104 |
| Canada | 77.6 | 129.4 | 79.7 | 128.9 | 88.3 | 131.7 | 2,173 | 3,035 | 14,161 | 36,597 |
| Central African Republic | 102.8 | 128.4 | 79.7 | 132.3 | 48.9 | 127.8 | 529 | 1,084 | 377 | 469 |
| Chad | 67.1 | 173.7 | 80.1 | 152.0 | 89.2 | 119.2 | 587 | 650 | 155 | 227 |
| Chile | 70.7 | 126.3 | 71.5 | 133.1 | 75.8 | 143.5 | 2,124 | 4,540 | 3,488 | 5,712 |
| China | 67.1 | 141.6 | 60.8 | 169.6 | 45.4 | 210.0 | 3,027 | 4,879 | 161 | 321 |
| Hong Kong, China | 133.6 | 59.3 | 99.8 | 49.5 | 194.3 | 44.6 | 1,712 | .. | .. | .. |
| Colombia | 84.1 | 100.9 | 75.5 | 118.2 | 72.6 | 125.2 | 2,452 | 3,091 | 3,034 | 3,448 |
| Congo, Dem. Rep. | 73.0 | 89.1 | 72.2 | 92.0 | 77.7 | 103.2 | 807 | 785 | 241 | *252* |
| Congo, Rep. | 84.6 | 113.4 | 82.3 | 117.1 | 80.7 | 128.5 | 838 | 687 | 385 | 475 |
| Costa Rica | 70.7 | 146.8 | 73.1 | 141.3 | 77.2 | 121.5 | 2,498 | 3,543 | 3,139 | 5,140 |
| Côte d'Ivoire | 73.8 | 132.3 | 70.8 | 130.5 | 74.7 | 120.9 | 867 | 1,136 | 1,074 | 1,136 |
| Croatia | .. | 87.2 | .. | 69.9 | .. | 50.2 | .. | 4,444 | .. | 8,839 |
| Cuba | 84.1 | 55.0 | 90.1 | 59.4 | 96.0 | 66.1 | 2,458 | 2,148 | .. | .. |
| Czech Republic | .. | 89.0 | .. | 81.9 | .. | 75.3 | .. | 4,092 | .. | 5,637 |
| Denmark | 65.2 | 94.6 | 83.2 | 106.6 | 95.0 | 117.7 | 4,040 | 6,120 | 19,350 | 54,090 |
| Dominican Republic | 96.5 | 90.6 | 85.2 | 103.5 | 68.8 | 125.3 | 3,024 | 3,827 | 2,018 | 2,769 |
| Ecuador | 78.2 | 126.3 | 77.4 | 139.6 | 73.0 | 151.6 | 1,633 | 2,064 | 1,206 | 1,773 |
| Egypt, Arab Rep. | 75.5 | 142.6 | 68.4 | 151.3 | 67.0 | 159.6 | 4,053 | 7,015 | 721 | 1,240 |
| El Salvador | 120.4 | 108.6 | 90.8 | 119.6 | 88.8 | 123.6 | 1,702 | 2,063 | 1,925 | 1,711 |
| Eritrea | .. | 180.3 | .. | 139.4 | .. | 110.5 | .. | 822 | .. | .. |
| Estonia | .. | 66.6 | .. | 43.0 | .. | 36.9 | .. | 1,553 | .. | 3,698 |
| Ethiopia | .. | 121.6 | .. | 119.9 | .. | 116.2 | .. | 1,141 | .. | 138 |
| Finland | 76.3 | 86.3 | 93.8 | 89.7 | 107.5 | 93.0 | 2,511 | 2,763 | 18,547 | 36,557 |
| France | 87.4 | 111.8 | 93.8 | 107.6 | 97.8 | 105.8 | 4,700 | 7,271 | 19,318 | 53,785 |
| Gabon | 76.3 | 118.2 | 79.0 | 114.0 | 86.5 | 118.3 | 1,718 | 1,664 | 1,814 | 1,882 |
| Gambia, The | 79.5 | 114.1 | 82.8 | 115.4 | 94.4 | 114.5 | 1,284 | 1,101 | 325 | 226 |
| Georgia | .. | 60.8 | .. | 80.3 | .. | 88.2 | .. | 1,564 | .. | 1,960 |
| Germany | 90.1 | 114.2 | 91.4 | 94.8 | 98.7 | 86.4 | 4,166 | 6,436 | 9,059 | 29,553 |
| Ghana | 67.0 | 173.4 | 68.7 | 162.9 | 79.7 | 101.9 | 807 | 1,306 | 670 | 558 |
| Greece | 86.8 | 105.8 | 91.2 | 99.3 | 99.9 | 96.8 | 3,090 | 3,486 | 8,600 | 13,400 |
| Guatemala | 89.6 | 121.0 | 69.7 | 124.0 | 76.0 | 127.3 | 1,578 | 1,726 | 2,143 | 2,112 |
| Guinea | 89.7 | 143.6 | 96.3 | 143.9 | 116.4 | 142.3 | 958 | 1,312 | .. | 292 |
| Guinea-Bissau | 64.8 | 123.8 | 68.3 | 123.3 | 78.4 | 121.1 | 711 | 1,283 | 221 | 302 |
| Haiti | 103.4 | 86.9 | 101.3 | 95.7 | 100.2 | 128.8 | 1,009 | 922 | 509 | 349 |
| Honduras | 90.4 | 116.6 | 88.2 | 111.9 | 80.8 | 130.0 | 1,170 | 1,176 | 696 | 979 |

| | Crop production index | | Food production index | | Livestock production index | | Cereal yield | | Agricultural productivity | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1989-91 = 100 | | 1989-91 = 100 | | 1989-91 = 100 | | kilograms per hectare | | Agriculture value added per worker 1995 $ | |
| | 1979-81 | 1998-2000 | 1979-81 | 1998-2000 | 1979-81 | 1998-2000 | 1979-81 | 1998-2000 | 1979-81 | 1998-2000 |
| Hungary | 93.3 | 79.3 | 90.7 | 74.3 | 94.1 | 69.6 | 4,519 | 4,507 | 3,390 | 5,016 |
| India | 70.9 | 123.3 | 68.1 | 125.7 | 62.2 | 133.5 | 1,324 | 2,299 | 272 | 397 |
| Indonesia | 66.2 | 118.6 | 63.3 | 119.2 | 51.0 | 122.4 | 2,837 | 3,915 | 609 | 736 |
| Iran, Islamic Rep. | 57.3 | 150.0 | 61.1 | 150.0 | 68.0 | 146.1 | 1,108 | 2,030 | 2,197 | 3,756 |
| Iraq | 74.7 | 83.7 | 78.0 | 78.9 | 81.4 | 64.9 | 832 | 609 | .. | .. |
| Ireland | 93.9 | 110.1 | 83.3 | 111.3 | 83.3 | 111.9 | 4,733 | 6,883 | .. | .. |
| Israel | 99.8 | 103.2 | 85.0 | 112.2 | 78.4 | 118.7 | 1,840 | 1,701 | .. | .. |
| Italy | 106.1 | 105.1 | 101.4 | 105.0 | 93.0 | 105.5 | 3,548 | 5,033 | 11,090 | 24,827 |
| Jamaica | 98.6 | 123.2 | 86.0 | 120.9 | 73.9 | 119.5 | 1,667 | 1,197 | 829 | 1,346 |
| Japan | 107.9 | 88.3 | 94.0 | 92.5 | 85.1 | 94.2 | 5,252 | 5,971 | 17,378 | 30,086 |
| Jordan | 54.7 | 120.4 | 57.5 | 141.2 | 51.5 | 194.2 | 521 | 1,698 | 1,158 | 1,422 |
| Kazakhstan | .. | 65.7 | .. | 61.0 | .. | 45.3 | .. | 975 | .. | 1,421 |
| Kenya | 74.5 | 108.7 | 67.5 | 105.3 | 60.1 | 105.2 | 1,364 | 1,434 | 262 | 225 |
| Korea, Dem. Rep. | .. | .. | .. | .. | .. | .. | 3,694 | 2,987 | .. | .. |
| Korea, Rep. | 87.8 | 107.0 | 77.6 | 119.1 | 52.6 | 155.6 | 4,986 | 6,336 | 3,765 | 12,374 |
| Kuwait | 37.1 | 153.1 | 91.4 | 173.6 | 106.6 | 176.4 | 3,124 | 2,556 | .. | .. |
| Kyrgyz Republic | .. | 130.6 | .. | 115.9 | .. | 77.7 | .. | 2,577 | .. | 3,528 |
| Lao PDR | 73.5 | 141.1 | 70.3 | 146.0 | 56.0 | 162.3 | 1,402 | 2,925 | .. | 578 |
| Latvia | .. | 69.6 | .. | 44.3 | .. | 34.2 | .. | 1,981 | .. | 2,499 |
| Lebanon | 52.0 | 137.7 | 59.2 | 143.1 | 100.5 | 162.9 | 1,307 | 2,428 | .. | 29,241 |
| Lesotho | 95.1 | 115.9 | 89.1 | 98.6 | 87.7 | 87.6 | 977 | 974 | 723 | 540 |
| Liberia | .. | .. | .. | .. | .. | .. | 1,251 | 1,292 | .. | .. |
| Libya | 76.3 | 133.0 | 78.7 | 152.9 | 68.4 | 159.6 | 430 | 761 | .. | .. |
| Lithuania | .. | 74.5 | .. | 63.6 | .. | 54.7 | .. | 2,156 | .. | 3,129 |
| Macedonia, FYR | .. | 108.1 | .. | 95.6 | .. | 85.4 | .. | 3,076 | .. | 4,270 |
| Madagascar | 83.1 | 104.2 | 83.8 | 109.4 | 87.7 | 108.2 | 1,664 | 1,891 | 197 | 181 |
| Malawi | 85.7 | 148.8 | 93.2 | 152.7 | 78.2 | 111.9 | 1,161 | 1,514 | 109 | 140 |
| Malaysia | 75.3 | 111.8 | 55.6 | 135.4 | 41.0 | 152.0 | 2,828 | 2,860 | 3,939 | 6,638 |
| Mali | 54.5 | 142.8 | 76.7 | 125.7 | 94.5 | 122.3 | 804 | 1,163 | 241 | 283 |
| Mauritania | 62.1 | 149.7 | 86.5 | 105.7 | 89.4 | 99.5 | 384 | 916 | 299 | 480 |
| Mauritius | 93.3 | 94.2 | 89.7 | 104.0 | 64.0 | 135.6 | 2,536 | 5,094 | 3,087 | 4,977 |
| Mexico | 86.5 | 121.5 | 83.8 | 128.6 | 83.5 | 136.0 | 2,164 | 2,604 | 1,482 | 1,772 |
| Moldova | .. | 53.7 | .. | 44.1 | .. | 35.4 | .. | 2,439 | .. | 1,297 |
| Mongolia | 44.6 | 36.3 | 88.1 | 89.5 | 93.2 | 93.8 | 573 | 735 | *994* | 1,300 |
| Morocco | 54.8 | 95.3 | 55.9 | 100.7 | 59.8 | 108.4 | 811 | 780 | 1,146 | 1,785 |
| Mozambique | 109.6 | 143.5 | 100.9 | 131.0 | 85.8 | 102.3 | 603 | 919 | .. | 134 |
| Myanmar | 89.0 | 154.2 | 88.2 | 150.4 | 89.1 | 148.7 | 2,521 | 3,043 | .. | .. |
| Namibia | 80.1 | 110.4 | 107.2 | 97.0 | 115.6 | 95.5 | 377 | 285 | 919 | 1,468 |
| Nepal | 62.7 | 120.9 | 65.9 | 121.5 | 77.3 | 123.3 | 1,615 | 2,007 | 162 | 188 |
| Netherlands | 79.8 | 108.1 | 86.5 | 101.5 | 88.3 | 101.2 | 5,696 | 7,430 | 24,181 | 53,819 |
| New Zealand | 74.4 | 135.9 | 90.7 | 125.6 | 95.5 | 116.4 | 4,089 | 6,314 | 18,086 | 27,106 |
| Nicaragua | 124.1 | 134.5 | 117.8 | 140.9 | 139.7 | 136.0 | 1,475 | 1,694 | 1,543 | 1,887 |
| Niger | 90.1 | 151.4 | 97.9 | 141.7 | 109.7 | 125.4 | 440 | 379 | 222 | 214 |
| Nigeria | 51.4 | 155.5 | 57.2 | 152.3 | 84.3 | 126.0 | 1,265 | 1,206 | 414 | 672 |
| Norway | 94.5 | 84.8 | 93.8 | 95.9 | 96.2 | 100.5 | 3,634 | 4,002 | 17,013 | 33,305 |
| Oman | 60.4 | 113.8 | 62.5 | 113.8 | 61.6 | 104.0 | 982 | 2,204 | .. | .. |
| Pakistan | 65.6 | 125.6 | 66.4 | 144.4 | 59.5 | 152.3 | 1,608 | 2,261 | 394 | 630 |
| Panama | 97.1 | 96.5 | 85.6 | 107.3 | 71.3 | 125.4 | 1,524 | 2,217 | 2,122 | 2,632 |
| Papua New Guinea | 86.5 | 112.4 | 86.2 | 113.8 | 85.0 | 136.6 | 2,087 | 4,107 | 649 | 765 |
| Paraguay | 58.7 | 110.3 | 60.7 | 132.9 | 62.1 | 129.5 | 1,535 | 2,159 | 2,641 | 3,508 |
| Peru | 82.2 | 161.9 | 77.3 | 161.2 | 78.0 | 150.1 | 1,946 | 2,856 | 1,273 | 1,693 |
| Philippines | 88.2 | 107.8 | 86.1 | 121.3 | 73.7 | 163.0 | 1,611 | 2,434 | 1,347 | 1,328 |
| Poland | 84.6 | 85.6 | 87.9 | 88.0 | 98.0 | 87.0 | 2,345 | 2,885 | .. | 1,864 |
| Portugal | 85.0 | 89.7 | 72.2 | 98.3 | 71.8 | 118.9 | 1,102 | 2,791 | 3,350 | 7,235 |
| Puerto Rico | 131.2 | 62.9 | 99.7 | 81.7 | 90.3 | 87.5 | 7,970 | 2,580 | .. | .. |
| Romania | 114.1 | 90.5 | 113.0 | 92.5 | 110.0 | 89.3 | 2,854 | 2,543 | .. | 3,592 |
| Russian Federation | .. | 66.0 | .. | 61.8 | .. | 52.6 | .. | 1,387 | .. | 2,249 |

# 3.3 Agricultural output and productivity

| | Crop production index | | Food production index | | Livestock production index | | Cereal yield | | Agricultural productivity | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1989-91 = 100 | | 1989-91 = 100 | | 1989-91 = 100 | | kilograms per hectare | | Agriculture value added per worker 1995 $ | |
| | 1979-81 | 1998-2000 | 1979-81 | 1998-2000 | 1979-81 | 1998-2000 | 1979-81 | 1998-2000 | 1979-81 | 1998-2000 |
| Rwanda | 84.3 | 88.2 | 85.3 | 91.6 | 81.0 | 108.8 | 1,134 | 930 | 371 | 235 |
| Saudi Arabia | 27.2 | 91.7 | 26.7 | 86.8 | 32.7 | 143.0 | 820 | 3,754 | 2,167 | .. |
| Senegal | 77.2 | 102.9 | 74.0 | 114.2 | 65.1 | 138.0 | 690 | 721 | 336 | 304 |
| Sierra Leone | 80.3 | 81.7 | 84.5 | 87.0 | 84.1 | 112.4 | 1,249 | 1,116 | 367 | 341 |
| Singapore | 595.0 | 48.2 | 154.3 | 40.8 | 173.7 | 39.5 | .. | .. | 16,676 | 49,905 |
| Slovak Republic | .. | .. | .. | .. | .. | .. | .. | *4,225* | .. | .. |
| Slovenia | .. | 91.3 | .. | 100.0 | .. | 105.0 | .. | 5,378 | .. | 31,539 |
| Somalia | .. | .. | .. | .. | .. | .. | 474 | 513 | .. | .. |
| South Africa | 95.0 | 105.5 | 92.6 | 103.4 | 89.7 | 96.5 | 2,105 | 2,332 | 2,899 | 3,866 |
| Spain | 83.0 | 108.7 | 82.0 | 111.6 | 84.2 | 124.2 | 1,986 | 3,208 | 10,703 | 21,824 |
| Sri Lanka | 99.3 | 114.3 | 98.3 | 115.9 | 93.2 | 132.6 | 2,462 | 3,180 | 648 | 753 |
| Sudan | 130.2 | 162.9 | 105.1 | 158.4 | 89.3 | 149.9 | 645 | 514 | .. | .. |
| Swaziland | 72.5 | 90.4 | 80.2 | 91.0 | 96.5 | 83.4 | 1,345 | 1,836 | 1,671 | 1,731 |
| Sweden | 92.1 | 93.9 | 100.1 | 100.8 | 103.8 | 103.9 | 3,595 | 4,570 | 18,020 | 34,556 |
| Switzerland | 95.5 | 98.7 | 95.8 | 97.0 | 98.8 | 94.3 | 4,883 | 6,323 | .. | .. |
| Syrian Arab Republic | 100.4 | 159.6 | 94.2 | 151.1 | 72.2 | 132.5 | 1,156 | 1,333 | 2,206 | 2,890 |
| Tajikistan | .. | 56.7 | .. | 53.8 | .. | 37.2 | .. | 1,243 | .. | 1,236 |
| Tanzania | 81.8 | 100.2 | 76.7 | 106.0 | 69.3 | 119.5 | 1,063 | 1,295 | .. | 189 |
| Thailand | 79.2 | 113.4 | 80.3 | 113.6 | 64.9 | 127.3 | 1,911 | 2,478 | 630 | 909 |
| Togo | 70.4 | 146.6 | 77.1 | 135.9 | 52.0 | 121.9 | 729 | 933 | 345 | 538 |
| Trinidad and Tobago | 119.9 | 101.8 | 101.9 | 107.9 | 84.3 | 100.7 | 3,167 | 2,933 | 3,536 | 2,484 |
| Tunisia | 68.5 | 116.7 | 66.5 | 127.5 | 60.3 | 151.5 | 828 | 1,152 | 1,743 | 3,083 |
| Turkey | 76.6 | 114.8 | 75.8 | 112.5 | 80.4 | 108.1 | 1,869 | 2,196 | 1,860 | 1,886 |
| Turkmenistan | .. | 78.9 | .. | 134.0 | .. | 136.5 | .. | 2,346 | .. | 1,229 |
| Uganda | 67.5 | 119.5 | 70.4 | 116.6 | 84.8 | 120.6 | 1,555 | 1,377 | .. | 353 |
| Ukraine | .. | 57.2 | .. | 47.9 | .. | 45.7 | .. | 2,027 | .. | 1,345 |
| United Arab Emirates | 38.9 | 276.2 | 48.8 | 261.6 | 45.3 | 174.1 | 2,224 | 865 | .. | .. |
| United Kingdom | 80.1 | 102.9 | 92.0 | 98.9 | 98.1 | 98.1 | 4,792 | 6,981 | 20,326 | 34,938 |
| United States | 98.6 | 121.9 | 94.5 | 122.9 | 89.0 | 120.0 | 4,151 | 5,794 | .. | .. |
| Uruguay | 86.8 | 151.4 | 87.1 | 137.3 | 85.9 | 121.3 | 1,644 | 3,506 | 5,367 | 8,652 |
| Uzbekistan | .. | 87.9 | .. | 116.2 | .. | 116.4 | .. | 2,390 | .. | 1,035 |
| Venezuela, RB | 76.3 | 106.0 | 80.2 | 116.8 | 84.9 | 117.8 | 1,904 | 3,134 | 3,935 | 5,143 |
| Vietnam | 66.7 | 159.0 | 63.8 | 152.4 | 52.9 | 164.8 | 2,049 | 3,955 | .. | 240 |
| West Bank and Gaza | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Yemen, Rep. | 82.3 | 129.0 | 75.0 | 130.0 | 68.9 | 135.8 | 1,038 | 1,050 | .. | 366 |
| Yugoslavia, Fed. Rep. | 96.3 | *71.1* | 94.3 | *89.4* | 94.2 | *101.8* | 3,601 | *2,953* | .. | .. |
| Zambia | 64.5 | 93.8 | 72.9 | 100.8 | 86.2 | 113.2 | 1,676 | 1,391 | 196 | 214 |
| Zimbabwe | 77.8 | 121.1 | 83.3 | 105.2 | 89.7 | 108.7 | 1,359 | 1,184 | 307 | 366 |
| **World** | **79.1 w** | **123.6 w** | **78.8 w** | **127.9 w** | **79.6 w** | **129.4 w** | **1,608 w** | **2,083 w** | **.. w** | **.. w** |
| **Low income** | 71.6 | 124.4 | 70.7 | 126.5 | 68.4 | 131.2 | 1,083 | 1,297 | .. | .. |
| **Middle income** | 74.5 | 128.2 | 72.0 | 141.4 | 69.3 | 153.7 | 1,789 | 2,343 | .. | .. |
| Lower middle income | 72.1 | 132.3 | 68.2 | 150.5 | 59.8 | 176.0 | 1,741 | 2,083 | .. | .. |
| Upper middle income | 80.7 | 117.3 | 79.5 | 122.7 | 82.3 | 122.8 | 1,874 | 2,718 | .. | .. |
| **Low & middle income** | 73.5 | 126.8 | 71.5 | 136.3 | 69.1 | 148.0 | 1,418 | 1,813 | .. | .. |
| East Asia & Pacific | 69.0 | 135.4 | 63.8 | 156.4 | 48.0 | 197.6 | 2,116 | 2,945 | .. | .. |
| Europe & Central Asia | .. | .. | .. | .. | .. | .. | 2,854 | 2,355 | .. | .. |
| Latin America & Carib. | 80.3 | 124.3 | 78.3 | 131.2 | 79.8 | 131.9 | 1,802 | 2,346 | .. | .. |
| Middle East & N. Africa | 66.1 | 131.3 | 64.8 | 134.0 | 64.1 | 136.8 | 925 | 1,354 | .. | .. |
| South Asia | 71.9 | 121.3 | 69.6 | 125.7 | 64.0 | 136.2 | 1,510 | 2,280 | 265 | .. |
| Sub-Saharan Africa | 75.4 | 128.5 | 78.3 | 124.7 | 84.1 | 114.2 | 895 | 1,120 | 418 | .. |
| **High income** | 93.5 | 115.7 | 92.1 | 112.9 | 91.1 | 109.9 | 3,170 | 3,881 | .. | .. |
| Europe EMU | 91.0 | 108.6 | 91.4 | 103.4 | 93.8 | 101.0 | 4,035 | 5,646 | .. | .. |

a. Includes Luxembourg.

## About the data

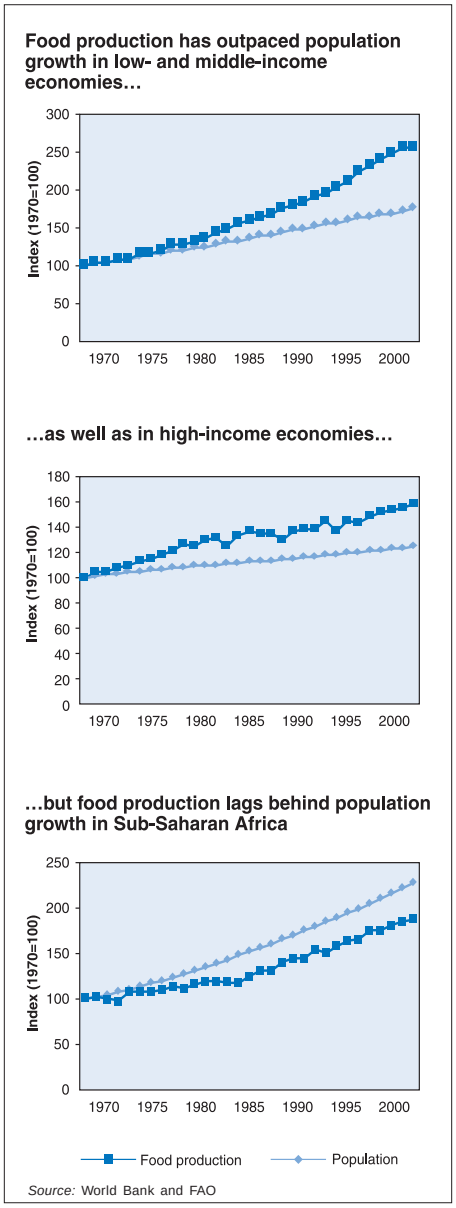
The agricultural production indexes in the table are prepared by the Food and Agriculture Organization (FAO). The FAO obtains data from official and semiofficial reports of crop yields, area under production, and livestock numbers. If data are not available, the FAO makes estimates. The indexes are calculated 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.

**Figure 3.3**




*Source:* World Bank and FAO

## 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.

## 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 agricultural value added see table 4.2.

# 3.4 | Deforestation and biodiversity

| | Forest area | | Average annual deforestation | | Mammals | | Birds | | Higher plants[a] | | Nationally protected areas | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | thousand sq. km **2000** | % of total land area **2000**[b] | sq. km **1990-2000** | % **1990-2000** | Species **1996**[b] | Threatened species **2000**[b] | Species **1996**[b] | Threatened species **2000**[b] | Species **1997**[b] | Threatened species **1997**[b] | thousand sq. km **1999**[b] | % of total land area **1999**[b] |
| Afghanistan | 14 | 2.1 | .. | .. | 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 | 0.8 | 3.1 |
| Algeria | 21 | 0.9 | -266 | -1.3 | 92 | 13 | 192 | 6 | 3,164 | 141 | 58.9 | 2.5 |
| Angola | 698 | 56.0 | 1,242 | 0.2 | 276 | 18 | 765 | 15 | 5,185 | 30 | 81.8 | 6.6 |
| Argentina | 346 | 12.7 | 2,851 | 0.8 | 320 | 32 | 897 | 39 | 9,372 | 247 | 49.1 | 1.8 |
| Armenia | 4 | 12.4 | -42 | -1.3 | .. | 7 | .. | 4 | .. | 31 | 2.1 | 7.6 |
| Australia | 1,581 | 20.6 | .. | .. | 252 | 63 | 649 | 35 | 15,638 | 2,245 | 542.5 | 7.1 |
| Austria | 39 | 47.0 | -77 | -0.2 | 83 | 9 | 213 | 3 | 3,100 | 23 | 24.5 | 29.6 |
| Azerbaijan | 11 | 12.6 | -130 | -1.3 | .. | 13 | .. | 8 | .. | 28 | 4.8 | 5.5 |
| Bangladesh | 13 | 10.2 | -165 | -1.3 | 109 | 21 | 295 | 23 | 5,000 | 24 | 1.0 | 0.8 |
| Belarus | 94 | 45.3 | -2,562 | -3.2 | .. | 5 | 221 | 3 | .. | 1 | 13.0 | 6.3 |
| Belgium | .. | .. | .. | .. | 58 | 11 | 180 | 2 | 1,550 | 2 | 0.0 | 0.0 |
| Benin | 27 | 24.0 | 699 | 2.3 | 188 | 7 | 307 | 2 | 2,201 | 4 | 7.8 | 7.0 |
| Bolivia | 531 | 48.9 | 1,611 | 0.3 | 316 | 23 | 1,274 | 27 | 17,367 | 227 | 156.0 | 14.4 |
| Bosnia and Herzegovina | 23 | 44.6 | .. | .. | .. | 10 | .. | 3 | .. | 64 | 0.3 | 0.5 |
| Botswana | 124 | 21.9 | 1,184 | 0.9 | 164 | 5 | 386 | 7 | 2,151 | 7 | 105.0 | 18.5 |
| Brazil | 5,325 | 63.0 | 22,264 | 0.4 | 394 | 79 | 1,492 | 113 | 56,215 | 1,358 | 375.1 | 4.4 |
| Bulgaria | 37 | 33.4 | -204 | -0.6 | 81 | 15 | 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 | 5 | 451 | 7 | *2,500* | *1* | 1.5 | 5.7 |
| Cambodia | 93 | 52.9 | 561 | 0.6 | 123 | 21 | 307 | 19 | .. | 5 | 28.6 | 16.2 |
| Cameroon | 239 | 51.3 | 2,218 | 0.9 | 297 | 37 | 690 | 15 | 8,260 | 89 | 21.0 | 4.5 |
| Canada | 2,446 | 26.5 | .. | .. | 193 | 14 | 426 | 8 | 3,270 | 278 | 907.0 | 9.8 |
| Central African Republic | 229 | 36.8 | 300 | 0.1 | 209 | 12 | 537 | 3 | 3,602 | 1 | 51.1 | 8.2 |
| 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 | 21 | 5,284 | 329 | 141.4 | 18.9 |
| China | 1,635 | 17.5 | -18,063 | -1.2 | 394 | 76 | 1,100 | 73 | 32,200 | 312 | 598.4 | 6.4 |
| Hong Kong, China | .. | .. | .. | .. | 24 | 1 | 76 | 11 | 1,984 | 9 | 0.5 | .. |
| Colombia | 496 | 47.8 | 1,905 | 0.4 | 359 | 36 | 1,695 | 77 | 51,220 | 712 | 93.6 | 9.0 |
| Congo, Dem. Rep. | 1,352 | 59.6 | 5,324 | 0.4 | 415 | 40 | 929 | 28 | 11,007 | 78 | 101.9 | 4.5 |
| Congo, Rep. | 221 | 64.6 | 175 | 0.1 | 200 | 12 | 449 | 4 | 6,000 | 3 | 15.4 | 4.5 |
| Costa Rica | 20 | 38.5 | 158 | 0.8 | 205 | 14 | 600 | 13 | 12,119 | 527 | 7.2 | 14.2 |
| Côte d'Ivoire | 71 | 22.4 | 2,649 | 3.1 | 230 | 17 | 535 | 12 | 3,660 | 94 | 19.9 | 6.2 |
| 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 | 19.1 | 17.4 |
| 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 | 13.8 | 32.5 |
| Dominican Republic | 14 | 28.4 | .. | .. | 20 | 5 | 136 | 15 | 5,657 | 136 | 15.2 | 31.5 |
| Ecuador | 106 | 38.1 | 1,372 | 1.2 | 302 | 31 | 1,388 | 62 | 19,362 | 824 | 120.8 | 43.6 |
| Egypt, Arab Rep. | 1 | 0.1 | -20 | -3.4 | 98 | 12 | 153 | 7 | 2,076 | 82 | 7.9 | 0.8 |
| El Salvador | 1 | 5.8 | 72 | 4.6 | 135 | 2 | 251 | 0 | 2,911 | 42 | 0.1 | 0.3 |
| Eritrea | 16 | 15.7 | 54 | 0.3 | 112 | 12 | 319 | 7 | .. | *0* | 5.0 | 5.0 |
| Estonia | 21 | 48.7 | -125 | -0.6 | 65 | 5 | 213 | 3 | .. | 2 | 5.0 | 11.8 |
| Ethiopia | 46 | 4.6 | 403 | 0.8 | 255 | 34 | 626 | 16 | 6,603 | 163 | 55.2 | 5.5 |
| Finland | 219 | 72.0 | -80 | 0.0 | 60 | 6 | 248 | 3 | 1,102 | 6 | 18.7 | 6.1 |
| France | 153 | 27.9 | -616 | -0.4 | 93 | 18 | 269 | 5 | 4,630 | 195 | 74.4 | 13.5 |
| Gabon | 218 | 84.7 | 101 | 0.0 | 190 | 15 | 466 | 6 | 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 | 42.9 | .. | .. | .. | 14 | .. | 3 | .. | 29 | 2.0 | 2.8 |
| Germany | 107 | 30.1 | .. | .. | 76 | 12 | 239 | 5 | 2,682 | 14 | 0.0 | 0.0 |
| Ghana | 63 | 27.8 | 1,200 | 1.7 | 222 | 13 | 529 | 8 | 3,725 | 103 | 11.0 | 4.9 |
| Greece | 36 | 27.9 | -300 | -0.9 | 95 | 14 | 251 | 7 | 4,992 | 571 | 4.7 | 3.6 |
| Guatemala | 29 | 26.3 | 537 | 1.7 | 250 | 6 | 458 | 6 | 8,681 | 355 | 18.3 | 16.8 |
| Guinea | 69 | 28.2 | 347 | 0.5 | 190 | 11 | 409 | 10 | 3,000 | 39 | 1.6 | 0.7 |
| Guinea-Bissau | 22 | 77.8 | 216 | 0.9 | 108 | 2 | 243 | 0 | *1,000* | *0* | 0.0 | 0.0 |
| Haiti | 1 | 3.2 | 70 | 5.7 | .. | 4 | 75 | 14 | 5,242 | 100 | 0.1 | 0.4 |
| Honduras | 54 | 48.1 | 590 | 1.0 | 173 | 9 | 422 | 5 | 5,680 | 96 | 6.7 | 6.0 |

| | Forest area | | Average annual deforestation | | Mammals | | Birds | | Higher plants[a] | | Nationally protected areas | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | thousand sq. km 2000 | % of total land area 2000[b] | sq. km 1990-2000 | % 1990-2000 | Species 1996[b] | Threatened species 2000[b] | Species 1996[b] | Threatened species 2000[b] | Species 1997[b] | Threatened species 1997[b] | thousand sq. km 1999[b] | % of total land area 1999[b] |
| 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 | 86 | 923 | 70 | 16,000 | 1,236 | 143.1 | 4.8 |
| Indonesia | 1,050 | 58.0 | 13,124 | 1.2 | 436 | 140 | 1,519 | 113 | 29,375 | 264 | 192.5 | 10.6 |
| Iran, Islamic Rep. | 73 | 4.5 | .. | .. | 140 | 23 | 323 | 13 | 8,000 | 2 | 83.0 | 5.1 |
| Iraq | 8 | 1.8 | .. | .. | 81 | 10 | 172 | 11 | .. | *2* | 0.0 | 0.0 |
| Ireland | 7 | 9.6 | -170 | -3.0 | 25 | 5 | 142 | 1 | 950 | 1 | 0.7 | 0.9 |
| 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 | 22.0 | 7.5 |
| Jamaica | 3 | 30.0 | 54 | 1.5 | 24 | 5 | 113 | 12 | 3,308 | 744 | 0.0 | 0.1 |
| Japan | 241 | 66.1 | -34 | 0.0 | 132 | 37 | 250 | 34 | 5,565 | 707 | 25.6 | 6.8 |
| Jordan | 1 | 1.0 | .. | .. | 71 | 8 | 141 | 8 | 2,100 | 9 | 3.0 | 3.4 |
| Kazakhstan | 121 | 4.5 | -2,390 | -2.2 | .. | 18 | .. | 15 | .. | 71 | 73.4 | 2.7 |
| Kenya | 171 | 30.0 | 931 | 0.5 | 359 | 51 | 844 | 24 | 6,506 | 240 | 35.1 | 6.2 |
| Korea, Dem. Rep. | 82 | 68.2 | .. | .. | .. | 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 | 27 | 487 | 19 | .. | 2 | 0.0 | 0.0 |
| Latvia | 29 | 47.1 | -127 | -0.4 | 83 | 5 | 217 | 3 | *1,153* | *0* | 8.1 | 13.0 |
| Lebanon | 0 | 3.5 | 1 | 0.3 | 54 | 6 | 154 | 7 | 3,000 | 5 | 0.0 | 0.5 |
| Lesotho | 0 | 0.5 | .. | .. | 33 | 3 | 58 | 7 | 1,591 | 21 | 0.1 | 0.2 |
| Liberia | 35 | 36.1 | 760 | 2.0 | 193 | 16 | 372 | 11 | 2,200 | 25 | 1.3 | 1.3 |
| Libya | 4 | 0.2 | -47 | -1.4 | 76 | 9 | 91 | 1 | 1,825 | 57 | 1.7 | 0.1 |
| Lithuania | 20 | 30.9 | -48 | -0.2 | 70 | 22 | 321 | 76 | 1,847 | 332 | 7.5 | 11.5 |
| Macedonia, FYR | 9 | 35.6 | .. | .. | .. | 11 | .. | 3 | .. | *0* | 1.8 | 7.1 |
| Madagascar | 117 | 20.2 | 1,174 | 0.9 | 105 | 50 | 202 | 27 | 9,505 | 306 | 11.2 | 1.9 |
| 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 | 47 | 501 | 37 | 15,500 | 490 | 15.1 | 4.6 |
| 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 | 4 | 27 | 9 | 750 | 294 | 0.2 | 7.7 |
| Mexico | 552 | 28.9 | 6,306 | 1.1 | 450 | 69 | 769 | 39 | 26,071 | 1,593 | 66.4 | 3.5 |
| Moldova | 3 | 9.9 | -7 | -0.2 | 68 | 3 | 177 | 5 | .. | 5 | 0.5 | 1.4 |
| Mongolia | 106 | 6.8 | 600 | 0.5 | 134 | 12 | 390 | 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 | 15 | 498 | 16 | 5,692 | 89 | 47.8 | 6.1 |
| Myanmar | 344 | 52.3 | 5,169 | 1.4 | 251 | 36 | 867 | 35 | 7,000 | 32 | 1.7 | 0.3 |
| Namibia | 80 | 9.8 | 734 | 0.9 | 154 | 14 | 469 | 11 | 3,174 | 75 | 106.2 | 12.9 |
| Nepal | 39 | 27.3 | 783 | 1.8 | 167 | 27 | 611 | 26 | 6,973 | 20 | 11.1 | 7.8 |
| Netherlands | 4 | 11.1 | -10 | -0.3 | 55 | 11 | 191 | 4 | 1,221 | 1 | 2.3 | 6.8 |
| New Zealand | 79 | 29.7 | -390 | -0.5 | 10 | 8 | 150 | 62 | 2,382 | 211 | 63.3 | 23.6 |
| Nicaragua | 33 | 27.0 | 1,172 | 3.0 | 200 | 6 | 482 | 5 | 7,590 | 98 | 9.1 | 7.5 |
| 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 | 25 | 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 | .. | .. | 56 | 9 | 107 | 10 | 1,204 | 30 | 34.3 | 16.1 |
| Pakistan | 25 | 3.2 | 304 | 1.1 | 151 | 18 | 375 | 17 | 4,950 | 14 | 37.3 | 4.8 |
| Panama | 29 | 38.6 | 519 | 1.6 | 218 | 20 | 732 | 16 | 9,915 | 1,302 | 14.2 | 19.1 |
| Papua New Guinea | 306 | 67.6 | 1,129 | 0.4 | 214 | 58 | 644 | 32 | 11,544 | 92 | 0.1 | 0.0 |
| Paraguay | 234 | 58.8 | 1,230 | 0.5 | 305 | 9 | 556 | 26 | 7,851 | 129 | 14.0 | 3.5 |
| Peru | 652 | 50.9 | 2,688 | 0.4 | 344 | 47 | 1,538 | 73 | 18,245 | 906 | 34.6 | 2.7 |
| Philippines | 58 | 19.4 | 887 | 1.4 | 153 | 50 | 395 | 67 | 8,931 | 360 | 14.5 | 4.9 |
| Poland | 93 | 30.6 | -110 | -0.1 | 84 | 15 | 227 | 4 | 2,450 | 27 | 29.3 | 9.6 |
| 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 | 0.2 | 2.1 |
| 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 | 42 | 628 | 38 | .. | 214 | 529.1 | 3.1 |

# 3.4 Deforestation and biodiversity

| | Forest area | | Average annual deforestation | | Mammals | | Birds | | Higher plants[a] | | Nationally protected areas | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | thousand sq. km 2000 | % of total land area 2000[b] | sq. km 1990-2000 | % 1990-2000 | Species 1996[b] | Threatened species 2000[b] | Species 1996[b] | Threatened species 2000[b] | Species 1997[b] | Threatened species 1997[b] | thousand sq. km 1999[b] | % of total land area 1999[b] |
| Rwanda | 3 | 12.4 | 150 | 3.9 | 151 | 8 | 513 | 9 | *2,288* | *0* | 3.6 | 14.7 |
| Saudi Arabia | 15 | 0.7 | .. | .. | 77 | 7 | 155 | 15 | 2,028 | 7 | 49.7 | 2.3 |
| Senegal | 62 | 32.2 | 450 | 0.7 | 155 | 11 | 384 | 4 | 2,086 | 31 | 21.8 | 11.3 |
| Sierra Leone | 11 | 14.7 | 361 | 2.9 | 147 | 11 | 466 | 10 | 2,090 | 29 | 0.8 | 1.1 |
| Singapore | 0 | 3.3 | .. | .. | 45 | 3 | 118 | 7 | 2,168 | 29 | 0.0 | 4.8 |
| Slovak Republic | 20 | 42.5 | -69 | -0.3 | .. | 9 | 209 | 4 | .. | 65 | 10.8 | 22.6 |
| 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 | 1.8 | 0.3 |
| South Africa | 89 | 7.3 | 80 | 0.1 | 247 | 41 | 596 | 28 | 23,420 | 2,215 | 66.2 | 5.4 |
| 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 | 20 | 250 | 14 | 3,314 | 455 | 8.7 | 13.5 |
| Sudan | 616 | 25.9 | 9,589 | 1.4 | 267 | 24 | 680 | 6 | 3,137 | 10 | 86.4 | 3.6 |
| Swaziland | 5 | 30.3 | -58 | -1.2 | 47 | 4 | 364 | 5 | 2,715 | 42 | 0.4 | 2.0 |
| Sweden | 271 | 65.9 | -6 | 0.0 | 60 | 8 | 249 | 2 | 1,750 | 13 | 36.4 | 8.9 |
| Switzerland | 12 | 30.3 | -43 | -0.4 | 75 | 6 | 193 | 2 | 3,030 | 30 | 10.6 | 26.9 |
| Syrian Arab Republic | 5 | 2.5 | .. | .. | 63 | 4 | 204 | 8 | 3,000 | 8 | 0.0 | 0.0 |
| Tajikistan | 4 | 2.8 | -20 | -0.5 | .. | 9 | .. | 7 | .. | 50 | 5.9 | 4.2 |
| Tanzania | 388 | 43.9 | 913 | 0.2 | 316 | 43 | 822 | 33 | 10,008 | 436 | 138.2 | 15.6 |
| Thailand | 148 | 28.9 | 1,124 | 0.7 | 265 | 34 | 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 | 9.9 | 1.3 |
| Turkmenistan | 38 | 8.0 | .. | .. | .. | 13 | .. | 6 | .. | 17 | 19.8 | 4.2 |
| Uganda | 42 | 21.3 | 913 | 2.0 | 338 | 19 | 830 | 13 | 5,406 | 15 | 19.1 | 9.6 |
| Ukraine | 96 | 16.5 | -310 | -0.3 | .. | 17 | 263 | 8 | .. | 52 | 9.4 | 1.6 |
| 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 | 50.0 | 20.7 |
| United States | 2,260 | 24.7 | -3,880 | -0.2 | 428 | 37 | 650 | 55 | 19,473 | 4,669 | 1,231.2 | 13.4 |
| 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 | .. | 11 | .. | 9 | .. | 41 | 8.2 | 2.0 |
| Venezuela, RB | 495 | 56.1 | 2,175 | 0.4 | 305 | 25 | 1,181 | 24 | 21,073 | 426 | 322.5 | 36.6 |
| Vietnam | 98 | 30.2 | -516 | -0.5 | 213 | 37 | 535 | 35 | 10,500 | 341 | 10.0 | 3.1 |
| West Bank and Gaza | .. | .. | .. | .. | .. | 1 | .. | 1 | .. | .. | .. | .. |
| Yemen, Rep. | 4 | 0.9 | 92 | 1.8 | 66 | 4 | 143 | 12 | .. | *149* | 0.0 | 0.0 |
| Yugoslavia, Fed. Rep. | 29 | .. | 14 | 0.0 | .. | 11 | .. | 5 | 5,351 | 155 | 3.4 | 3.3 |
| Zambia | 312 | 42.0 | 8,509 | 2.4 | 229 | 12 | 605 | 11 | 4,747 | 12 | 63.7 | 8.6 |
| Zimbabwe | 190 | 49.2 | 3,199 | 1.5 | 270 | 12 | 532 | 10 | 4,440 | 100 | 30.7 | 7.9 |
| **World** | **38,602 s** | **29.7 w** | **90,385.0 s** | **0.2 w** | | | | | | | **8,437.7 s** | **6.5 w** |
| **Low income** | 8,802 | 27.1 | 71,466.0 | 0.8 | | | | | | | 1,852.8 | 5.7 |
| **Middle income** | 21,828 | 32.7 | 26,930.0 | 0.1 | | | | | | | 3,461.3 | 5.2 |
| Lower middle income | 13,881 | 31.8 | -10,206.0 | -0.1 | | | | | | | 2,119.4 | 4.9 |
| Upper middle income | 7,947 | 34.5 | 37,136.0 | 0.5 | | | | | | | 1,341.9 | 5.8 |
| **Low & middle income** | 30,630 | 30.9 | 98,396.0 | 0.3 | | | | | | | 5,314.1 | 5.4 |
| East Asia & Pacific | 4,341 | 27.2 | 7,048.0 | 0.2 | | | | | | | 1,122.2 | 7.0 |
| Europe & Central Asia | 9,464 | 39.7 | -8,143.0 | -0.1 | | | | | | | 789.9 | 3.3 |
| Latin America & Carib. | 9,440 | 47.1 | 45,878.0 | 0.5 | | | | | | | 1,477.5 | 7.4 |
| Middle East & N. Africa | 168 | 1.5 | -239.0 | -0.1 | | | | | | | 242.4 | 2.2 |
| South Asia | 782 | 16.3 | 889.0 | 0.1 | | | | | | | 213.3 | 4.5 |
| Sub-Saharan Africa | 6,436 | 27.3 | 52,963.0 | 0.8 | | | | | | | 1,468.8 | 6.2 |
| **High income** | 7,972 | 26.1 | -8,011.0 | -0.1 | | | | | | | 3,123.6 | 10.2 |
| Europe EMU | 927 | 37.0 | -2,988.0 | -0.3 | | | | | | | 198.3 | 7.8 |

a. Flowering plants only. b. Data may refer to earlier years. They are the most recent reported by the World Conservation Monitoring Center in 2000.

## 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 as of 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 one of 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 of 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 *Biodiversity Data Sourcebook* (1994) and the IUCN's *2000 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 resources per capita cu.m. 2000 | billion cu.m.[b] | % of total resources[a,b] | % for agriculture[c] | % for industry[c] | % for domestic[c] | % of urban population with access 1990 | % of urban population with access 2000 | % of rural population with access 1990 | % of rural population with access 2000 |
| Afghanistan | 55 | 10.0 | 2,448 | 26.1 | 40.2 | 99 [d] | 0 [d] | 1 [d] | .. | 19 | .. | 11 |
| Albania | 27 | 15.7 | 12,489 | 1.4 | 3.3 | 71 | 0 | 29 | .. | .. | .. | .. |
| Algeria | 14 | 0.4 | 470 | 4.5 | 31.5 | 60 [d] | 15 [d] | 25 [d] | .. | 98 | .. | 88 |
| Angola | 184 | .. | 14,009 | 0.5 | 0.3 | 76 [d] | 10 [d] | 14 [d] | .. | 34 | .. | 40 |
| Argentina | 360 | 623.0 | 26,545 | 28.6 | 2.9 | 75 | 9 | 16 | .. | 85 | .. | 30 |
| Armenia | 9 | 1.5 | 2,787 | 2.9 | 27.6 | 66 | 4 | 30 | .. | .. | .. | .. |
| Australia | 352 | 0.0 | 18,351 | 15.1 | 4.3 | 33 | 2 | 65 | 100 | 100 | 100 | 100 |
| Austria | 55 | 29.0 | 10,357 | 2.2 | 2.7 | 9 | 60 | 31 | 100 | 100 | 100 | 100 |
| Azerbaijan | 8 | 21.0 | 3,615 | 16.5 | 56.8 | 70 | 25 | 5 | .. | .. | .. | .. |
| Bangladesh | 105 | 1,105.6 | 9,238 | 14.6 | 1.2 | 86 | 2 | 12 | 98 | 99 | 89 | 97 |
| Belarus | 37 | 20.8 | 5,797 | 2.7 | 4.7 | 35 | 43 | 22 | .. | 100 | .. | 100 |
| Belgium | 12 | 4.0 | 1,561 | 0.0 | 56.4 | .. | .. | .. | .. | .. | .. | .. |
| Benin | 10 | 15.5 | 4,114 | 0.2 | 0.6 | 67 [d] | 10 [d] | 23 [d] | .. | 74 | .. | 55 |
| Bolivia | 316 | 7.2 | 38,806 | 1.4 | 0.4 | 48 | 20 | 32 | 92 | 93 | 52 | 55 |
| Bosnia and Herzegovina | 36 | 2.0 | 9,429 | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Botswana | 3 | 11.8 | 9,176 | 0.1 | 0.7 | 48 [d] | 20 [d] | 32 [d] | 100 | 100 | 91 | .. |
| Brazil | 5,418 | 1,900.0 | 42,944 | 54.9 | 0.7 | 61 | 18 | 21 | 93 | 95 | 50 | 54 |
| Bulgaria | 18 | 0.2 | 2,228 | 0.0 | 76.4 | .. | .. | .. | .. | .. | .. | 98 |
| Burkina Faso | 18 | 2.0 | 1,730 | 0.4 | 1.9 | 81 [d] | 0 [d] | 19 [d] | 74 | 84 | 50 | .. |
| Burundi | 4 | .. | 529 | 0.1 | 2.8 | 64 [d] | 0 [d] | 36 [d] | 94 | 96 | 63 | .. |
| Cambodia | 121 | 355.6 | 39,613 | 0.5 | 0.1 | 94 | 1 | 5 | .. | 53 | .. | 25 |
| Cameroon | 268 | 0.0 | 18,016 | 0.4 | 0.1 | 35 [d] | 19 [d] | 46 [d] | 76 | 82 | 36 | 42 |
| Canada | 2,740 | 52.0 | 90,797 | 45.1 | 1.6 | 9 | 80 | 11 | 100 | 100 | 99 | 99 |
| Central African Republic | 141 | .. | 37,934 | 0.1 | 0.0 | 73 [d] | 6 [d] | 21 [d] | 80 | 80 | 46 | 46 |
| Chad | 15 | 28.0 | 5,589 | 0.2 | 0.4 | 82 [d] | 2 [d] | 16 [d] | .. | 31 | .. | 26 |
| Chile | 928 | 0.0 | 61,007 | 21.4 | 2.2 | 84 | 11 | 5 | 98 | 99 | 48 | 66 |
| China | 2,812 | 17.2 | 2,241 | 525.5 | 18.6 | 77 | 18 | 5 | 99 | 94 | 60 | 66 |
| Hong Kong, China | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Colombia | 2,133 | 0.0 | 50,426 | 8.9 | 0.4 | 37 | 4 | 59 | 95 | 98 | 68 | 73 |
| Congo, Dem. Rep. | 935 | 313.0 | 24,496 | 0.4 | 0.0 | 23 [d] | 16 [d] | 61 [d] | .. | 89 | .. | 26 |
| Congo, Rep. | 222 | 610.0 | 275,646 | 0.0 | 0.0 | 11 [d] | 27 [d] | 62 [d] | .. | 71 | .. | 17 |
| Costa Rica | 112 | .. | 29,494 | 5.8 | 5.1 | 80 | 7 | 13 | .. | 98 | .. | 98 |
| Côte d'Ivoire | 77 | .. | 4,790 | 0.7 | 0.9 | 67 [d] | 11 [d] | 22 [d] | 89 | 90 | 49 | 65 |
| Croatia | 38 | 33.7 | 16,301 | 0.1 | 1.1 | .. | 50 | 50 | .. | .. | .. | .. |
| Cuba | 38 | 0.0 | 3,396 | 5.2 | 13.7 | 51 | 0 | 49 | .. | 99 | .. | 82 |
| Czech Republic | 15 | 1.0 | 1,557 | 2.5 | 15.8 | 2 | 57 | 41 | .. | .. | .. | .. |
| Denmark | 6 | .. | 1,124 | 0.9 | 14.8 | 43 | 27 | 30 | .. | 100 | .. | 100 |
| Dominican Republic | 21 | .. | 2,508 | 8.3 | 39.7 | 89 | 1 | 11 | 83 | 83 | 70 | 70 |
| Ecuador | 442 | 0.0 | 34,952 | 17.0 | 3.8 | 82 | 6 | 12 | .. | 81 | .. | 51 |
| Egypt, Arab Rep. | 2 | 66.7 | 1,071 | 55.1 | 80.4 | 86 [d] | 8 [d] | 6 [d] | 97 | 96 | 91 | 94 |
| El Salvador | 18 | .. | 2,820 | 0.7 | 4.1 | 46 | 20 | 34 | .. | 88 | 47 | 61 |
| Eritrea | 3 | 6.0 | 2,148 | .. | .. | .. | .. | .. | .. | 63 | .. | 42 |
| Estonia | 13 | 0.1 | 9,350 | 0.2 | 1.3 | 5 | 39 | 56 | .. | .. | .. | .. |
| Ethiopia | 110 | 0.0 | 1,711 | 2.2 | 2.0 | 86 [d] | 3 [d] | 11 [d] | 77 | 77 | 13 | 13 |
| Finland | 107 | 3.0 | 21,248 | 2.4 | 2.2 | 0 | 82 | 17 | 100 | 100 | 100 | 100 |
| France | 180 | 11.0 | 3,243 | 40.6 | 21.3 | 12 | 73 | 15 | .. | .. | .. | .. |
| Gabon | 164 | 0.0 | 133,333 | 0.1 | 0.0 | 6 [d] | 22 [d] | 72 [d] | .. | 73 | .. | 55 |
| Gambia, The | 3 | 5.0 | 6,140 | 0.0 | 0.4 | 91 [d] | 2 [d] | 7 [d] | .. | 80 | .. | 53 |
| Georgia | 58 | 8.4 | 13,236 | 3.5 | 5.2 | 59 | 20 | 21 | .. | .. | .. | .. |
| Germany | 107 | 71.0 | 2,167 | 46.3 | 26.0 | 0 | 86 | 14 | .. | .. | .. | .. |
| Ghana | 30 | 22.9 | 2,756 | 0.3 | 0.6 | 52 [d] | 13 [d] | 35 [d] | 83 | 87 | 43 | 49 |
| Greece | 54 | 15.0 | 6,534 | 7.0 | 10.2 | 81 | 3 | 16 | .. | .. | .. | .. |
| Guatemala | 134 | 0.0 | 11,805 | 1.2 | 0.9 | 74 | 17 | 9 | 88 | 97 | 72 | 88 |
| Guinea | 226 | 0.0 | 30,479 | 0.7 | 0.3 | 87 [d] | 3 [d] | 10 [d] | 72 | 72 | 36 | 36 |
| Guinea-Bissau | 16 | 11.0 | 22,519 | 0.0 | 0.1 | 36 [d] | 4 [d] | 60 [d] | .. | 29 | .. | 55 |
| Haiti | 12 | .. | 1,520 | 1.0 | 8.1 | 94 | 1 | 5 | 55 | 49 | 42 | 45 |
| Honduras | 96 | 0.0 | 14,976 | 1.5 | 1.6 | 91 | 5 | 4 | 90 | 97 | 79 | 82 |

| | 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 resources per capita cu.m. 2000 | billion cu.m.[b] | % of total resources[a,b] | % for agriculture[c] | % for industry[c] | % for domestic[c] | % of urban population with access 1990 | % of urban population with access 2000 | % of rural population with access 1990 | % of rural population with access 2000 |
| Hungary | 6 | 114.0 | 11,974 | 6.3 | 5.2 | 5 | 70 | 14 | 100 | 100 | 98 | 98 |
| India | 1,261 | 647.2 | 1,878 | 500.0 | 26.2 | 92 | 3 | 5 | 92 | 92 | 73 | 86 |
| Indonesia | 2,838 | .. | 13,487 | 74.3 | 2.6 | 93 | 1 | 6 | 90 | 91 | 60 | 65 |
| Iran, Islamic Rep. | 129 | .. | 2,018 | 70.0 | 54.5 | 92 | 2 | 6 | 95 | 99 | 75 | 89 |
| Iraq | 35 | 75.9 | 4,776 | 42.8 | 38.5 | 92 | 5 | 3 | .. | 96 | .. | 48 |
| Ireland | 49 | 3.0 | 13,706 | 1.2 | 2.3 | 10 | 74 | 16 | .. | .. | .. | .. |
| Israel | 2 | 0.9 | 449 | 1.7 | 61.1 | 64[d] | 7[d] | 29[d] | .. | .. | .. | .. |
| Italy | 161 | 6.8 | 2,903 | 57.5 | 28.6 | 45 | 37 | 18 | .. | .. | .. | .. |
| Jamaica | 9 | .. | 3,570 | 0.9 | 9.6 | 77 | 7 | 15 | .. | 81 | .. | 59 |
| Japan | 430 | 0.0 | 3,389 | 91.4 | 21.3 | 64 | 17 | 19 | .. | .. | .. | .. |
| Jordan | 1 | .. | 143 | 1.0 | 140.0 | 75 | 3 | 22 | 99 | 100 | 92 | 84 |
| Kazakhstan | 75 | 34.2 | 7,371 | 33.7 | 30.7 | 81 | 17 | 2 | .. | 98 | .. | 82 |
| Kenya | 20 | 10.0 | 1,004 | 2.0 | 6.8 | 76[d] | 4[d] | 20[d] | 89 | 87 | 25 | 31 |
| Korea, Dem. Rep. | 67 | 10.1 | 3,462 | 14.2 | 18.4 | 73 | 16 | 11 | .. | .. | .. | .. |
| Korea, Rep. | 65 | 4.9 | 1,476 | 23.7 | 33.9 | 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 | .. | 59 | .. | 100 |
| Latvia | 17 | 18.7 | 14,924 | 0.3 | 0.8 | 13 | 32 | 55 | .. | .. | .. | .. |
| Lebanon | 5 | 0.0 | 1,109 | 1.3 | 26.9 | 68 | 4 | 28 | .. | 100 | .. | 100 |
| Lesotho | 5 | 0.0 | 2,555 | 0.1 | 1.0 | 56[d] | 22 | 22[d] | .. | 98 | .. | 88 |
| Liberia | 200 | 32.0 | 74,121 | 0.1 | 0.1 | 60[d] | 13[d] | 27[d] | .. | .. | .. | .. |
| Libya | 1 | 0.0 | 151 | 3.9 | 486.3 | 87[d] | 4[d] | 9[d] | 72 | 72 | 68 | 68 |
| Lithuania | 17 | 7.0 | 6,857 | 3.6 | 14.9 | 3 | 16 | 81 | .. | .. | .. | .. |
| Macedonia, FYR | 6 | 1.0 | 3,447 | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Madagascar | 337 | 0.0 | 21,710 | 19.7 | 5.8 | 99[d] | 0[d] | 1[d] | 85 | 85 | 31 | 31 |
| Malawi | 18 | 1.1 | 1,804 | 0.9 | 5.1 | 86[d] | 3[d] | 10[d] | 90 | 95 | 43 | 44 |
| Malaysia | 580 | .. | 24,925 | 12.7 | 2.2 | 76 | 13 | 11 | .. | .. | .. | 94 |
| Mali | 60 | 40.0 | 9,225 | 1.4 | 1.4 | 97[d] | 1[d] | 2[d] | 65 | 74 | 52 | 61 |
| Mauritania | 0 | 11.0 | 4,278 | 16.3 | 14.3 | 92 | 2 | 6 | 34 | 34 | 40 | 40 |
| Mauritius | 2 | 0.0 | 1,855 | 0.4 | 16.4 | 77[d] | 7[d] | 16[d] | 100 | 100 | 100 | 100 |
| Mexico | 409 | 49.0 | 4,675 | 77.8 | 17.0 | 78 | 5 | 17 | 92 | 94 | 61 | 63 |
| Moldova | 1 | 10.7 | 2,732 | 3.0 | 25.3 | 26 | 65 | 9 | .. | 100 | .. | 100 |
| Mongolia | 35 | .. | 14,512 | 0.4 | 1.2 | 53 | 27 | 20 | .. | 77 | .. | 30 |
| Morocco | 30 | 0.0 | 1,045 | 11.1 | 36.8 | 92[d] | 3[d] | 5[d] | 94 | 100 | 58 | 58 |
| Mozambique | 100 | 111.0 | 11,927 | 0.6 | 0.3 | 89[d] | 2[d] | 9[d] | .. | 86 | .. | 43 |
| Myanmar | 881 | 165.0 | 21,898 | 4.0 | 0.4 | 90 | 3 | 7 | 88 | 88 | 56 | 60 |
| Namibia | 6 | 39.3 | 25,896 | 0.3 | 0.5 | 68[d] | 3[d] | 29[d] | 98 | 100 | 63 | 67 |
| Nepal | 198 | 12.0 | 9,122 | 29.0 | 13.8 | 99 | 0 | 1 | 96 | 85 | 63 | 80 |
| 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 | 37,507 | 1.3 | 0.7 | 84 | 2 | 14 | 93 | 95 | 44 | 59 |
| Niger | 4 | 29.0 | 3,000 | 0.5 | 1.5 | 82[d] | 2[d] | 16[d] | 65 | 70 | 51 | 56 |
| Nigeria | 221 | 59.0 | 2,206 | 4.0 | 1.3 | 54[d] | 15[d] | 31[d] | 78 | 81 | 33 | 39 |
| Norway | 382 | 11.0 | 87,508 | 2.0 | 0.5 | 3 | 68 | 27 | 100 | 100 | 100 | 100 |
| Oman | 1 | .. | 418 | 1.2 | 122.0 | 94 | 2 | 5 | 41 | 41 | 30 | 30 |
| Pakistan | 85 | 170.3 | 1,847 | 155.6 | 61.0 | 97 | 2 | 2 | 96 | 96 | 79 | 84 |
| Panama | 147 | .. | 51,611 | 1.6 | 1.1 | 70 | 2 | 28 | .. | 88 | .. | 86 |
| Papua New Guinea | 801 | .. | 156,140 | 0.1 | 0.0 | 49 | 22 | 29 | 88 | 88 | 32 | 32 |
| Paraguay | 94 | .. | 17,103 | 0.4 | 0.5 | 78 | 7 | 15 | 80 | 95 | 47 | 58 |
| Peru | 1,746 | 144.0 | 73,653 | 19.0 | 1.0 | 86 | 7 | 7 | 84 | 87 | 47 | 51 |
| Philippines | 479 | 0.0 | 6,338 | 55.4 | 11.6 | 88 | 4 | 8 | 94 | 92 | 81 | 80 |
| Poland | 55 | 8.0 | 1,630 | 12.1 | 19.2 | 11 | 76 | 13 | .. | .. | .. | .. |
| Portugal | 37 | 35.0 | 7,194 | 7.3 | 10.1 | 53 | 40 | 8 | .. | .. | .. | .. |
| Puerto Rico | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Romania | 49 | 170.0 | 9,762 | 0.0 | 9.0 | .. | .. | .. | .. | 91 | .. | 16 |
| Russian Federation | 4,313 | 185.5 | 30,904 | 77.1 | 1.7 | 20 | 62 | 19 | .. | 100 | .. | 96 |

# 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 resources per capita cu.m. 2000 | billion cu.m.[b] | % of total resources[a,b] | % for agriculture[c] | % for industry[c] | % for domestic[c] | % of urban population with access 1990 | % of urban population with access 2000 | % of rural population with access 1990 | % of rural population with access 2000 |
| Rwanda | 6 | .. | 740 | 0.8 | 12.2 | 94 [d] | 1 [d] | 5 [d] | .. | 60 | .. | 40 |
| Saudi Arabia | 2 | .. | 116 | 17.0 | 708.3 | 90 | 1 | 9 | .. | 100 | .. | 64 |
| Senegal | 26 | 13.0 | 4,134 | 1.5 | 3.5 | 92 [d] | 3 [d] | 5 [d] | 90 | 92 | 60 | 65 |
| Sierra Leone | 160 | 0.0 | 31,803 | 0.4 | 0.2 | 89 [d] | 4 [d] | 7 [d] | .. | 23 | .. | 31 |
| Singapore | .. | .. | .. | 0.0 | .. | .. | .. | .. | 100 | 100 | .. | .. |
| Slovak Republic | 13 | 70.0 | 15,365 | 1.4 | 1.7 | .. | .. | .. | .. | 100 | .. | 100 |
| Slovenia | 19 | 0.0 | 9,306 | 0.5 | 2.7 | .. | 50 | 50 | 100 | 100 | 100 | 100 |
| Somalia | 6 | 9.7 | 1,789 | 0.8 | 5.2 | 97 [d] | 0 [d] | 3 [d] | .. | .. | .. | .. |
| South Africa | 45 | 5.2 | 1,168 | 13.3 | 26.6 | 72 [d] | 11 [d] | 17 [d] | .. | 92 | .. | 80 |
| Spain | 112 | 0.3 | 2,840 | 35.5 | 31.7 | 62 | 26 | 12 | .. | .. | .. | .. |
| Sri Lanka | 50 | 0.0 | 2,583 | 9.8 | 19.5 | 96 | 2 | 2 | 90 | 91 | 59 | 80 |
| Sudan | 35 | 119.0 | 4,953 | 17.8 | 11.6 | 94 [d] | 1 [d] | 5 [d] | 86 | 86 | 60 | 69 |
| Swaziland | 3 | 1.9 | 4,306 | 0.7 | 14.7 | 96 [d] | 2 [d] | 2 [d] | .. | .. | .. | .. |
| Sweden | 178 | 12.2 | 21,445 | 2.7 | 1.4 | 9 | 55 | 36 | 100 | 100 | 100 | 100 |
| Switzerland | 40 | 13.0 | 7,382 | 2.6 | 4.9 | 0 | 58 | 42 | 100 | 100 | 100 | 100 |
| Syrian Arab Republic | 7 | 37.7 | 2,761 | 14.4 | 32.2 | 94 | 2 | 4 | .. | 94 | .. | 64 |
| Tajikistan | 66 | 13.3 | 12,901 | 11.9 | 14.9 | 92 | 4 | 4 | .. | .. | .. | .. |
| Tanzania | 80 | 9.0 | 2,641 | 1.2 | 1.3 | 89 [d] | 2 [d] | 9 [d] | 80 | 80 | 42 | 42 |
| Thailand | 210 | 199.9 | 6,750 | 33.1 | 8.1 | 91 | 4 | 5 | 83 | 89 | 68 | 77 |
| Togo | 12 | 0.5 | 2,651 | 0.1 | 0.8 | 25 [d] | 13 [d] | 62 [d] | 82 | 85 | 38 | 38 |
| Trinidad and Tobago | .. | .. | .. | 0.0 | .. | .. | .. | .. | .. | .. | .. | .. |
| Tunisia | 4 | 0.4 | 408 | 2.8 | 68.7 | 86 [d] | 2 [d] | 13 [d] | 94 | .. | 61 | .. |
| Turkey | 196 | 7.6 | 3,118 | 35.5 | 17.4 | 73 [d] | 11 [d] | 16 [d] | 82 | 82 | 76 | 84 |
| Turkmenistan | 1 | 59.5 | 11,714 | 23.8 | 39.0 | 98 | 1 | 1 | .. | .. | .. | .. |
| Uganda | 39 | 27.0 | 2,972 | 0.2 | 0.3 | 60 | 8 | 32 | 80 | 72 | 40 | 46 |
| Ukraine | 53 | 86.5 | 2,820 | 26.0 | 18.6 | 30 | 52 | 18 | .. | .. | .. | .. |
| United Arab Emirates | 0 | 0.0 | 69 | 2.1 | 1,055.0 | 67 | 9 | 24 | .. | .. | .. | .. |
| United Kingdom | 145 | 2.0 | 2,461 | 9.3 | 6.4 | 3 | 77 | 20 | 100 | 100 | 100 | 100 |
| United States | 2,460 | 18.0 | 8,801 | 447.7 | 18.9 | 27 [d] | 65 [d] | 8 [d] | 100 | 100 | 100 | 100 |
| Uruguay | 59 | 74.0 | 39,856 | 4.2 | 3.2 | 91 | 3 | 6 | .. | 98 | .. | 93 |
| Uzbekistan | 16 | 98.1 | 4,622 | 58.0 | 50.7 | 94 | 2 | 4 | .. | 96 | .. | 78 |
| Venezuela, RB | 846 | .. | 35,002 | 4.1 | 0.5 | 46 | 10 | 44 | .. | 88 | .. | 58 |
| Vietnam | 367 | 524.7 | 11,350 | 54.3 | 6.1 | 86 | 10 | 4 | 81 | 81 | 40 | 50 |
| West Bank and Gaza | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Yemen, Rep. | 4 | .. | 234 | 2.9 | 71.5 | 92 | 1 | 7 | 85 | 85 | 60 | 64 |
| Yugoslavia, Fed. Rep. | 44 | 144.0 | 17,674 | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Zambia | 80 | 35.8 | 11,498 | 1.7 | 1.5 | 77 [d] | 7 [d] | 16 [d] | 88 | 88 | 28 | 48 |
| Zimbabwe | 14 | .. | 1,117 | 1.2 | 8.7 | 79 [d] | 7 [d] | 14 [d] | 99 | 100 | 68 | 77 |
| **World** | **42,833 w** | **9,427.3** | **8,696 w** | | | **71 w** | **19 w** | **9 w** | **94 w** | **93 w** | **64** | **71 w** |
| **Low income** | 10,449 | 4,903.6 | 6,243 | | | 90 | 5 | 5 | 89 | 88 | 64 | 70 |
| **Middle income** | 24,239 | 4,155.8 | 10,579 | | | 74 | 16 | 10 | 95 | 94 | 62 | 69 |
| Lower middle income | 14,755 | 1,253.5 | 7,836 | | | 76 | 17 | 7 | 97 | 95 | 62 | 69 |
| Upper middle income | 9,483 | 2,902.3 | 19,319 | | | 68 | 13 | 17 | .. | 92 | .. | 70 |
| **Low & middle income** | 34,687 | 9,059.4 | 8,505 | | | 81 | 11 | 8 | 93 | 92 | 63 | 70 |
| East Asia & Pacific | 9,445 | 1,420.5 | .. | | | 80 | 14 | 6 | 96 | 93 | 60 | 66 |
| Europe & Central Asia | 5,232 | 1,134.8 | 13,426 | | | 57 | 31 | 11 | .. | .. | .. | .. |
| Latin America & Carib. | 13,987 | 2,797.2 | 32,905 | | | 74 | 9 | 18 | 92 | 93 | 56 | 62 |
| Middle East & N. Africa | 234 | 183.1 | 1,427 | | | 89 | 4 | 6 | 93 | 96 | 76 | 80 |
| South Asia | 1,849 | 1,945.1 | 2,800 | | | 93 | 2 | 4 | 93 | 92 | 75 | 85 |
| Sub-Saharan Africa | 3,941 | 1,578.7 | 8,379 | | | 86 | 4 | 10 | 81 | 82 | 37 | 41 |
| **High income** | 8,146 | 367.9 | .. | | | 40 | 43 | 14 | .. | .. | .. | .. |
| Europe EMU | 885 | 258.8 | 3,783 | | | 34 | 52 | 14 | .. | .. | .. | .. |

a. River flows from other countries are included when available, but river outflows are not, because of data unreliability. b. Data refer to any year from 1980 to 1999. c. Unless otherwise noted, sectoral withdrawal shares are estimated for 1987. d. Data refer to a year other than 1987 (see *Primary data documentation*).

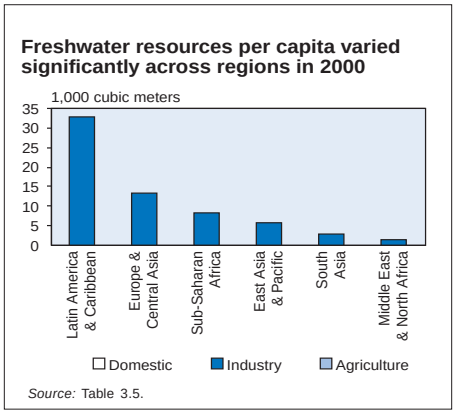
## About the data

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.

This year's table shows both internal freshwater resources and the river flows arising outside countries. Because the data on total freshwater resources include river flows entering a country while river flows out of the country are not deducted (because of data unreliability), they overestimate the availability of water from international river ways. This can be important in water-short countries, notably in the Middle East.

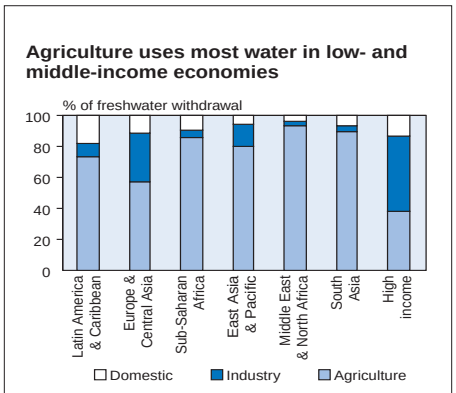
The data on access to an improved water source measure the share of the population with reasonable and ready access to an adequate amount of safe water for domestic purposes. An improved source can be any form of collection or piping used to make water regularly available. While information on access 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 safe water 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.

**Figure 3.5a**




*Source:* Table 3.5.

**Figure 3.5b**




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 of rivers 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 withdrawal, not counting evaporation losses from storage basins. Withdrawals also include water from desalination plants in countries where they are a significant source. Withdrawal data are for single years between 1980 and 1999 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 1998–99* and *World Resources 2000–01* (produced in collaboration with the United Nations Environment Programme, United Nations Development Programme, and the World Bank). These are supplemented by the FAO'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 | 1999[a] | 1980 | 1999[a] | 1999[a] | 1999[a] | 1999[a] | 1999[a] | 1999[a] | 1999[a] | 1999[a] | 1999[a] |
| Afghanistan | 6,680 | .. | 0.17 | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Albania | .. | *6,512* | .. | *0.29* | *14.3* | *0.9* | *5.5* | *73.5* | *0.3* | *4.6* | *0.0* | 0.8 |
| Algeria | 60,290 | *45,645* | 0.19 | *0.24* | *23.4* | *2.0* | *5.9* | *59.5* | *0.7* | *7.6* | *0.8* | 0.0 |
| Angola | .. | *1,472* | .. | *0.20* | *7.6* | *3.0* | *9.2* | *65.9* | *0.3* | *5.5* | *4.4* | 4.1 |
| Argentina | 244,711 | *177,882* | 0.18 | *0.21* | *6.5* | *12.5* | *7.9* | *59.4* | *0.1* | *7.4* | *1.5* | 4.5 |
| Armenia | .. | *10,014* | .. | *0.25* | .. | .. | .. | .. | .. | .. | .. | .. |
| Australia | 204,333 | *91,544* | 0.18 | *0.21* | .. | .. | .. | .. | .. | .. | .. | .. |
| Austria | 108,416 | 87,294 | 0.16 | 0.14 | 12.2 | 19.6 | 9.7 | 36.5 | 0.3 | 6.1 | 4.5 | 11.1 |
| Azerbaijan | .. | *45,025* | .. | *0.17* | *11.6* | *2.5* | *12.0* | *49.0* | *0.2* | *18.1* | *1.0* | 5.6 |
| Bangladesh | 66,713 | *186,852* | 0.16 | *0.16* | *2.8* | *6.8* | *3.5* | *34.2* | *0.1* | *50.9* | *0.6* | 1.1 |
| Belarus | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Belgium | 136,452 | *113,460* | 0.16 | *0.16* | *14.4* | *17.7* | *11.6* | *36.8* | *0.2* | *8.8* | *2.0* | 8.4 |
| Benin | 1,646 | .. | 0.28 | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Bolivia | 9,343 | 12,323 | 0.22 | 0.24 | 3.1 | 14.2 | 7.2 | 64.7 | 0.3 | 7.4 | 2.2 | 0.9 |
| Bosnia and Herzegovina | .. | *8,903* | .. | *0.18* | *20.5* | *13.1* | *6.6* | *33.3* | *0.2* | *17.6* | *5.8* | 2.8 |
| Botswana | 1,307 | *4,635* | 0.24 | *0.20* | *1.7* | *15.8* | *5.4* | *56.4* | *0.2* | *17.2* | *1.4* | 1.9 |
| Brazil | 866,790 | *629,406* | 0.16 | *0.20* | *17.7* | *12.9* | *9.2* | *44.4* | *0.1* | *9.8* | *1.4* | 4.5 |
| Bulgaria | 152,125 | *107,945* | 0.13 | *0.17* | *11.7* | *7.9* | *6.6* | *48.1* | *0.1* | *17.0* | *2.0* | 6.6 |
| Burkina Faso | 2,385 | *2,598* | 0.29 | *0.22* | *3.5* | *1.1* | *5.4* | *73.8* | *0.1* | *4.1* | *10.1* | 1.9 |
| Burundi | 769 | *1,644* | 0.22 | *0.24* | *0.0* | *8.3* | *4.7* | *67.8* | *0.1* | *16.7* | *1.6* | 0.9 |
| Cambodia | .. | *12,078* | .. | *0.16* | *0.0* | *3.4* | *3.3* | *59.2* | *0.6* | *24.7* | *5.8* | 3.1 |
| Cameroon | 14,569 | *10,810* | 0.29 | *0.20* | *3.3* | *6.2* | *28.0* | *52.6* | *0.0* | *3.7* | *5.8* | 0.4 |
| Canada | 330,241 | 297,370 | 0.18 | 0.17 | 9.5 | 28.8 | 9.7 | 34.3 | 0.1 | 5.5 | 3.9 | 8.2 |
| Central African Republic | 861 | *670* | 0.26 | *0.17* | *0.0* | .. | *4.0* | *61.9* | *0.0* | *13.9* | *19.6* | 0.6 |
| Chad | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Chile | 44,371 | 74,583 | 0.21 | 0.24 | 7.7 | 12.0 | 8.8 | 61.4 | 0.1 | 5.2 | 2.4 | 2.4 |
| China | 3,377,105 | *7,024,090* | 0.14 | *0.14* | *20.3* | *11.0* | *14.9* | *28.9* | *0.5* | *15.0* | *0.7* | 8.7 |
| Hong Kong, China | 102,002 | 41,639 | 0.11 | 0.18 | 1.3 | 43.4 | 4.3 | 24.2 | 0.1 | 20.9 | 0.3 | 5.4 |
| Colombia | 96,055 | 105,683 | 0.19 | 0.20 | 3.6 | 14.2 | 10.3 | 51.8 | 0.2 | 16.0 | 0.9 | 3.0 |
| Congo, Dem. Rep. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Congo, Rep. | *1,039* | .. | *0.21* | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Costa Rica | .. | *33,975* | .. | *0.22* | *1.3* | *9.0* | *6.2* | *63.8* | *0.1* | *15.4* | *1.5* | 2.5 |
| Côte d'Ivoire | 15,414 | *12,401* | 0.23 | *0.24* | .. | *5.5* | *7.1* | *71.9* | *0.0* | *8.6* | *5.9* | 1.0 |
| Croatia | .. | *48,447* | .. | *0.17* | *7.2* | *14.4* | *8.6* | *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* | *7.9* | *43.6* | *0.3* | *10.4* | *3.9* | 11.4 |
| Denmark | 65,465 | *83,591* | 0.17 | *0.17* | *4.4* | *29.1* | *7.9* | *44.2* | *0.2* | *2.2* | *3.5* | 8.6 |
| Dominican Republic | 54,935 | .. | 0.38 | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Ecuador | 25,297 | 34,610 | 0.23 | 0.27 | 2.4 | 10.7 | 6.2 | 72.3 | 0.1 | 5.6 | 1.4 | 1.3 |
| Egypt, Arab Rep. | 169,146 | 208,104 | 0.19 | 0.18 | 12.0 | 6.9 | 9.8 | 47.7 | 0.3 | 19.1 | 0.6 | 3.5 |
| El Salvador | 9,390 | *22,760* | 0.24 | *0.18* | *2.1* | *10.2* | *8.1* | *43.5* | *0.1* | *34.1* | *0.5* | 1.4 |
| Eritrea | 16,754 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Estonia | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Ethiopia | .. | *20,449* | .. | *0.22* | *1.9* | *10.7* | *4.6* | *59.1* | *0.3* | *21.0* | *1.8* | 0.6 |
| Finland | 92,275 | 61,835 | 0.17 | 0.20 | 9.6 | 42.6 | 3.1 | 31.0 | 0.2 | 3.0 | 4.3 | 6.3 |
| France | 729,776 | *300,964* | 0.14 | *0.10* | .. | .. | .. | .. | .. | .. | .. | .. |
| Gabon | 2,661 | *1,886* | 0.15 | *0.26* | *0.0* | *6.0* | *4.9* | *79.7* | *0.1* | *1.2* | *6.9* | 1.2 |
| Gambia, The | 549 | *832* | 0.30 | *0.34* | *0.0* | *15.3* | *1.9* | *77.9* | *0.1* | *2.6* | *1.9* | 0.2 |
| Georgia | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Germany | .. | *811,315* | .. | *0.12* | *12.7* | *16.8* | *15.5* | *30.6* | *0.3* | *4.8* | *2.2* | 17.2 |
| Ghana | 15,868 | *14,449* | 0.20 | *0.17* | *9.8* | *16.9* | *10.5* | *39.5* | *0.2* | *9.1* | *12.4* | 1.7 |
| Greece | 65,304 | 57,722 | 0.17 | 0.20 | 6.0 | 12.1 | 8.8 | 54.2 | 0.3 | 13.8 | 1.4 | 3.5 |
| Guatemala | 20,856 | *19,253* | 0.25 | *0.28* | *4.9* | *7.2* | *6.1* | *72.8* | *0.1* | *6.9* | *0.8* | 1.0 |
| Guinea | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Guinea-Bissau | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Haiti | 4,734 | .. | 0.19 | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Honduras | 13,067 | *34,036* | 0.23 | *0.20* | *1.1* | *7.8* | *3.9* | *55.5* | *0.1* | *26.8* | *4.0* | 0.8 |

| | 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 | 1999[a] | 1980 | 1999[a] | 1999[a] | 1999[a] | 1999[a] | 1999[a] | 1999[a] | 1999[a] | 1999[a] | 1999[a] |
| Hungary | 201,888 | 140,824 | 0.15 | 0.17 | 8.8 | 10.0 | 8.0 | 50.2 | 0.2 | 13.4 | 1.9 | 7.4 |
| India | 1,422,564 | 1,746,562 | 0.21 | 0.19 | 13.4 | 8.0 | 9.2 | 51.0 | 0.2 | 12.9 | 0.3 | 5.0 |
| Indonesia | 214,010 | *676,082* | 0.22 | *0.20* | *2.8* | *7.0* | *7.1* | *55.3* | *0.1* | *21.1* | *4.1* | 2.5 |
| 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* | *15.1* | *39.4* | *0.7* | *16.7* | *0.3* | 4.8 |
| Ireland | 43,544 | *37,886* | 0.19 | *0.15* | *1.8* | *17.5* | *11.8* | *50.1* | *0.2* | *5.9* | *2.0* | 10.7 |
| Israel | 39,113 | *54,149* | 0.15 | *0.16* | *3.7* | *19.7* | *9.4* | *43.9* | *0.2* | *12.1* | *1.8* | 9.3 |
| Italy | 442,712 | *354,590* | 0.13 | *0.13* | *12.1* | *16.1* | *11.5* | *28.7* | *0.3* | *15.9* | *2.5* | 12.9 |
| Jamaica | 11,123 | *17,507* | 0.25 | *0.29* | *6.9* | *7.2* | *3.8* | *70.8* | *0.1* | *9.8* | *1.3* | 0.0 |
| Japan | 1,456,016 | 1,415,879 | 0.14 | 0.14 | 8.1 | 21.8 | 8.8 | 40.3 | 0.2 | 5.9 | 1.6 | 13.2 |
| Jordan | 4,146 | *16,142* | 0.17 | *0.18* | *3.9* | *16.2* | *14.5* | *51.4* | *0.5* | *7.2* | *3.3* | 3.0 |
| Kazakhstan | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Kenya | 26,834 | *49,304* | 0.19 | *0.24* | *4.1* | *12.2* | *6.1* | *66.7* | *0.1* | *8.8* | *1.9* | 0.0 |
| Korea, Dem. Rep. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Korea, Rep. | 281,900 | 288,408 | 0.14 | 0.12 | 12.3 | 16.1 | 12.5 | 27.0 | 0.2 | 15.3 | 1.4 | 15.2 |
| Kuwait | 6,921 | *10,108* | 0.16 | *0.16* | *2.3* | *17.0* | *12.1* | *45.5* | *0.4* | *14.2* | *2.9* | 5.5 |
| Kyrgyz Republic | .. | *20,700* | .. | *0.16* | *13.7* | *0.2* | *0.9* | *54.8* | *0.4* | *21.0* | *1.0* | 8.0 |
| Lao PDR | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Latvia | .. | *25,789* | .. | *0.21* | *2.8* | *6.7* | *4.3* | *67.5* | *0.1* | *11.2* | *7.3* | 0.0 |
| Lebanon | 14,586 | .. | 0.20 | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Lesotho | *993* | *3,123* | *0.24* | *0.16* | *1.2* | *4.0* | *0.7* | *39.7* | *0.1* | *51.3* | *0.6* | 2.3 |
| Liberia | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Libya | 3,532 | .. | 0.21 | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Lithuania | .. | *38,615* | .. | *0.18* | *1.4* | *10.9* | *5.0* | *56.0* | *0.2* | *17.6* | *4.2* | 4.6 |
| Macedonia, FYR | .. | *23,490* | .. | *0.18* | *11.7* | *9.6* | *6.2* | *45.0* | *0.1* | *20.9* | *1.7* | 4.9 |
| Madagascar | 9,131 | .. | 0.23 | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Malawi | 12,224 | *11,805* | 0.32 | *0.29* | *0.0* | *16.0* | *3.7* | *70.0* | *0.0* | *7.8* | *1.7* | 0.8 |
| Malaysia | 77,215 | 154,926 | 0.15 | 0.11 | 7.9 | 13.7 | 16.1 | 31.5 | 0.3 | 8.6 | 6.6 | 15.3 |
| Mali | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Mauritania | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Mauritius | 9,224 | 15,677 | 0.21 | 0.16 | 1.1 | 6.6 | 2.6 | 36.1 | 0.1 | 51.5 | 0.7 | 1.2 |
| Mexico | 130,993 | 163,569 | 0.22 | 0.17 | 8.0 | 8.4 | 14.0 | 55.4 | 0.2 | 5.2 | 0.4 | 8.5 |
| Moldova | .. | *34,234* | .. | *0.29* | *0.2* | *4.0* | *1.4* | *81.7* | *0.2* | *10.8* | *1.3* | 0.5 |
| Mongolia | 9,254 | *7,939* | 0.19 | *0.18* | *1.8* | *4.3* | *0.9* | *63.1* | *0.3* | *24.6* | *4.9* | 0.0 |
| Morocco | 26,598 | 90,563 | 0.15 | 0.18 | 0.8 | 7.6 | 7.2 | 53.6 | 0.3 | 27.0 | 0.9 | 2.5 |
| Mozambique | .. | *495* | .. | *0.16* | .. | .. | .. | .. | .. | .. | .. | .. |
| Myanmar | .. | *3,319* | .. | *0.14* | *17.4* | *9.0* | *35.6* | *28.2* | *0.5* | *5.0* | *3.0* | 1.2 |
| Namibia | .. | *7,350* | .. | *0.35* | *0.0* | *5.0* | *1.6* | *90.4* | *0.1* | *1.2* | *0.9* | 0.8 |
| Nepal | *18,692* | *26,550* | *0.25* | *0.14* | *1.5* | *8.1* | *3.9* | *43.3* | *1.2* | *39.3* | *1.7* | 1.0 |
| Netherlands | 165,416 | 120,502 | 0.18 | 0.18 | 7.7 | 25.8 | 12.2 | 42.2 | 0.2 | 2.5 | 1.2 | 8.3 |
| New Zealand | 59,012 | *50,706* | 0.21 | *0.22* | *4.6* | *19.6* | *4.9* | *58.6* | *0.1* | *4.9* | *3.1* | 4.2 |
| Nicaragua | 9,647 | .. | 0.28 | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Niger | 372 | .. | 0.19 | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Nigeria | 72,082 | *53,646* | 0.17 | *0.18* | *0.9* | *31.2* | *6.5* | *37.4* | *0.2* | *10.6* | *10.4* | 2.9 |
| Norway | 67,897 | *52,616* | 0.19 | *0.21* | *5.7* | *35.4* | *3.3* | *44.4* | *0.1* | *1.6* | *3.4* | 6.1 |
| Oman | .. | *5,199* | .. | *0.17* | *4.6* | *15.2* | *6.7* | *52.1* | *0.8* | *13.4* | *3.6* | 3.5 |
| Pakistan | 75,125 | *100,821* | 0.17 | *0.18* | *11.6* | *7.0* | *8.4* | *39.9* | *0.2* | *30.3* | *0.3* | 2.3 |
| Panama | 8,121 | *12,145* | 0.26 | *0.31* | *1.5* | *11.6* | *5.5* | *75.2* | *0.2* | *5.1* | *0.5* | 0.4 |
| Papua New Guinea | 4,365 | .. | 0.22 | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Paraguay | .. | *3,250* | .. | *0.28* | *2.3* | *9.9* | *6.0* | *73.6* | *0.3* | *6.7* | *0.3* | 0.8 |
| Peru | 50,367 | *51,828* | 0.18 | *0.21* | *9.6* | *12.0* | *8.4* | *53.0* | *0.2* | *12.3* | *1.6* | 2.9 |
| Philippines | 182,052 | *204,879* | 0.19 | *0.18* | *5.2* | *9.8* | *7.3* | *54.5* | *0.2* | *16.4* | *2.0* | 4.6 |
| Poland | 580,869 | 412,979 | 0.14 | 0.15 | 14.2 | 4.5 | 6.7 | 50.5 | 0.4 | 12.8 | 1.9 | 9.0 |
| Portugal | 105,441 | *142,761* | 0.15 | *0.14* | *3.5* | *14.3* | *5.1* | *39.5* | *0.4* | *25.3* | *5.1* | 6.8 |
| Puerto Rico | 24,034 | *17,494* | 0.16 | *0.14* | *0.9* | *10.9* | *17.7* | *40.2* | *0.2* | *19.6* | *1.3* | 9.1 |
| Romania | 343,145 | *333,168* | 0.12 | *0.14* | *17.1* | *6.7* | *9.0* | *34.3* | *0.3* | *18.5* | *4.8* | 9.4 |
| Russian Federation | .. | *1,485,833* | .. | *0.16* | *17.7* | *7.4* | *9.3* | *46.8* | *0.3* | *6.9* | *2.1* | 9.5 |

# 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 | 1999[a] | 1980 | 1999[a] | 1999[a] | 1999[a] | 1999[a] | 1999[a] | 1999[a] | 1999[a] | 1999[a] | 1999[a] |
| Rwanda | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Saudi Arabia | *18,181* | *24,436* | *0.12* | *0.14* | *4.4* | *15.9* | *21.1* | *45.1* | *1.0* | *3.8* | *2.0* | 6.8 |
| Senegal | 9,865 | *10,488* | 0.31 | *0.30* | *0.0* | *6.3* | *8.8* | *78.8* | *0.0* | *4.6* | *0.1* | 1.3 |
| Sierra Leone | *1,612* | *4,170* | *0.24* | *0.32* | .. | *9.6* | *3.0* | *82.3* | *0.1* | *2.0* | *2.2* | 0.8 |
| Singapore | 28,558 | 31,793 | 0.10 | 0.09 | 2.0 | 28.0 | 15.1 | 19.9 | 0.1 | 4.0 | 1.5 | 29.3 |
| Slovak Republic | .. | *57,970* | .. | *0.15* | *17.2* | *12.7* | *7.9* | *37.5* | *0.3* | *11.9* | *2.7* | 9.9 |
| Slovenia | .. | *37,321* | .. | *0.16* | *30.1* | *15.7* | *9.1* | *24.5* | *0.2* | *12.1* | *2.0* | 6.2 |
| Somalia | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| South Africa | 237,599 | 238,259 | 0.17 | 0.17 | 11.9 | 16.9 | 9.2 | 40.9 | 0.2 | 10.9 | 3.5 | 6.5 |
| Spain | 376,253 | 349,151 | 0.16 | 0.16 | 6.8 | 19.0 | 8.6 | 43.6 | 0.3 | 9.4 | 4.0 | 8.3 |
| Sri Lanka | 30,086 | *83,850* | 0.18 | *0.17* | *1.0* | *6.5* | *6.0* | *47.5* | *0.2* | *36.6* | *1.0* | 1.2 |
| Sudan | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Swaziland | 2,826 | *2,009* | 0.26 | *0.23* | .. | *79.8* | *0.3* | .. | *0.1* | *16.5* | *2.0* | 1.2 |
| Sweden | 130,439 | 93,076 | 0.15 | 0.16 | 10.6 | 37.3 | 7.5 | 28.8 | 0.1 | 1.3 | 3.3 | 11.1 |
| Switzerland | .. | *123,752* | .. | *0.17* | *24.9* | *23.6* | *10.4* | *25.0* | *0.2* | *3.2* | *4.2* | 8.7 |
| Syrian Arab Republic | 36,262 | *15,115* | 0.19 | *0.20* | *4.1* | *1.5* | *3.9* | *69.8* | *0.9* | *19.4* | *0.2* | 0.2 |
| Tajikistan | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Tanzania | 21,084 | *32,508* | 0.21 | *0.26* | *4.7* | *10.8* | *5.0* | *65.2* | *0.1* | *11.8* | *1.4* | 1.2 |
| Thailand | *213,271* | *355,819* | *0.22* | *0.16* | *6.1* | *5.3* | *5.3* | *42.2* | *0.2* | *35.4* | *1.5* | 3.9 |
| Togo | 963 | .. | 0.27 | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Trinidad and Tobago | 7,835 | *11,787* | 0.18 | *0.28* | *4.4* | *10.9* | *6.7* | *72.6* | *0.1* | *2.9* | *1.3* | 1.2 |
| Tunisia | 20,294 | *46,489* | 0.16 | *0.16* | *6.2* | *8.1* | *6.4* | *40.7* | *0.4* | *33.6* | *1.5* | 3.3 |
| Turkey | 160,173 | *186,275* | 0.20 | *0.16* | *10.7* | *7.0* | *7.6* | *42.9* | *0.3* | *25.5* | *1.0* | 5.1 |
| Turkmenistan | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Uganda | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Ukraine | .. | *518,995* | .. | *0.17* | *22.2* | *3.3* | *6.9* | *51.4* | *0.4* | *5.9* | *1.8* | 8.2 |
| United Arab Emirates | *4,524* | .. | *0.15* | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| United Kingdom | 964,510 | 604,572 | 0.15 | 0.15 | 7.4 | 28.5 | 11.8 | 32.9 | 0.2 | 6.1 | 2.4 | 10.8 |
| United States | 2,742,993 | 2,529,037 | 0.14 | 0.14 | 8.5 | 32.2 | 10.3 | 28.0 | 0.2 | 5.9 | 2.9 | 11.9 |
| Uruguay | 34,270 | *24,896* | 0.21 | *0.25* | *1.4* | *10.8* | *5.9* | *69.5* | *0.1* | *9.5* | *0.7* | 2.0 |
| Uzbekistan | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Venezuela, RB | 84,797 | *92,026* | 0.20 | *0.21* | *14.1* | *11.5* | *9.9* | *51.8* | *0.2* | *7.3* | *1.7* | 3.4 |
| Vietnam | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| West Bank and Gaza | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Yemen, Rep. | .. | *7,823* | .. | *0.25* | *0.0* | *9.1* | *12.9* | *71.1* | *0.3* | *4.9* | *1.0* | 0.9 |
| Yugoslavia, Fed. Rep. | .. | *117,128* | .. | *0.16* | *10.3* | *12.3* | *7.8* | *44.9* | *0.3* | *14.5* | *2.1* | 7.9 |
| Zambia | 13,605 | *11,433* | 0.23 | *0.22* | *3.4* | *10.8* | *7.3* | *63.6* | *0.2* | *9.3* | *2.9* | 2.4 |
| Zimbabwe | 32,681 | *32,988* | 0.20 | *0.20* | *13.6* | *11.3* | *5.6* | *48.1* | *0.2* | *15.1* | *3.0* | 3.1 |

Note: Industry shares may not sum to 100 percent because data may be from different years.

a. Data refer to any year from 1993 to 1999.

## About the data

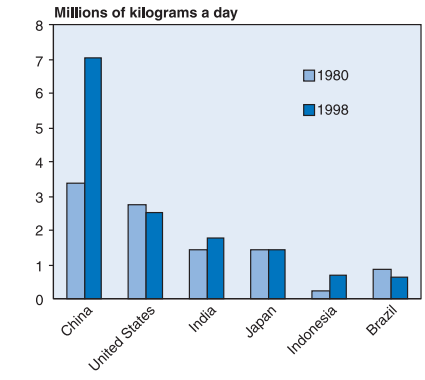
Emissions of organic pollutants from industrial activities are a major cause of degradation of water quality. Water quality and pollution levels are generally measured in terms of concentration, or load—the rate of occurrence of a substance in an aqueous solution. Polluting substances include organic 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 have been updated through 1999 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.

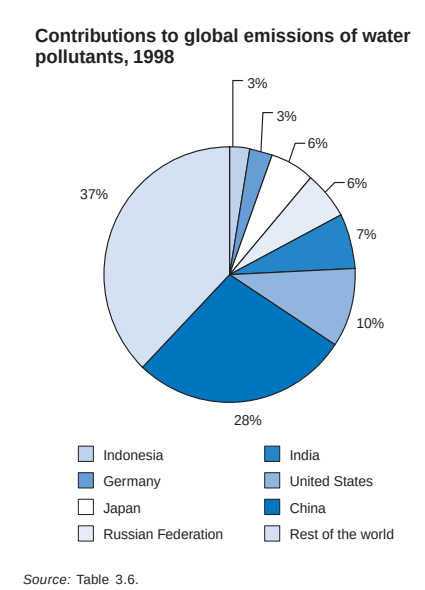
In their study Hettige, Mani, and Wheeler (1998) used plant- and sector-level information on emissions and employment from 13 national environmental protection agencies and sector-level information on output and employment from the United Nations Industrial Development Organization (UNIDO). Their econometric 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 sectoral emissions estimates 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 1999.

### Figure 3.6a




*Source:* Table 3.6.

### Figure 3.6b




*Source:* Table 3.6.

## 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).

## Data sources

Indicators in this table were drawn from a 1998 study by Hemamala Hettige, Muthukumara Mani, and David Wheeler, "Industrial Pollution in Economic Development: Kuznets Revisited" (available on the Web at www.worldbank.org/nipr). These indicators were then updated through 1999 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 | 1999 | 1980 | 1999 | 1980-99 | 1980 | 1999 | 1980-99 | 1980 | 1999 |
| Afghanistan | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Albania | 3,428 | 865 | 3,049 | 1,052 | -6.7 | 1,142 | 311 | -7.8 | -12 | 18 |
| Algeria | 66,741 | 142,883 | 12,088 | 28,280 | 3.6 | 647 | 944 | 1.1 | -452 | -405 |
| Angola | 11,301 | 43,644 | 4,437 | 7,591 | 2.9 | 628 | 595 | -0.2 | -155 | -475 |
| Argentina | 38,813 | 81,932 | 41,868 | 63,182 | 2.4 | 1,490 | 1,727 | 0.9 | 7 | -30 |
| Armenia | 1,263 | 646 | 1,070 | 1,845 | .. | .. | 485 | .. | .. | 65 |
| Australia | 86,096 | 212,204 | 70,372 | 107,930 | 2.4 | 4,790 | 5,690 | 1.0 | -22 | -97 |
| Austria | 7,561 | 9,520 | 22,823 | 28,432 | 1.6 | 3,022 | 3,513 | 1.1 | 67 | 67 |
| Azerbaijan | 14,821 | 19,037 | 15,001 | 12,574 | .. | .. | 1,575 | .. | .. | -51 |
| Bangladesh | 6,745 | 14,474 | 8,441 | 17,935 | 4.2 | 99 | 139 | 1.9 | 20 | 19 |
| Belarus | 2,566 | 3,475 | 2,385 | 23,895 | .. | .. | 2,381 | .. | .. | 85 |
| Belgium | 7,986 | 13,766 | 46,100 | 58,642 | 1.8 | 4,682 | 5,735 | 1.6 | 83 | 77 |
| Benin | 1,212 | 1,556 | 1,363 | 1,973 | 1.9 | 394 | 323 | -1.2 | 11 | 21 |
| Bolivia | 4,374 | 6,020 | 2,438 | 4,572 | 3.5 | 455 | 562 | 1.2 | -79 | -32 |
| Bosnia and Herzegovina | .. | 705 | .. | 2,008 | .. | .. | 518 | .. | .. | 65 |
| Botswana | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Brazil | 62,372 | 133,654 | 111,471 | 179,701 | 2.7 | 917 | 1,068 | 1.0 | 44 | 26 |
| Bulgaria | 7,737 | 9,056 | 28,673 | 18,203 | -2.6 | 3,236 | 2,218 | -2.1 | 73 | 50 |
| Burkina Faso | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Burundi | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Cambodia | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Cameroon | 6,707 | 12,109 | 3,676 | 6,103 | 2.5 | 421 | 419 | -0.3 | -82 | -98 |
| Canada | 207,417 | 366,554 | 193,000 | 241,780 | 1.6 | 7,848 | 7,929 | 0.4 | -7 | -52 |
| Central African Republic | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Chad | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Chile | 5,801 | 7,668 | 9,662 | 25,348 | 5.7 | 867 | 1,688 | 4.0 | 40 | 70 |
| China | 608,625 | 1,056,963 | 592,511 | 1,088,349 | 3.8 | 604 | 868 | 2.4 | -3 | 3 |
| Hong Kong, China | 39 | 48 | 5,439 | 17,886 | 5.9 | 1,079 | 2,661 | 4.5 | 99 | 100 |
| Colombia | 18,040 | 77,142 | 19,348 | 28,081 | 2.6 | 680 | 676 | 0.6 | 7 | -175 |
| Congo, Dem. Rep. | 8,697 | 14,860 | 8,706 | 14,525 | 2.7 | 324 | 293 | -0.6 | 0 | -2 |
| Congo, Rep. | 4,024 | 14,079 | 862 | 720 | -1.2 | 516 | 245 | -4.2 | -367 | -1,855 |
| Costa Rica | 767 | 1,322 | 1,527 | 3,052 | 4.1 | 669 | 818 | 1.4 | 50 | 57 |
| Côte d'Ivoire | 2,419 | 5,973 | 3,662 | 6,052 | 2.5 | 447 | 388 | -0.9 | 34 | 1 |
| Croatia | .. | 3,721 | .. | 8,156 | .. | .. | 1,864 | .. | .. | 54 |
| Cuba | 4,227 | 5,242 | 14,910 | 12,464 | -1.8 | 1,536 | 1,117 | -2.6 | 72 | 58 |
| Czech Republic | 41,208 | 27,952 | 47,254 | 38,584 | -1.2 | 4,618 | 3,754 | -1.2 | 13 | 28 |
| Denmark | 896 | 23,642 | 19,734 | 20,070 | 0.8 | 3,852 | 3,773 | 0.6 | 95 | -18 |
| Dominican Republic | 1,327 | 1,491 | 3,491 | 7,451 | 3.9 | 613 | 904 | 2.0 | 62 | 80 |
| Ecuador | 11,745 | 21,730 | 5,180 | 8,750 | 2.7 | 651 | 705 | 0.3 | -127 | -148 |
| Egypt, Arab Rep. | 34,168 | 58,460 | 15,970 | 44,490 | 4.7 | 391 | 709 | 2.3 | -114 | -31 |
| El Salvador | 1,623 | 2,136 | 2,537 | 4,005 | 2.2 | 553 | 651 | 0.6 | 25 | 47 |
| Eritrea | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Estonia | 6,951 | 2,762 | 6,275 | 4,557 | .. | .. | 3,286 | .. | .. | 39 |
| Ethiopia | 10,575 | 17,176 | 11,145 | 18,227 | 2.6 | 295 | 290 | -0.1 | 5 | 6 |
| Finland | 6,912 | 15,402 | 25,413 | 33,372 | 1.7 | 5,317 | 6,461 | 1.3 | 73 | 54 |
| France | 46,799 | 127,617 | 187,766 | 255,043 | 2.0 | 3,485 | 4,351 | 1.5 | 75 | 50 |
| Gabon | 9,441 | 17,842 | 1,493 | 1,608 | -0.3 | 2,158 | 1,342 | -3.2 | -532 | -1,010 |
| Gambia, The | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Georgia | 1,504 | 739 | 4,474 | 2,573 | .. | .. | 512 | .. | .. | 71 |
| Germany | 185,628 | 132,961 | 360,385 | 337,196 | -0.2 | 4,602 | 4,108 | -0.5 | 48 | 61 |
| Ghana | 3,305 | 5,540 | 4,027 | 7,108 | 3.6 | 375 | 377 | 0.4 | 18 | 22 |
| Greece | 3,696 | 9,812 | 15,695 | 26,894 | 3.0 | 1,628 | 2,552 | 2.5 | 76 | 64 |
| Guatemala | 2,503 | 4,566 | 3,754 | 6,074 | 3.0 | 550 | 548 | 0.4 | 33 | 25 |
| Guinea | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Guinea-Bissau | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Haiti | 1,877 | 1,578 | 2,099 | 2,067 | 0.2 | 392 | 265 | -1.8 | 11 | 24 |
| Honduras | 1,315 | 1,817 | 1,892 | 3,267 | 3.1 | 530 | 522 | 0.1 | 30 | 44 |

| | 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 | 1999 | 1980 | 1999 | 1980-99 | 1980 | 1999 | 1980-99 | 1980 | 1999 |
| Hungary | 14,935 | 11,491 | 28,940 | 25,289 | -1.0 | 2,703 | 2,512 | -0.7 | 48 | 55 |
| India | 222,418 | 409,788 | 242,592 | 480,418 | 3.8 | 353 | 482 | 1.8 | 8 | 15 |
| Indonesia | 128,996 | 226,378 | 59,933 | 136,121 | 4.8 | 404 | 658 | 3.0 | -115 | -66 |
| Iran, Islamic Rep. | 81,142 | 229,406 | 38,987 | 103,635 | 5.6 | 996 | 1,651 | 3.0 | -108 | -121 |
| Iraq | 136,643 | 131,754 | 12,030 | 28,802 | 4.6 | 925 | 1,263 | 1.5 | -1,036 | -357 |
| Ireland | 1,894 | 2,513 | 8,485 | 13,979 | 2.6 | 2,495 | 3,726 | 2.3 | 78 | 82 |
| Israel | 153 | 615 | 8,563 | 18,493 | 5.2 | 2,208 | 3,029 | 2.6 | 98 | 97 |
| Italy | 19,644 | 27,754 | 138,629 | 169,041 | 1.3 | 2,456 | 2,932 | 1.2 | 86 | 84 |
| Jamaica | 224 | 641 | 2,378 | 4,136 | 4.0 | 1,115 | 1,597 | 3.0 | 91 | 85 |
| Japan | 43,281 | 104,223 | 346,527 | 515,447 | 2.7 | 2,967 | 4,070 | 2.3 | 88 | 80 |
| Jordan | 1 | 286 | 1,714 | 4,871 | 5.0 | 786 | 1,028 | 0.5 | 100 | 94 |
| Kazakhstan | 76,799 | 64,668 | 76,799 | 35,439 | .. | .. | 2,374 | .. | 0 | -82 |
| Kenya | 7,891 | 12,129 | 9,791 | 14,690 | 2.2 | 589 | 499 | -0.8 | 19 | 17 |
| Korea, Dem. Rep. | 29,135 | 54,198 | 31,914 | 58,925 | 4.0 | 1,856 | 2,658 | 2.6 | 9 | 8 |
| Korea, Rep. | 9,644 | 31,852 | 41,238 | 181,365 | 9.3 | 1,082 | 3,871 | 8.2 | 77 | 82 |
| Kuwait | 91,636 | 104,291 | 12,249 | 17,289 | 0.3 | 8,908 | 8,984 | -0.3 | -648 | -503 |
| Kyrgyz Republic | 2,190 | 1,301 | 1,717 | 2,451 | .. | .. | 504 | .. | .. | 47 |
| Lao PDR | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Latvia | 261 | 1,497 | 566 | 3,822 | .. | .. | 1,586 | .. | .. | 61 |
| Lebanon | 178 | 161 | 2,524 | 5,469 | 4.8 | 841 | 1,280 | 2.8 | 93 | 97 |
| Lesotho | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Liberia | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Libya | 96,550 | 73,420 | 7,193 | 12,254 | 3.9 | 2,364 | 2,370 | 1.2 | -1,242 | -499 |
| Lithuania | .. | 3,540 | .. | 7,909 | .. | .. | 2,138 | .. | .. | 55 |
| Macedonia, FYR | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Madagascar | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Malawi | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Malaysia | 18,202 | 73,411 | 12,162 | 42,650 | 7.8 | 884 | 1,878 | 4.9 | -50 | -72 |
| Mali | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Mauritania | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Mauritius | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Mexico | 149,359 | 221,771 | 98,898 | 148,991 | 2.1 | 1,464 | 1,543 | 0.2 | -51 | -49 |
| Moldova | 35 | 63 | .. | 2,813 | .. | .. | 656 | .. | .. | 98 |
| Mongolia | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Morocco | 877 | 615 | 4,778 | 9,931 | 4.2 | 247 | 352 | 2.1 | 82 | 94 |
| Mozambique | 7,413 | 7,067 | 8,074 | 6,985 | -0.9 | 668 | 404 | -2.6 | 8 | .. |
| Myanmar | 9,513 | 13,943 | 9,430 | 12,897 | 1.4 | 280 | 273 | -0.4 | -1 | -8 |
| Namibia | .. | 270 | .. | 1,108 | .. | .. | 645 | .. | .. | 76 |
| Nepal | 4,630 | 7,035 | 4,805 | 8,051 | 2.8 | 330 | 358 | 0.4 | 4 | 13 |
| Netherlands | 71,821 | 59,054 | 64,984 | 74,068 | 1.4 | 4,593 | 4,686 | 0.8 | -11 | 20 |
| New Zealand | 5,485 | 15,143 | 9,210 | 18,176 | 3.8 | 2,959 | 4,770 | 2.7 | 40 | 17 |
| Nicaragua | 910 | 1,482 | 1,555 | 2,664 | 2.7 | 532 | 539 | 0.0 | 41 | 44 |
| Niger | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Nigeria | 148,479 | 178,822 | 52,846 | 87,286 | 2.6 | 743 | 705 | -0.4 | -181 | -105 |
| Norway | 55,716 | 209,765 | 18,792 | 26,606 | 1.8 | 4,593 | 5,965 | 1.3 | -196 | -688 |
| Oman | 15,090 | 54,504 | 996 | 8,469 | 11.3 | 905 | 3,607 | 6.8 | -1,415 | -544 |
| Pakistan | 20,997 | 44,091 | 25,472 | 59,830 | 4.7 | 308 | 444 | 2.1 | 18 | 26 |
| Panama | 529 | 704 | 1,821 | 2,347 | 2.2 | 934 | 835 | 0.2 | 71 | 70 |
| Papua New Guinea | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Paraguay | 1,605 | 6,741 | 2,089 | 4,140 | 4.4 | 671 | 773 | 1.5 | 23 | -63 |
| Peru | 14,655 | 11,659 | 11,700 | 13,101 | 1.0 | 675 | 519 | -0.9 | -25 | 11 |
| Philippines | 10,670 | 19,681 | 21,212 | 40,728 | 3.9 | 442 | 549 | 1.5 | 50 | 52 |
| Poland | 122,224 | 83,394 | 123,035 | 93,382 | -1.4 | 3,458 | 2,416 | -1.8 | 1 | 11 |
| Portugal | 1,481 | 1,940 | 10,291 | 23,627 | 4.5 | 1,054 | 2,365 | 4.5 | 86 | 92 |
| Puerto Rico | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Romania | 52,587 | 27,859 | 65,123 | 36,432 | -3.0 | 2,933 | 1,622 | -3.1 | 19 | 24 |
| Russian Federation | 748,647 | 950,589 | 763,707 | 602,952 | .. | .. | 4,121 | .. | .. | -58 |

# 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 | 1999 | 1980 | 1999 | 1980-99 | 1980 | 1999 | 1980-99 | 1980 | 1999 |
| Rwanda | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Saudi Arabia | 533,071 | 448,735 | 35,357 | 84,907 | 4.4 | 3,773 | 4,204 | 0.3 | -1,408 | -429 |
| Senegal | 1,046 | 1,684 | 1,921 | 2,957 | 2.3 | 347 | 318 | -0.4 | 46 | 43 |
| Sierra Leone | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Singapore | .. | 64 | 6,062 | 22,693 | 9.0 | 2,511 | 5,742 | 6.3 | .. | 100 |
| Slovak Republic | 3,418 | 5,136 | 21,040 | 17,991 | -1.3 | 4,221 | 3,335 | -1.7 | 84 | 71 |
| Slovenia | .. | 2,985 | .. | 6,506 | .. | .. | 3,277 | .. | .. | 54 |
| Somalia | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| South Africa | 73,169 | 143,993 | 65,417 | 109,334 | 2.2 | 2,372 | 2,597 | -0.1 | -12 | -32 |
| Spain | 15,636 | 30,691 | 68,576 | 118,467 | 3.1 | 1,834 | 3,005 | 2.9 | 77 | 74 |
| Sri Lanka | 3,209 | 4,547 | 4,536 | 7,728 | 2.4 | 308 | 406 | 1.1 | 29 | 41 |
| Sudan | 7,089 | 17,034 | 8,406 | 15,372 | 2.9 | 435 | 503 | 0.6 | 16 | -11 |
| Swaziland | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Sweden | 16,132 | 34,489 | 39,911 | 51,094 | 1.2 | 4,803 | 5,769 | 0.8 | 60 | 32 |
| Switzerland | 7,030 | 11,805 | 20,861 | 26,689 | 1.5 | 3,301 | 3,738 | 0.7 | 66 | 56 |
| Syrian Arab Republic | 9,502 | 34,205 | 5,348 | 18,049 | 5.5 | 614 | 1,143 | 2.2 | -78 | -90 |
| Tajikistan | 1,986 | 1,381 | .. | 3,344 | .. | .. | 543 | .. | .. | 59 |
| Tanzania | 9,502 | 14,269 | 10,280 | 15,033 | 2.0 | 553 | 457 | -1.0 | 8 | 5 |
| Thailand | 11,182 | 38,499 | 22,808 | 70,415 | 7.6 | 488 | 1,169 | 6.1 | 51 | 45 |
| Togo | 562 | 1,015 | 715 | 1,373 | 3.6 | 284 | 313 | 0.7 | 21 | 26 |
| Trinidad and Tobago | 13,141 | 16,079 | 3,873 | 8,022 | 3.1 | 3,579 | 6,205 | 2.2 | -239 | -100 |
| Tunisia | 6,966 | 7,120 | 3,907 | 7,673 | 3.7 | 612 | 811 | 1.6 | -78 | 7 |
| Turkey | 17,077 | 26,903 | 31,452 | 70,326 | 4.6 | 707 | 1,093 | 2.6 | 46 | 62 |
| Turkmenistan | 8,034 | 26,331 | 7,948 | 13,644 | .. | .. | 2,677 | .. | .. | -93 |
| Uganda | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Ukraine | 109,708 | 81,923 | 97,893 | 148,389 | .. | .. | 2,973 | .. | .. | 45 |
| United Arab Emirates | 89,716 | 135,681 | 6,112 | 28,085 | 8.4 | 5,860 | 9,977 | 2.9 | -1,368 | -383 |
| United Kingdom | 196,792 | 281,674 | 201,284 | 230,324 | 1.0 | 3,573 | 3,871 | 0.7 | 2 | -22 |
| United States | 1,553,263 | 1,687,886 | 1,811,650 | 2,269,985 | 1.5 | 7,973 | 8,159 | 0.4 | 14 | 26 |
| Uruguay | 763 | 961 | 2,641 | 3,232 | 1.5 | 906 | 976 | 0.8 | 71 | 70 |
| Uzbekistan | 4,615 | 55,109 | 4,821 | 49,383 | .. | .. | 2,024 | .. | .. | -12 |
| Venezuela, RB | 139,392 | 209,707 | 34,962 | 53,406 | 2.4 | 2,317 | 2,253 | 0.0 | -299 | -293 |
| Vietnam | 18,364 | 44,858 | 19,573 | 35,209 | 3.1 | 364 | 454 | 1.1 | 6 | -27 |
| West Bank and Gaza | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Yemen, Rep. | 60 | 20,247 | 1,424 | 3,139 | 4.2 | 167 | 184 | 0.3 | 96 | -545 |
| Yugoslavia, Fed. Rep. | .. | 10,096 | .. | 13,375 | .. | .. | 1,258 | .. | .. | 25 |
| Zambia | 4,198 | 5,784 | 4,551 | 6,190 | 1.3 | 793 | 626 | -1.6 | 8 | 7 |
| Zimbabwe | 5,793 | 8,322 | 6,570 | 10,170 | 2.6 | 921 | 821 | -0.3 | 12 | 18 |
| **World** | **6,907,812 t** | **9,714,082 t** | **6,929,212 t** | **9,635,465 *t*** | **2.9 w** | **1,482 w** | **1,671 *w*** | **1.1 w** | **.. w** | **.. w** |
| **Low income** | 819,980 | 1,359,334 | 674,896 | 1,262,983 | 4.9 | 391 | 567 | 2.6 | -23 | -8 |
| **Middle income** | 3,308,639 | 4,648,785 | 2,490,055 | 3,506,451 | 4.4 | 895 | 1,325 | 2.8 | -33 | -33 |
| Lower middle income | 1,931,423 | 2,962,555 | 1,755,632 | 2,308,831 | 5.4 | 660 | 1,146 | 4.0 | -9 | -28 |
| Upper middle income | 1,377,216 | 1,686,230 | 734,423 | 1,197,620 | 2.8 | 1,601 | 1,897 | 1.0 | -94 | -41 |
| **Low & middle income** | 4,128,619 | 6,008,119 | 3,164,951 | 4,769,434 | 4.5 | 676 | 979 | 2.6 | -31 | -26 |
| East Asia & Pacific | 844,331 | 1,559,783 | 810,781 | 1,666,659 | 4.5 | 587 | 920 | 3.0 | -5 | 6 |
| Europe & Central Asia | 1,241,994 | 1,420,239 | 1,332,872 | 1,240,388 | 7.8 | 3,348 | 2,628 | .. | .. | -15 |
| Latin America & Carib. | 475,362 | 816,043 | 381,870 | 588,053 | 2.4 | 1,071 | 1,171 | 0.6 | -24 | -39 |
| Middle East & N. Africa | 986,110 | 1,208,951 | 145,640 | 365,967 | 4.8 | 838 | 1,279 | 2.0 | -580 | -230 |
| South Asia | 257,999 | 479,935 | 285,846 | 573,962 | 3.9 | 323 | 441 | 1.8 | 10 | 16 |
| Sub-Saharan Africa | 322,823 | 523,168 | 207,942 | 334,405 | 2.3 | 713 | 671 | -0.6 | -57 | -56 |
| **High income** | 2,779,193 | 3,705,963 | 3,764,261 | 4,866,031 | 1.7 | 4,794 | 5,448 | 1.0 | 26 | 24 |
| Europe EMU | 369,087 | 431,075 | 952,790 | 1,142,253 | 1.2 | 3,337 | 3,785 | 0.9 | 61 | 62 |

## About the data

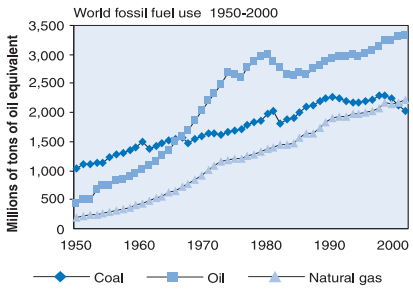
In developing countries growth in commercial energy use is closely related to growth in the modern sectors—industry, motorized transport, and urban areas—but commercial energy use also reflects climatic, geographic, and economic factors (such as the relative price of energy). Commercial energy use has 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) and the United Nations Statistics Division (UNSD). IEA data for non-OECD countries are based on national energy data adjusted to conform to annual questionnaires completed by OECD member governments. UNSD data are primarily from responses to questionnaires sent to national governments, supplemented by official national statistical publications and by data from intergovernmental organizations. When official data are not available, the UNSD prepares estimates based on the professional and commercial literature. This variety of sources affects the cross-country comparability of data.

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, which comprises solid biomass and animal products, gas and liquid from biomass, industrial waste, 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.

**Figure 3.7**

**While the world's use of coal is decreasing, its use of other fossil fuels continues to increase**




*Source:* Worldwatch Institute from: UN, DOE, BP Amoco, LBL, IEA, and IGU.

## 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.

## Data sources

The data on commercial energy production and use are primarily from IEA electronic files and from the United Nations Statistics Division's *Energy Statistics Yearbook*. 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 | | Traditional fuel use | | Carbon dioxide emissions | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PPP $ per kg oil equivalent | | % of total energy use | | Total million metric tons | | Per capita metric tons | | kg per PPP $ of GDP | |
| | 1980 | 1999 | 1980 | 1997 | 1980 | 1998 | 1980 | 1998 | 1980 | 1998 |
| Afghanistan | .. | .. | 63.0 | *75.6* | 1.7 | 1.0 | 0.1 | 0.0 | .. | 0.0 |
| Albania | .. | 10.4 | 13.1 | 7.3 | 4.8 | 1.6 | 1.8 | 0.5 | .. | 0.2 |
| Algeria | 4.9 | 5.4 | 1.9 | 1.5 | 66.1 | 106.6 | 3.5 | 3.6 | 1.1 | 0.7 |
| Angola | .. | 4.4 | 64.9 | 69.7 | 5.3 | 5.9 | 0.8 | 0.5 | .. | 0.2 |
| Argentina | 4.7 | 7.1 | 5.9 | 4.0 | 107.5 | 136.9 | 3.8 | 3.8 | 0.6 | 0.3 |
| Armenia | .. | 4.9 | .. | 0.0 | .. | 3.4 | .. | 0.9 | .. | 0.4 |
| Australia | 2.1 | 4.4 | 3.8 | 4.4 | 202.8 | 331.5 | 13.8 | 17.7 | 1.4 | 0.7 |
| Austria | 3.5 | 7.2 | 1.2 | 4.7 | 52.4 | 63.9 | 6.9 | 7.9 | 0.7 | 0.3 |
| Azerbaijan | .. | 1.6 | .. | 0.0 | .. | 38.8 | .. | 4.9 | .. | 2.2 |
| Bangladesh | 5.7 | 10.8 | 81.3 | 46.0 | 7.6 | 23.4 | 0.1 | 0.2 | 0.2 | 0.1 |
| Belarus | .. | 2.9 | .. | 0.8 | .. | 60.5 | .. | 6.0 | .. | 0.9 |
| Belgium | 2.4 | 4.5 | 0.2 | 1.6 | 131.3 | 101.3 | 13.3 | 9.9 | 1.2 | 0.4 |
| Benin | 1.3 | 2.9 | 85.4 | 89.2 | 0.5 | 0.7 | 0.1 | 0.1 | 0.3 | 0.1 |
| Bolivia | 3.2 | 4.2 | 19.3 | 14.0 | 4.5 | 12.1 | 0.8 | 1.5 | 0.6 | 0.6 |
| Bosnia and Herzegovina | .. | .. | .. | 10.1 | .. | 4.7 | .. | 1.2 | .. | 0.0 |
| Botswana | .. | .. | 35.7 | .. | 1.0 | 3.8 | 1.1 | 2.4 | 0.6 | 0.4 |
| Brazil | 4.4 | 6.7 | 35.5 | 28.7 | 183.4 | 299.6 | 1.5 | 1.8 | 0.4 | 0.3 |
| Bulgaria | 0.9 | 2.3 | 0.5 | 1.3 | 75.3 | 47.4 | 8.5 | 5.7 | 2.9 | 1.2 |
| Burkina Faso | .. | .. | 91.3 | 87.1 | 0.4 | 1.0 | 0.1 | 0.1 | 0.2 | 0.1 |
| Burundi | .. | .. | 97.0 | 94.2 | 0.1 | 0.2 | 0.0 | 0.0 | 0.1 | 0.1 |
| Cambodia | .. | .. | 100.0 | 89.3 | 0.3 | 0.7 | 0.0 | 0.1 | .. | 0.0 |
| Cameroon | 2.8 | 3.8 | 51.7 | 69.2 | 3.9 | 1.8 | 0.4 | 0.1 | 0.4 | 0.1 |
| Canada | 1.5 | 3.3 | 0.4 | 4.7 | 420.9 | 467.2 | 17.1 | 15.4 | 1.4 | 0.6 |
| Central African Republic | .. | .. | 88.9 | 87.5 | 0.1 | 0.2 | 0.0 | 0.1 | 0.1 | 0.1 |
| Chad | .. | .. | 95.9 | 97.6 | 0.2 | 0.1 | 0.0 | 0.0 | 0.1 | 0.0 |
| Chile | 3.2 | 5.2 | 12.3 | 11.3 | 27.5 | 60.2 | 2.5 | 4.1 | 0.9 | 0.5 |
| China | 0.8 | 4.2 | 8.4 | 5.7 | 1,476.8 | 3,108.0 | 1.5 | 2.5 | 3.2 | 0.7 |
| Hong Kong, China | 6.4 | 8.4 | 0.9 | 0.7 | 16.3 | 35.8 | 3.2 | 5.4 | 0.5 | 0.3 |
| Colombia | 12.0 | 9.3 | 15.9 | 17.7 | 39.8 | 67.8 | 1.4 | 1.7 | 0.2 | 0.3 |
| Congo, Dem. Rep. | 3.3 | *2.6* | 73.9 | 91.7 | 3.5 | 2.4 | 0.1 | 0.1 | 0.1 | 0.1 |
| Congo, Rep. | 0.8 | 2.8 | 77.8 | 53.0 | 0.4 | 1.8 | 0.2 | 0.6 | 0.6 | 0.8 |
| Costa Rica | 5.8 | 10.8 | 26.3 | 54.2 | 2.5 | 5.1 | 1.1 | 1.4 | 0.3 | 0.2 |
| Côte d'Ivoire | 2.9 | 4.3 | 52.8 | 91.5 | 4.6 | 13.2 | 0.6 | 0.9 | 0.4 | 0.5 |
| Croatia | .. | 4.1 | .. | 3.2 | .. | 19.8 | .. | 4.5 | .. | 0.6 |
| Cuba | .. | .. | 27.9 | 30.2 | 30.8 | 24.9 | 3.2 | 2.2 | .. | 0.0 |
| Czech Republic | .. | 3.5 | 0.6 | 1.6 | .. | 118.3 | .. | 11.5 | .. | 0.9 |
| Denmark | 3.0 | 6.9 | 0.4 | 5.9 | 62.9 | 53.4 | 12.3 | 10.1 | 1.1 | 0.4 |
| Dominican Republic | 3.6 | 6.2 | 27.5 | 14.3 | 6.4 | 20.3 | 1.1 | 2.5 | 0.5 | 0.5 |
| Ecuador | 3.0 | 4.5 | 26.7 | 17.5 | 13.4 | 26.3 | 1.7 | 2.2 | 0.9 | 0.7 |
| Egypt, Arab Rep. | 3.5 | 4.9 | 4.7 | 3.2 | 45.2 | 105.8 | 1.1 | 1.7 | 0.8 | 0.5 |
| El Salvador | 4.3 | 6.8 | 52.9 | 34.5 | 2.1 | 6.1 | 0.5 | 1.0 | 0.2 | 0.2 |
| Eritrea | .. | .. | .. | 96.0 | .. | 0.0 | .. | 0.0 | .. | 0.0 |
| Estonia | .. | 2.6 | .. | 13.8 | .. | 17.0 | .. | 12.1 | .. | 1.4 |
| Ethiopia | *1.4* | 2.2 | 89.6 | 95.9 | 1.8 | 2.0 | 0.0 | 0.0 | *0.1* | 0.1 |
| Finland | 1.8 | 3.6 | 4.3 | 6.5 | 56.9 | 53.3 | 11.9 | 10.3 | 1.3 | 0.5 |
| France | 2.9 | 5.3 | 1.3 | 5.7 | 482.7 | 369.9 | 9.0 | 6.3 | 0.9 | 0.3 |
| Gabon | 1.9 | 4.5 | 30.8 | 32.9 | 6.2 | 2.8 | 8.9 | 2.4 | 2.2 | 0.4 |
| Gambia, The | .. | .. | 72.7 | 78.6 | 0.2 | 0.2 | 0.2 | 0.2 | 0.3 | 0.1 |
| Georgia | .. | 4.8 | .. | 1.0 | .. | 5.2 | .. | 1.0 | .. | 0.4 |
| Germany | 2.3 | 5.8 | 0.3 | 1.3 | .. | 825.2 | .. | 10.1 | .. | 0.4 |
| Ghana | 2.8 | 5.0 | 43.7 | 78.1 | 2.4 | 4.4 | 0.2 | 0.2 | 0.2 | 0.1 |
| Greece | 4.8 | 6.0 | 3.0 | 4.5 | 51.7 | 85.2 | 5.4 | 8.1 | 0.7 | 0.6 |
| Guatemala | 4.1 | 6.8 | 54.6 | 62.0 | 4.5 | 9.7 | 0.7 | 0.9 | 0.3 | 0.3 |
| Guinea | .. | .. | 71.4 | 74.2 | 0.9 | 1.2 | 0.2 | 0.2 | .. | 0.1 |
| Guinea-Bissau | .. | .. | 80.0 | 57.1 | 0.5 | 0.0 | 0.7 | 0.0 | 1.8 | 0.0 |
| Haiti | 3.6 | 5.5 | 80.7 | 74.7 | 0.8 | 1.3 | 0.1 | 0.2 | 0.1 | 0.1 |
| Honduras | 2.9 | 4.5 | 55.3 | 54.8 | 2.1 | 5.1 | 0.6 | 0.8 | 0.4 | 0.3 |

| | GDP per unit of energy use | | Traditional fuel use | | Carbon dioxide emissions | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PPP $ per kg oil equivalent | | % of total energy use | | Total million metric tons | | Per capita metric tons | | kg per PPP $ of GDP | |
| | 1980 | 1999 | 1980 | 1997 | 1980 | 1998 | 1980 | 1998 | 1980 | 1998 |
| Hungary | 2.0 | 4.6 | 2.0 | 1.6 | 82.5 | 58.7 | 7.7 | 5.8 | 1.4 | 0.5 |
| India | 1.9 | 4.7 | 31.5 | 20.7 | 347.3 | 1,061.0 | 0.5 | 1.1 | 0.8 | 0.5 |
| Indonesia | 2.2 | 4.4 | 51.5 | 29.3 | 94.6 | 233.6 | 0.6 | 1.1 | 0.7 | 0.4 |
| Iran, Islamic Rep. | 2.9 | 3.4 | 0.4 | 0.7 | 116.1 | 289.9 | 3.0 | 4.7 | 1.0 | 0.9 |
| Iraq | .. | .. | 0.3 | 0.1 | 44.0 | 82.4 | 3.4 | 3.7 | .. | 0.0 |
| Ireland | 2.3 | 7.0 | 0.0 | 0.2 | 25.2 | 38.3 | 7.4 | 10.3 | 1.3 | 0.5 |
| Israel | 3.6 | 6.1 | 0.0 | 0.0 | 21.1 | 60.3 | 5.4 | 10.1 | 0.7 | 0.6 |
| Italy | 3.9 | 7.7 | 0.8 | 1.0 | 371.9 | 414.9 | 6.6 | 7.2 | 0.7 | 0.3 |
| Jamaica | 1.7 | 2.2 | 5.0 | 6.0 | 8.4 | 11.0 | 4.0 | 4.3 | 2.1 | 1.2 |
| Japan | 3.4 | 6.3 | 0.1 | 1.6 | 920.4 | 1,133.5 | 7.9 | 9.0 | 0.8 | 0.4 |
| Jordan | 3.2 | 3.8 | 0.0 | 0.0 | 4.7 | 13.9 | 2.2 | 3.0 | 0.8 | 0.8 |
| Kazakhstan | .. | 2.1 | .. | 0.2 | .. | 122.9 | .. | 8.2 | .. | 1.7 |
| Kenya | 1.1 | 2.1 | 76.8 | 80.3 | 6.2 | 9.1 | 0.4 | 0.3 | 0.6 | 0.3 |
| Korea, Dem. Rep. | .. | .. | 3.1 | 1.4 | 124.9 | 226.1 | 7.3 | 10.3 | .. | 0.0 |
| Korea, Rep. | 2.8 | 4.1 | 4.0 | 2.4 | 125.1 | 363.7 | 3.3 | 7.8 | 1.1 | 0.6 |
| Kuwait | 1.3 | 1.8 | 0.0 | 0.0 | 24.7 | 49.1 | 18.0 | 26.3 | 1.6 | 1.7 |
| Kyrgyz Republic | .. | 5.0 | .. | 0.0 | .. | 6.4 | .. | 1.3 | .. | 0.6 |
| Lao PDR | .. | .. | 72.3 | 88.7 | 0.2 | 0.4 | 0.1 | 0.1 | .. | 0.1 |
| Latvia | .. | 4.1 | .. | 26.2 | .. | 7.9 | .. | 3.2 | .. | 0.5 |
| Lebanon | .. | 3.3 | 2.4 | 2.5 | 6.2 | 16.3 | 2.1 | 3.9 | .. | 0.9 |
| Lesotho | .. | .. | .. | .. | .. | 0.0 | .. | 0.0 | .. | 0.0 |
| Liberia | .. | .. | 62.5 | *89.7* | 2.0 | 0.4 | 1.1 | 0.1 | .. | 0.0 |
| Libya | .. | .. | 2.3 | 0.9 | 26.9 | 36.4 | 8.8 | 7.2 | .. | 0.0 |
| Lithuania | .. | 3.1 | .. | 6.3 | .. | 15.6 | .. | 4.2 | .. | 0.6 |
| Macedonia, FYR | .. | .. | .. | 6.1 | .. | 12.4 | .. | 6.1 | .. | 1.4 |
| Madagascar | .. | .. | 78.4 | 84.3 | 1.6 | 1.3 | 0.2 | 0.1 | 0.3 | 0.1 |
| Malawi | .. | .. | 90.6 | 88.6 | 0.7 | 0.7 | 0.1 | 0.1 | 0.3 | 0.1 |
| Malaysia | 2.7 | 4.3 | 15.7 | 5.5 | 28.0 | 120.5 | 2.0 | 5.4 | 0.8 | 0.7 |
| Mali | .. | .. | 86.7 | 88.9 | 0.4 | 0.5 | 0.1 | 0.0 | 0.1 | 0.1 |
| Mauritania | .. | .. | 0.0 | 0.0 | 0.6 | 2.9 | 0.4 | 1.2 | 0.4 | 0.7 |
| Mauritius | .. | .. | 59.1 | 36.1 | 0.6 | 1.7 | 0.6 | 1.5 | 0.3 | 0.2 |
| Mexico | 3.1 | 5.4 | 5.0 | 4.5 | 252.5 | 374.0 | 3.7 | 3.9 | 0.8 | 0.5 |
| Moldova | .. | 3.2 | .. | 0.5 | .. | 9.7 | .. | 2.2 | .. | 1.1 |
| Mongolia | .. | .. | 14.4 | 4.3 | 6.8 | 7.7 | 4.1 | 3.3 | *3.5* | 2.0 |
| Morocco | 6.8 | 10.0 | 5.2 | 4.0 | 15.9 | 32.0 | 0.8 | 1.2 | 0.5 | 0.3 |
| Mozambique | 0.6 | 2.1 | 43.7 | 91.4 | 3.2 | 1.3 | 0.3 | 0.1 | 0.7 | 0.1 |
| Myanmar | .. | .. | 69.3 | 60.5 | 4.8 | 8.2 | 0.1 | 0.2 | .. | 0.0 |
| Namibia | .. | 9.6 | .. | .. | .. | 0.0 | .. | 0.0 | .. | 0.0 |
| Nepal | 1.5 | 3.5 | 94.2 | 89.6 | 0.5 | 3.0 | 0.0 | 0.1 | 0.1 | 0.1 |
| Netherlands | 2.2 | 5.2 | 0.0 | 1.1 | 153.0 | 163.8 | 10.8 | 10.4 | 1.1 | 0.5 |
| New Zealand | 2.9 | 4.0 | 0.2 | 0.8 | 17.6 | 30.0 | 5.6 | 7.9 | 0.6 | 0.4 |
| Nicaragua | 3.5 | 4.2 | 49.2 | 42.2 | 2.0 | 3.4 | 0.7 | 0.7 | 0.4 | 0.3 |
| Niger | .. | .. | 79.5 | 80.6 | 0.6 | 1.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Nigeria | 0.8 | 1.2 | 66.8 | 67.8 | 68.1 | 78.5 | 1.0 | 0.6 | 1.6 | 0.8 |
| Norway | 2.4 | 4.8 | 0.4 | 1.1 | 38.7 | 33.6 | 9.5 | 7.6 | 0.9 | 0.3 |
| Oman | .. | .. | *0.0* | .. | 5.9 | 20.3 | 5.3 | 8.8 | .. | 0.0 |
| Pakistan | 2.2 | 4.2 | 24.4 | 29.5 | 31.6 | 97.1 | 0.4 | 0.7 | 0.6 | 0.4 |
| Panama | 3.3 | 7.1 | 26.6 | 14.4 | 3.5 | 5.8 | 1.8 | 2.1 | 0.6 | 0.4 |
| Papua New Guinea | .. | .. | 65.4 | 62.5 | 1.8 | 2.3 | 0.6 | 0.5 | 0.5 | 0.2 |
| Paraguay | 4.2 | 5.8 | 62.0 | 49.6 | 1.5 | 4.6 | 0.5 | 0.9 | 0.2 | 0.2 |
| Peru | 4.6 | 8.9 | 15.2 | 24.6 | 23.6 | 27.9 | 1.4 | 1.1 | 0.4 | 0.2 |
| Philippines | 5.6 | 6.9 | 37.0 | 26.9 | 36.5 | 76.0 | 0.8 | 1.0 | 0.3 | 0.3 |
| Poland | .. | 3.5 | 0.4 | 0.8 | 456.2 | 321.7 | 12.8 | 8.3 | .. | 1.0 |
| Portugal | 5.6 | 6.9 | 1.2 | 0.9 | 27.1 | 54.6 | 2.8 | 5.5 | 0.5 | 0.4 |
| Puerto Rico | .. | .. | *0.0* | .. | 14.0 | 17.6 | 4.4 | 4.6 | .. | 0.0 |
| Romania | 1.6 | 3.8 | 1.3 | 5.7 | 191.8 | 92.4 | 8.6 | 4.1 | 1.9 | 0.7 |
| Russian Federation | .. | 1.9 | .. | 0.8 | .. | 1,434.6 | .. | 9.8 | .. | 1.4 |

# 3.8 Energy efficiency and emissions

| | GDP per unit of energy use | | Traditional fuel use | | Carbon dioxide emissions | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PPP $ per kg oil equivalent | | % of total energy use | | Total million metric tons | | Per capita metric tons | | kg per PPP $ of GDP | |
| | 1980 | 1999 | 1980 | 1997 | 1980 | 1998 | 1980 | 1998 | 1980 | 1998 |
| Rwanda | .. | .. | 89.8 | 88.3 | 0.3 | 0.5 | 0.1 | 0.1 | 0.1 | 0.1 |
| Saudi Arabia | 3.0 | 2.5 | 0.0 | 0.0 | 130.7 | 283.0 | 14.0 | 14.4 | 1.2 | 1.3 |
| Senegal | 2.3 | 4.5 | 50.8 | 56.2 | 2.8 | 3.3 | 0.5 | 0.4 | 0.6 | 0.3 |
| Sierra Leone | .. | .. | 90.0 | 86.1 | 0.6 | 0.5 | 0.2 | 0.1 | 0.3 | 0.2 |
| Singapore | 2.4 | 3.6 | 0.4 | 0.0 | 30.1 | 82.3 | 12.5 | 21.0 | 2.1 | 1.1 |
| Slovak Republic | .. | 3.2 | .. | 0.5 | .. | 38.1 | .. | 7.1 | .. | 0.7 |
| Slovenia | .. | 4.9 | .. | 1.5 | .. | 14.6 | .. | 7.4 | .. | 0.5 |
| Somalia | .. | .. | 78.6 | .. | 0.6 | 0.0 | 0.1 | 0.0 | .. | 0.0 |
| South Africa | 2.7 | 3.5 | 4.9 | 43.4 | 211.3 | 343.7 | 7.7 | 8.3 | 1.2 | 0.9 |
| Spain | 3.8 | 6.1 | 0.4 | 1.3 | 200.0 | 247.2 | 5.3 | 6.3 | 0.8 | 0.4 |
| Sri Lanka | 3.5 | 8.1 | 53.5 | 46.5 | 3.4 | 8.1 | 0.2 | 0.4 | 0.2 | 0.1 |
| Sudan | 1.4 | 3.2 | 86.9 | 75.1 | 3.3 | 3.6 | 0.2 | 0.1 | 0.3 | 0.1 |
| Swaziland | .. | .. | .. | .. | 0.5 | 0.4 | 0.8 | 0.4 | 0.4 | 0.1 |
| Sweden | 2.1 | 4.0 | 7.7 | 17.9 | 71.4 | 48.6 | 8.6 | 5.5 | 0.8 | 0.3 |
| Switzerland | 4.4 | 7.3 | 0.9 | 6.0 | 40.9 | 41.8 | 6.5 | 5.9 | 0.4 | 0.2 |
| Syrian Arab Republic | 2.6 | 3.0 | 0.0 | 0.0 | 19.3 | 50.6 | 2.2 | 3.3 | 1.4 | 0.9 |
| Tajikistan | .. | 1.9 | .. | .. | .. | 5.1 | .. | 0.8 | .. | 0.9 |
| Tanzania | .. | 1.1 | 92.0 | 91.4 | 1.9 | 2.2 | 0.1 | 0.1 | .. | 0.1 |
| Thailand | 3.0 | 5.2 | 40.3 | 24.6 | 40.0 | 192.4 | 0.9 | 3.2 | 0.6 | 0.6 |
| Togo | 4.3 | 4.7 | 35.7 | 71.9 | 0.6 | 0.9 | 0.2 | 0.2 | 0.2 | 0.1 |
| Trinidad and Tobago | 1.3 | 1.3 | 1.4 | 0.8 | 16.7 | 22.4 | 15.4 | 17.4 | 3.4 | 2.3 |
| Tunisia | 4.0 | 7.4 | 16.1 | 12.4 | 9.4 | 22.4 | 1.5 | 2.4 | 0.6 | 0.4 |
| Turkey | 3.6 | 5.9 | 20.5 | 3.1 | 76.3 | 202.0 | 1.7 | 3.2 | 0.7 | 0.5 |
| Turkmenistan | .. | 1.2 | .. | .. | .. | 27.9 | .. | 5.7 | .. | 2.1 |
| Uganda | .. | .. | 93.6 | 89.7 | 0.6 | 1.3 | 0.1 | 0.1 | *0.1* | 0.1 |
| Ukraine | .. | 1.2 | .. | 0.5 | .. | 353.6 | .. | 7.0 | .. | 2.1 |
| United Arab Emirates | 4.4 | *1.8* | *0.0* | .. | 36.3 | 88.2 | 34.8 | 32.4 | 1.4 | 1.8 |
| United Kingdom | 2.5 | 5.8 | 0.0 | 3.3 | 580.3 | 542.3 | 10.3 | 9.2 | 1.1 | 0.4 |
| United States | 1.6 | 3.9 | 1.3 | 3.8 | 4,626.8 | 5,447.6 | 20.4 | 19.8 | 1.6 | 0.6 |
| Uruguay | 5.0 | 9.2 | 11.1 | 21.0 | 5.8 | 5.8 | 2.0 | 1.8 | 0.4 | 0.2 |
| Uzbekistan | .. | 1.1 | .. | 0.0 | .. | 109.2 | .. | 4.5 | .. | 2.1 |
| Venezuela, RB | 1.7 | 2.5 | 0.9 | 0.7 | 90.1 | 155.4 | 6.0 | 6.7 | 1.5 | 1.1 |
| Vietnam | .. | 4.1 | 49.1 | 37.8 | 16.8 | 43.9 | 0.3 | 0.6 | .. | 0.3 |
| West Bank and Gaza | .. | .. | .. | .. | .. | 0.0 | .. | 0.0 | .. | 0.0 |
| Yemen, Rep. | .. | 4.4 | *0.0* | 1.4 | .. | 14.2 | .. | 0.9 | .. | 1.1 |
| Yugoslavia, Fed. Rep. | .. | .. | .. | 1.5 | 102.0 | 0.0 | 10.4 | 0.0 | .. | 0.0 |
| Zambia | 0.9 | 1.2 | 37.4 | 72.7 | 3.5 | 1.6 | 0.6 | 0.2 | 0.9 | 0.2 |
| Zimbabwe | 1.6 | 3.5 | 27.6 | 25.2 | 9.6 | 14.1 | 1.3 | 1.2 | 0.9 | 0.4 |
| **World** | **2.2 w** | **4.4 w** | **7.4 w** | **8.2 w** | **13,852.7 t** | **22,825.0 t** | **3.4 w** | **3.9 w** | **1.1 w** | **0.6 w** |
| **Low income** | 1.9 | 3.6 | 43.7 | 28.6 | 772.4 | 2,416.1 | 0.5 | 1.0 | 0.7 | 0.5 |
| **Middle income** | 2.3 | 4.0 | 9.7 | 7.3 | 4,266.1 | 9,211.7 | 2.3 | 3.5 | 1.1 | 0.7 |
| Lower middle income | 1.7 | 3.7 | 10.0 | 5.8 | 2,396.9 | 6,140.7 | 1.7 | 3.1 | 1.5 | 0.8 |
| Upper middle income | 3.3 | 4.7 | 9.2 | 10.4 | 1,869.2 | 3,070.9 | 4.2 | 4.9 | 0.8 | 0.6 |
| **Low & middle income** | 2.2 | 3.9 | 18.3 | 12.9 | 5,038.4 | 11,627.8 | 1.5 | 2.3 | 1.0 | 0.7 |
| East Asia & Pacific | .. | 4.3 | 14.6 | 9.4 | 1,958.4 | 4,385.2 | 1.4 | 2.4 | 1.9 | 0.7 |
| Europe & Central Asia | .. | 2.4 | 2.8 | 1.3 | 989.0 | 3,134.8 | .. | 6.8 | 1.4 | 1.1 |
| Latin America & Carib. | 4.1 | 6.0 | 18.4 | 16.0 | 848.2 | 1,308.3 | 2.4 | 2.6 | 0.5 | 0.4 |
| Middle East & N. Africa | 3.3 | 3.8 | 1.6 | 1.2 | 498.5 | 1,092.9 | 3.0 | 3.9 | 1.0 | 0.8 |
| South Asia | 2.0 | 4.9 | 33.8 | 23.6 | 392.3 | 1,194.4 | 0.4 | 0.9 | 0.7 | 0.5 |
| Sub-Saharan Africa | 1.8 | 4.6 | 47.2 | 63.9 | 352.0 | 512.2 | 0.9 | 0.8 | 0.9 | 0.5 |
| **High income** | 2.2 | 4.8 | 1.0 | 3.4 | 8,814.2 | 11,197.2 | 12.4 | 12.6 | 1.2 | 0.5 |
| Europe EMU | 2.8 | 5.9 | 0.7 | 2.5 | 1,565.2 | 2,431.9 | 7.5 | 8.0 | 0.8 | 0.4 |

## 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.

The data on traditional fuel are from the United Nations Statistics Division's *Energy Statistics Yearbook*. This series differs from those published in *World Development Indicators 1999* and previous editions, which came from other sources.

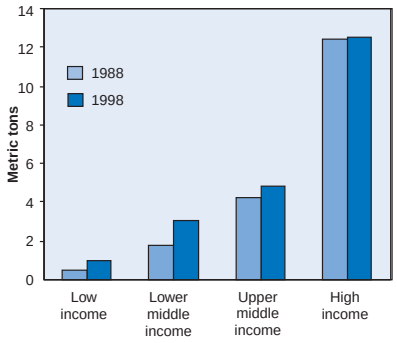
Carbon dioxide ($CO_2$) emissions, largely a by-product of energy production and use (see table 3.7), account for the largest share of greenhouse gases, which are associated with global warming. Anthropogenic $CO_2$ emissions result primarily from fossil fuel combustion and cement manufacturing. In combustion, different fossil fuels release different amounts of $CO_2$ for the same level of energy use. Burning oil releases about 50 percent more $CO_2$ than burning natural gas, and burning coal releases about twice as much. Cement manufacturing releases about half a metric ton of $CO_2$ for each ton of cement produced.

The Carbon Dioxide Information Analysis Center (CDIAC), sponsored by the U.S. Department of Energy, calculates annual anthropogenic emissions of $CO_2$. These calculations are derived from data on fossil fuel consumption, based on the World Energy Data Set maintained by the United Nations Statistics Division, and from data on world cement manufacturing, based on the Cement Manufacturing Data Set maintained by the U.S. Bureau of Mines. Emissions of $CO_2$ 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 $CO_2$ by multiplying the carbon mass by 3.664 (the ratio of the mass of carbon to that of $CO_2$).

Although the estimates of global $CO_2$ 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.

### Figure 3.8a

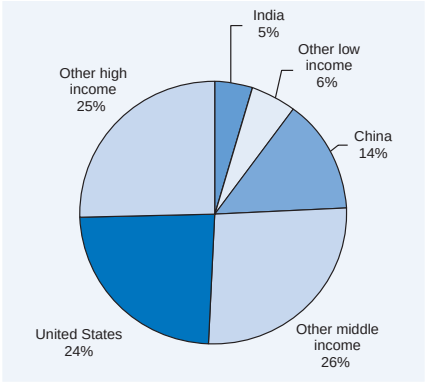
**Per capita emissions of carbon dioxide rise with income**




*Source:* Table 3.8.

### Figure 3.8b

**High-income economies accounted for only 15 percent of the world's population in 1998—but half its carbon dioxide emissions**




*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.
- **Traditional fuel use** includes estimates of the consumption of fuelwood, charcoal, bagasse, and animal and vegetable wastes. Total energy use comprises commercial energy use (see table 3.7) and traditional fuel use.
- **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 traditional fuel use are from the United Nations Statistics Division's *Energy Statistics Yearbook*. The data on $CO_2$ 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 | | Sources of electricty | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | billion kwh | | Hydropower % | | Coal % | | Oil % | | Gas % | | Nuclear power % | |
| | 1980 | 1999 | 1980 | 1999 | 1980 | 1999 | 1980 | 1999 | 1980 | 1999 | 1980 | 1999 |
| Afghanistan | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Albania | 3.7 | 5.4 | 79.4 | 97.1 | .. | .. | 20.6 | 2.9 | .. | .. | .. | .. |
| Algeria | 7.1 | 24.6 | 3.6 | 2.9 | .. | .. | 12.2 | 2.8 | 84.1 | 94.3 | .. | .. |
| Angola | 0.7 | 1.3 | 88.1 | 67.0 | .. | .. | 11.9 | 33.0 | .. | .. | .. | .. |
| Argentina | 39.7 | 80.7 | 38.1 | 26.8 | 2.1 | 2.2 | 31.6 | 4.9 | 22.0 | 57.0 | 5.9 | 8.8 |
| Armenia | 13.0 | 5.7 | 12.0 | 21.0 | .. | .. | 54.8 | *0.3* | .. | 42.7 | 33.2 | 36.3 |
| Australia | 95.2 | 203.0 | 13.6 | 8.2 | 73.3 | 78.1 | 5.4 | 1.3 | 7.3 | 10.6 | .. | .. |
| Austria | 41.6 | 59.2 | 69.1 | 68.4 | 7.0 | 9.1 | 14.0 | 4.7 | 9.2 | 14.7 | .. | .. |
| Azerbaijan | 15.0 | 18.2 | 7.3 | 8.3 | .. | .. | 92.7 | 72.0 | .. | 19.8 | .. | .. |
| Bangladesh | 2.4 | 14.4 | 24.8 | 5.8 | .. | .. | 26.6 | 9.3 | 48.6 | 85.0 | .. | .. |
| Belarus | 34.1 | 26.5 | 0.1 | 0.1 | .. | .. | 99.9 | 9.6 | .. | 90.0 | .. | .. |
| Belgium | 53.1 | 83.4 | 0.5 | 0.4 | 29.4 | 15.0 | 34.7 | 1.2 | 11.2 | 23.1 | 23.6 | 58.8 |
| Benin | 0.0 | 0.0 | .. | 4.3 | .. | .. | 100.0 | 95.7 | .. | .. | .. | .. |
| Bolivia | 1.6 | 3.9 | 68.2 | 46.0 | .. | .. | 10.3 | 3.4 | 20.0 | 49.1 | .. | .. |
| Bosnia and Herzegovina | .. | 2.6 | .. | 61.2 | .. | 33.7 | .. | 5.1 | .. | .. | .. | .. |
| Botswana | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Brazil | 139.4 | 332.3 | 92.5 | 88.1 | 2.4 | 2.9 | 3.8 | 5.0 | .. | 0.2 | .. | 1.2 |
| Bulgaria | 34.8 | 38.0 | 10.7 | 7.2 | 49.2 | 43.4 | 22.5 | 2.4 | .. | 5.3 | 17.7 | 41.6 |
| Burkina Faso | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Burundi | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Cambodia | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Cameroon | 1.5 | 3.4 | 93.9 | 98.8 | .. | .. | 6.1 | 1.2 | .. | .. | .. | .. |
| Canada | 373.3 | 577.0 | 67.3 | 59.9 | 16.0 | 19.0 | 3.7 | 2.6 | 2.5 | 4.5 | 10.2 | 12.7 |
| Central African Republic | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Chad | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Chile | 11.8 | 38.4 | 67.0 | 37.0 | 16.1 | 35.9 | 14.7 | 9.1 | 1.3 | 15.3 | .. | .. |
| China | 300.6 | 1239.3 | 19.4 | 16.4 | 54.6 | 77.8 | 25.8 | 4.0 | 0.2 | 0.4 | .. | 1.2 |
| Hong Kong, China | 12.6 | 29.5 | .. | .. | *22.6* | 56.2 | 100.0 | 0.9 | .. | 42.9 | .. | .. |
| Colombia | 20.4 | 44.1 | 70.0 | 76.4 | 7.9 | 7.9 | 1.8 | 0.3 | 19.3 | 14.2 | .. | .. |
| Congo, Dem. Rep. | 4.4 | 5.7 | 95.5 | 99.6 | .. | .. | 4.5 | 0.4 | .. | .. | .. | .. |
| Congo, Rep. | 0.2 | 0.1 | 64.5 | 97.9 | .. | .. | 35.5 | 2.1 | .. | .. | .. | .. |
| Costa Rica | 2.2 | 6.2 | 95.2 | 83.0 | .. | .. | 4.3 | 2.2 | .. | .. | .. | .. |
| Côte d'Ivoire | 1.7 | 4.9 | 77.3 | 24.1 | .. | .. | 22.7 | 10.3 | .. | 65.6 | .. | .. |
| Croatia | .. | 12.2 | .. | 53.8 | .. | 4.2 | .. | 32.3 | .. | 9.6 | .. | .. |
| Cuba | 9.9 | 14.5 | 1.0 | 0.7 | .. | .. | 89.7 | 93.6 | .. | 0.4 | .. | .. |
| Czech Republic | 52.7 | 64.2 | 4.6 | 2.6 | 84.8 | 69.9 | 9.6 | 0.7 | 1.1 | 4.7 | .. | 20.8 |
| Denmark | 26.8 | 38.9 | 0.1 | 0.1 | 81.8 | 51.6 | 18.0 | 12.5 | .. | 23.5 | .. | .. |
| Dominican Republic | 3.3 | 7.7 | 17.1 | 14.3 | .. | 8.2 | 80.5 | 77.2 | .. | .. | .. | .. |
| Ecuador | 3.4 | 10.3 | 25.9 | 69.7 | .. | .. | 74.1 | 30.3 | .. | .. | .. | .. |
| Egypt, Arab Rep. | 18.9 | 68.5 | 51.8 | 22.3 | .. | .. | 27.7 | 28.6 | 20.5 | 49.1 | .. | .. |
| El Salvador | 1.5 | 3.8 | 63.7 | 46.6 | .. | .. | 2.7 | 37.0 | .. | .. | .. | .. |
| Eritrea | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Estonia | 18.9 | 8.3 | .. | 0.0 | .. | 92.6 | 100.0 | 3.5 | .. | 3.7 | .. | .. |
| Ethiopia | 0.7 | 1.7 | 70.2 | 97.3 | .. | .. | 29.8 | 1.2 | .. | .. | .. | .. |
| Finland | 40.7 | 69.4 | 25.1 | 18.4 | 42.6 | 20.9 | 10.8 | 1.3 | 4.2 | 13.7 | 17.2 | 33.1 |
| France | 256.9 | 519.8 | 26.9 | 13.9 | 27.2 | 6.2 | 18.9 | 2.0 | 2.7 | 1.4 | 23.8 | 75.8 |
| Gabon | 0.5 | 1.0 | 49.1 | 71.3 | .. | .. | 50.9 | 17.8 | .. | 10.9 | .. | .. |
| Gambia, The | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Georgia | 14.7 | 8.0 | 43.8 | 80.1 | .. | .. | 56.2 | 2.5 | .. | 17.4 | .. | .. |
| Germany | 466.3 | 551.3 | 4.1 | 3.5 | 62.9 | 51.9 | 5.7 | 1.1 | 14.2 | 10.0 | 11.9 | 30.8 |
| Ghana | 5.3 | 5.2 | 99.2 | 76.4 | .. | .. | 0.8 | 23.6 | .. | .. | .. | .. |
| Greece | 22.7 | 49.4 | 15.0 | 9.3 | 44.8 | 65.6 | 40.1 | 16.5 | .. | 7.9 | .. | .. |
| Guatemala | 1.8 | 5.2 | 12.9 | 51.3 | .. | .. | 82.9 | 43.3 | .. | .. | .. | .. |
| Guinea | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Guinea-Bissau | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Haiti | 0.3 | 0.7 | 70.1 | 38.4 | .. | .. | 26.1 | 61.6 | .. | .. | .. | .. |
| Honduras | 0.9 | 3.4 | 86.3 | 62.6 | .. | .. | 13.7 | 32.3 | .. | .. | .. | .. |

| | Electricity production | | Sources of electricty | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | billion kwh | | Hydropower % | | Coal % | | Oil % | | Gas % | | Nuclear power % | |
| | 1980 | 1999 | 1980 | 1999 | 1980 | 1999 | 1980 | 1999 | 1980 | 1999 | 1980 | 1999 |
| Hungary | 23.9 | 37.2 | 0.5 | 0.5 | 50.4 | 25.9 | 13.9 | 14.3 | 35.2 | 21.1 | .. | 37.9 |
| India | 119.3 | 527.3 | 39.0 | 15.4 | 51.2 | 75.2 | 6.4 | 1.1 | 0.8 | 5.5 | 2.5 | 2.5 |
| Indonesia | 8.4 | 84.3 | 16.0 | 11.1 | .. | 30.1 | 84.0 | 19.0 | .. | 36.5 | .. | .. |
| Iran, Islamic Rep. | 22.4 | 112.7 | 25.1 | 4.4 | .. | .. | 50.1 | 19.0 | 24.8 | 76.5 | .. | .. |
| Iraq | 11.4 | 29.7 | 6.1 | 2.0 | .. | .. | 93.9 | 98.0 | .. | .. | .. | .. |
| Ireland | 10.6 | 21.8 | 7.9 | 3.9 | 16.4 | 34.5 | 60.4 | 28.3 | 15.2 | 31.9 | .. | .. |
| Israel | 12.4 | 39.2 | *0.0* | 0.1 | *18.1* | 67.3 | 100.0 | 32.6 | .. | 0.1 | .. | .. |
| Italy | 183.5 | 259.2 | 24.7 | 17.5 | 9.9 | 10.9 | 57.0 | 35.2 | 5.0 | 33.6 | 1.2 | .. |
| Jamaica | 1.7 | 6.6 | 7.2 | 1.8 | .. | .. | 76.0 | 90.4 | .. | .. | .. | .. |
| Japan | 572.5 | 1057.0 | 15.4 | 8.2 | 9.6 | 21.2 | 46.2 | 16.6 | 14.2 | 22.1 | 14.4 | 30.0 |
| Jordan | 1.1 | 7.1 | .. | 0.2 | .. | .. | 100.0 | 89.4 | .. | 10.4 | .. | .. |
| Kazakhstan | 61.5 | 47.5 | 9.3 | 12.9 | .. | 72.0 | 90.7 | 6.4 | .. | 8.7 | .. | .. |
| Kenya | 1.5 | 4.5 | 71.1 | 72.4 | .. | .. | 28.9 | 19.0 | .. | .. | .. | .. |
| Korea, Dem. Rep. | 35.0 | 32.6 | 64.3 | 64.7 | 35.7 | 35.3 | .. | .. | .. | .. | .. | .. |
| Korea, Rep. | 37.2 | 265.0 | 5.3 | 1.6 | 6.7 | 41.1 | 78.7 | 7.0 | .. | 11.4 | 9.3 | 38.9 |
| Kuwait | 9.0 | 31.6 | .. | .. | .. | .. | 20.1 | 77.3 | 79.9 | 22.7 | .. | .. |
| Kyrgyz Republic | 9.2 | 13.2 | 53.1 | 92.3 | .. | 3.9 | 46.9 | .. | .. | 3.9 | .. | .. |
| Lao PDR | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Latvia | 4.7 | 4.1 | 64.9 | 67.1 | .. | 0.9 | 35.1 | 8.7 | .. | 23.2 | .. | .. |
| Lebanon | 2.8 | 8.2 | 30.9 | 4.1 | .. | .. | 69.1 | 95.9 | .. | .. | .. | .. |
| Lesotho | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Liberia | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Libya | 4.8 | 20.0 | .. | .. | .. | .. | 100.0 | 100.0 | .. | .. | .. | .. |
| Lithuania | 11.7 | 13.1 | 4.0 | 3.2 | .. | .. | 96.0 | 13.8 | .. | 7.7 | .. | 75.4 |
| Macedonia, FYR | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Madagascar | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Malawi | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Malaysia | 10.0 | 65.2 | 13.9 | 11.5 | .. | 2.5 | 84.9 | 8.3 | 1.2 | 77.6 | .. | .. |
| Mali | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Mauritania | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Mauritius | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Mexico | 67.0 | 192.3 | 25.2 | 17.1 | *0.0* | 9.4 | 57.9 | 47.2 | 15.5 | 17.9 | .. | 5.2 |
| Moldova | 15.4 | 3.8 | 2.6 | 2.2 | .. | 5.5 | 97.4 | 9.6 | .. | 82.7 | .. | .. |
| Mongolia | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Morocco | 5.2 | 13.9 | 28.9 | 5.9 | 19.5 | 49.7 | 51.6 | 44.4 | .. | .. | .. | .. |
| Mozambique | 0.5 | 6.9 | 65.2 | 99.6 | 17.5 | .. | 17.3 | 0.4 | .. | 0.0 | .. | .. |
| Myanmar | 1.5 | 4.8 | 53.5 | 15.9 | 2.0 | .. | 31.3 | 16.1 | 13.2 | 68.0 | .. | .. |
| Namibia | .. | 1.2 | .. | 97.6 | .. | .. | .. | 2.4 | .. | .. | .. | .. |
| Nepal | 0.2 | 1.3 | 94.4 | 90.4 | .. | .. | 5.6 | 9.6 | .. | .. | .. | .. |
| Netherlands | 64.8 | 86.7 | .. | 0.1 | 13.7 | 25.5 | 38.4 | 7.6 | 39.8 | 56.9 | 6.5 | 4.4 |
| New Zealand | 22.6 | 38.1 | 83.6 | 61.7 | 1.9 | 4.8 | 0.2 | .. | 7.5 | 25.1 | .. | .. |
| Nicaragua | 1.1 | 2.1 | 51.3 | 18.3 | .. | .. | 43.3 | 76.2 | .. | .. | .. | .. |
| Niger | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Nigeria | 7.1 | 16.1 | 39.0 | 35.0 | 0.4 | .. | 45.1 | 24.2 | 15.5 | 40.8 | .. | .. |
| Norway | 83.8 | 121.7 | 99.8 | 99.3 | 0.0 | 0.2 | 0.1 | 0.0 | .. | 0.2 | .. | .. |
| Oman | 0.8 | 8.4 | .. | .. | .. | .. | 21.5 | 16.7 | 78.5 | 83.3 | .. | .. |
| Pakistan | 15.0 | 65.4 | 58.2 | 34.3 | 0.2 | 0.8 | 1.1 | 35.2 | 40.5 | 29.3 | 0.0 | 0.4 |
| Panama | 2.0 | 4.6 | 49.2 | 60.7 | .. | .. | 49.0 | 37.8 | .. | .. | .. | .. |
| Papua New Guinea | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Paraguay | 0.8 | 52.0 | 80.0 | 99.9 | .. | .. | 11.1 | 0.0 | .. | .. | .. | .. |
| Peru | 10.0 | 19.1 | 69.8 | 76.3 | .. | .. | 27.4 | 17.6 | 1.7 | 5.3 | .. | .. |
| Philippines | 18.0 | 41.3 | 19.6 | 19.0 | 1.0 | 27.1 | 67.9 | 28.3 | .. | 0.0 | .. | .. |
| Poland | 120.9 | 142.0 | 1.9 | 1.5 | 94.7 | 96.3 | 2.9 | 1.3 | 0.1 | 0.5 | .. | .. |
| Portugal | 15.2 | 42.9 | 52.7 | 16.9 | 2.3 | 35.2 | 42.9 | 25.6 | .. | 18.8 | .. | .. |
| Puerto Rico | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Romania | 67.5 | 50.7 | 18.7 | 36.1 | 31.4 | 29.4 | 9.6 | 7.6 | 40.2 | 16.6 | .. | 10.2 |
| Russian Federation | 804.9 | 845.3 | 16.1 | 19.0 | .. | 19.1 | 77.2 | 4.8 | .. | 42.4 | 6.7 | 14.4 |

# 3.9 Sources of electricity

| | Electricity production | | Sources of electricity | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Hydropower | | Coal | | Oil | | Gas | | Nuclear power | |
| | billion kwh | | % | | % | | % | | % | | % | |
| | 1980 | 1999 | 1980 | 1999 | 1980 | 1999 | 1980 | 1999 | 1980 | 1999 | 1980 | 1999 |
| Rwanda | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Saudi Arabia | 20.5 | 120.0 | .. | .. | .. | .. | 58.5 | 64.3 | 41.5 | 35.7 | .. | .. |
| Senegal | 0.6 | 1.4 | .. | .. | .. | .. | 100.0 | 98.5 | .. | 1.5 | .. | .. |
| Sierra Leone | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Singapore | 7.0 | 29.4 | .. | .. | .. | .. | 100.0 | 77.8 | .. | 19.7 | .. | .. |
| Slovak Republic | 20.0 | 27.5 | 11.3 | 16.5 | 37.9 | 23.4 | 17.9 | 1.2 | 10.2 | 11.2 | 22.7 | 47.7 |
| Slovenia | .. | 13.3 | .. | 28.2 | .. | 33.8 | .. | 1.1 | .. | 1.3 | .. | 35.4 |
| Somalia | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| South Africa | 99.0 | 200.4 | 1.0 | 0.4 | 99.0 | 93.2 | 0.0 | .. | .. | .. | .. | 6.4 |
| Spain | 109.2 | 206.3 | 27.1 | 11.1 | 30.0 | 36.6 | 35.2 | 11.8 | 2.7 | 9.2 | 4.7 | 28.5 |
| Sri Lanka | 1.7 | 6.2 | 88.7 | 67.5 | .. | .. | 11.3 | 32.5 | .. | .. | .. | .. |
| Sudan | 0.8 | 2.1 | 70.0 | 53.1 | .. | .. | 30.0 | 46.9 | .. | .. | .. | .. |
| Swaziland | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Sweden | 96.3 | 155.2 | 61.1 | 46.1 | 0.2 | 2.1 | 10.4 | 1.9 | .. | 0.3 | 27.5 | 47.2 |
| Switzerland | 48.2 | 68.5 | 68.1 | 58.4 | 0.1 | .. | 1.0 | 0.2 | 0.6 | 1.5 | 29.8 | 37.7 |
| Syrian Arab Republic | 4.0 | 21.1 | 64.7 | 41.1 | .. | .. | 31.9 | 23.8 | 3.4 | 35.1 | .. | .. |
| Tajikistan | 13.6 | 15.8 | 93.4 | 97.7 | .. | .. | 6.6 | .. | .. | 2.3 | .. | .. |
| Tanzania | 0.8 | 2.3 | 86.4 | 96.5 | .. | .. | 13.6 | 3.5 | .. | .. | .. | .. |
| Thailand | 14.4 | 90.1 | 8.8 | 3.6 | 9.8 | 18.3 | 81.4 | 17.8 | *9.9* | 59.2 | .. | .. |
| Togo | 0.0 | 0.1 | 13.3 | 3.1 | .. | .. | 86.7 | 96.9 | .. | .. | .. | .. |
| Trinidad and Tobago | 2.0 | 5.3 | .. | .. | .. | .. | 2.3 | .. | 96.5 | 99.6 | .. | .. |
| Tunisia | 2.9 | 10.0 | 0.8 | 0.9 | .. | .. | 64.5 | 13.5 | 34.7 | 85.5 | .. | .. |
| Turkey | 23.3 | 116.4 | 48.8 | 29.8 | 25.6 | 31.8 | 25.1 | 6.9 | .. | 31.2 | .. | .. |
| Turkmenistan | 6.7 | 8.9 | 0.1 | 0.1 | .. | .. | 99.9 | .. | .. | 99.9 | .. | .. |
| Uganda | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Ukraine | 236.0 | 172.1 | 5.7 | 6.8 | .. | 29.5 | 88.3 | 4.6 | .. | 17.3 | 6.0 | 41.9 |
| United Arab Emirates | 6.3 | 37.1 | .. | .. | .. | .. | 3.7 | 7.9 | 96.3 | 92.1 | .. | .. |
| United Kingdom | 284.1 | 363.9 | 1.4 | 1.5 | 73.2 | 29.3 | 11.7 | 1.5 | 0.7 | 38.8 | 13.0 | 26.5 |
| United States | 2427.3 | 3910.2 | 11.5 | 7.4 | 51.2 | 51.8 | 10.8 | 3.1 | 15.3 | 15.7 | 11.0 | 19.9 |
| Uruguay | 4.6 | 7.2 | 76.3 | 76.5 | .. | .. | 23.5 | 23.0 | .. | .. | .. | .. |
| Uzbekistan | 33.9 | 45.3 | 14.6 | 12.5 | .. | 4.8 | 85.4 | 11.4 | .. | 71.3 | .. | .. |
| Venezuela, RB | 35.8 | 80.6 | 40.7 | 75.1 | .. | .. | 32.4 | 7.1 | 26.9 | 17.8 | .. | .. |
| Vietnam | 3.6 | 23.6 | 41.8 | 58.5 | 39.9 | 12.4 | 18.3 | 13.9 | *0.4* | 15.3 | .. | .. |
| West Bank and Gaza | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Yemen, Rep. | 0.5 | 3.0 | .. | .. | .. | .. | 100.0 | 100.0 | .. | .. | .. | .. |
| Yugoslavia, Fed. Rep. | .. | 33.4 | .. | 40.1 | .. | 53.8 | .. | 3.2 | .. | 2.9 | .. | .. |
| Zambia | 9.5 | 8.1 | 98.8 | 99.5 | 0.7 | 0.5 | 0.5 | 0.0 | .. | .. | .. | .. |
| Zimbabwe | 4.5 | 7.1 | 88.3 | 41.6 | 11.7 | 58.4 | .. | .. | .. | .. | .. | .. |
| **World** | **8205.6 s** | **14732.8 s** | **20.6 w** | **17.5 w** | **33.0 w** | **38.2 w** | **28.4 w** | **8.4 w** | **8.8 w** | **17.2 w** | **8.7 w** | **17.2 w** |
| **Low income** | 577.8 | 1112.4 | 27.8 | 22.7 | 13.1 | 44.5 | 53.7 | 8.2 | 1.6 | 16.3 | 3.7 | 7.9 |
| **Middle income** | 2233.8 | 4759.2 | 21.6 | 22.7 | 22.3 | 38.5 | 48.0 | 11.2 | 4.6 | 19.6 | 3.2 | 7.3 |
| Lower middle income | 1492.5 | 2911.7 | 18.1 | 19.9 | 13.8 | 42.9 | 60.5 | 8.9 | 3.3 | 21.9 | 4.0 | 5.8 |
| Upper middle income | 741.3 | 1847.5 | 28.9 | 27.0 | 39.3 | 31.5 | 22.8 | 14.9 | 7.1 | 16.0 | 1.4 | 9.6 |
| **Low & middle income** | 2811.7 | 5871.6 | 22.9 | 22.7 | 20.4 | 39.6 | 49.2 | 10.7 | 4.0 | 19.0 | 3.3 | 7.4 |
| East Asia & Pacific | 428.8 | 1846.1 | 21.6 | 14.7 | 42.5 | 61.9 | 34.4 | 6.5 | 0.2 | 9.6 | 0.8 | 6.4 |
| Europe & Central Asia | 1640.1 | 1763.4 | 13.5 | 17.9 | 13.6 | 30.6 | 65.4 | 5.8 | 2.3 | 30.3 | 5.1 | 15.2 |
| Latin America & Carib. | 360.9 | 921.0 | 60.2 | 60.1 | 2.1 | 5.2 | 25.7 | 17.7 | 9.8 | 12.6 | 0.6 | 2.3 |
| Middle East & N. Africa | 104.0 | 453.1 | 20.5 | 7.0 | 1.0 | 1.5 | 52.2 | 44.0 | 26.3 | 47.6 | .. | .. |
| South Asia | 138.5 | 614.6 | 41.6 | 17.9 | 44.1 | 64.6 | 6.3 | 5.3 | 5.9 | 9.9 | 2.2 | 2.2 |
| Sub-Saharan Africa | 139.3 | 273.4 | 24.0 | 18.1 | 70.8 | 69.9 | 4.4 | 3.6 | 0.8 | 3.6 | .. | 4.7 |
| **High income** | 5393.9 | 8861.2 | 19.5 | 14.0 | 39.6 | 37.2 | 17.6 | 6.8 | 11.3 | 16.0 | 11.5 | 23.8 |
| Europe EMU | 1265.5 | 1949.8 | 17.0 | 11.6 | 37.3 | 27.2 | 23.2 | 8.6 | 9.8 | 14.1 | 11.7 | 35.8 |

## About the data

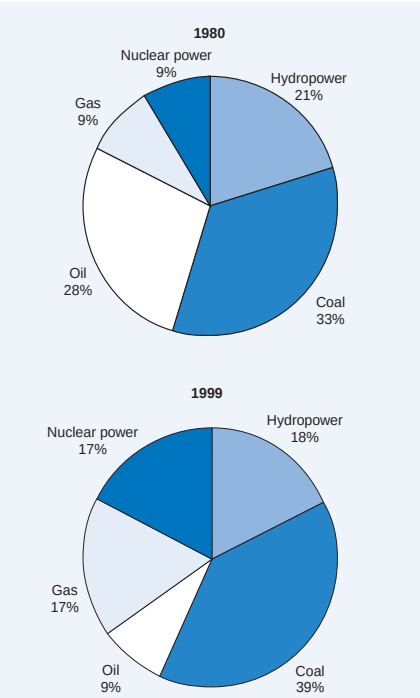
Use of energy in general, and access to electricity in particular, are important in improving people's standard of living. But electricity generation also can damage the environment. Whether such damage occurs depends largely on how electricity is generated. For example, burning coal releases twice as 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 geothermal, solar, and wind) are not shown.

The International Energy Agency (IEA) compiles data on energy inputs used to generate electricity. IEA data for non-OECD countries 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.

### Figure 3.9a

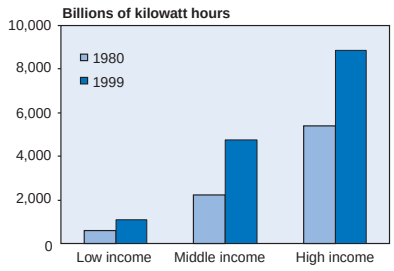
**There was a significant shift in the sources of electricity from 1980 to 1999**




*Source:* Table 3.9.

### Figure 3.9b

**High-income economies—with 15 percent of the world's population—generate eight times as much electricity as low-income economies**




*Source:* Table 3.9.

## 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. • **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.

## 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.*

# 3.10 | Urbanization

| | 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 | 2000 | 1980 | 2000 | 1980 | 2000 | 2015 | 1980 | 2000 | 1990 | 2000 | 1990 | 2000 |
| Afghanistan | 2.5 | 5.8 | 16 | 22 | 6 | 10 | 14 | 39 | 45 | .. | 25 | .. | 8 |
| Albania | 0.9 | 1.3 | 34 | 39 | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Algeria | 8.1 | 18.3 | 44 | 60 | 8 | 6 | 7 | 17 | 10 | .. | 90 | .. | 47 |
| Angola | 1.5 | 4.5 | 21 | 34 | 13 | 20 | 25 | 63 | 60 | .. | 70 | .. | 30 |
| Argentina | 23.3 | 33.1 | 83 | 89 | 42 | 41 | 40 | 43 | 38 | .. | 89 | .. | 48 |
| Armenia | 2.0 | 2.7 | 66 | 70 | 34 | 34 | 35 | 51 | 48 | .. | .. | .. | .. |
| Australia | 12.6 | 16.2 | 86 | 85 | 61 | 56 | 55 | 26 | 23 | 100 | 100 | 100 | 100 |
| Austria | 4.9 | 5.2 | 65 | 65 | 27 | 26 | 26 | 42 | 39 | 100 | 100 | 100 | 100 |
| Azerbaijan | 3.3 | 4.6 | 53 | 57 | 26 | 24 | 25 | 48 | 42 | .. | .. | .. | .. |
| Bangladesh | 12.3 | 32.1 | 14 | 25 | 6 | 13 | 17 | 26 | 38 | 78 | 82 | 27 | 44 |
| Belarus | 5.4 | 7.0 | 57 | 70 | 14 | 18 | 20 | 24 | 25 | .. | .. | .. | .. |
| Belgium | 9.4 | 10.0 | 95 | 97 | 12 | 11 | 11 | 13 | 11 | .. | .. | .. | .. |
| Benin | 0.9 | 2.7 | 27 | 42 | .. | .. | .. | .. | .. | 46 | 46 | 6 | 6 |
| Bolivia | 2.4 | 5.4 | 46 | 65 | 14 | 18 | 20 | 30 | 27 | 77 | 82 | 28 | 38 |
| Bosnia and Herzegovina | 1.5 | 1.7 | 36 | 43 | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Botswana | 0.1 | 0.8 | 15 | 50 | .. | .. | .. | .. | .. | 84 | .. | 44 | .. |
| Brazil | 80.5 | 138.5 | 66 | 81 | 32 | 34 | 34 | 16 | 13 | 84 | 85 | 37 | 40 |
| Bulgaria | 5.4 | 5.7 | 61 | 70 | 12 | 15 | 16 | 20 | 21 | .. | .. | .. | .. |
| Burkina Faso | 0.6 | 2.1 | 9 | 19 | .. | .. | .. | 44 | 54 | 88 | 88 | 14 | 16 |
| Burundi | 0.2 | 0.6 | 4 | 9 | .. | .. | .. | .. | .. | 67 | 79 | 90 | .. |
| Cambodia | 0.8 | 1.9 | 12 | 16 | .. | .. | .. | 44 | 51 | .. | 58 | .. | 10 |
| Cameroon | 2.7 | 7.3 | 31 | 49 | 11 | 21 | 27 | 19 | 23 | 99 | 99 | 79 | 85 |
| Canada | 18.6 | 23.7 | 76 | 77 | 32 | 37 | 38 | 16 | 20 | 100 | 100 | 99 | 99 |
| Central African Republic | 0.8 | 1.5 | 35 | 41 | .. | .. | .. | .. | .. | 43 | 43 | 23 | 23 |
| Chad | 0.8 | 1.8 | 19 | 24 | .. | .. | .. | 40 | 57 | 70 | 81 | 4 | 13 |
| Chile | 9.0 | 12.9 | 81 | 85 | 33 | 36 | 37 | 41 | 43 | 98 | 98 | 93 | 93 |
| China | 192.3 | 405.2 | 20 | 32 | 13 | 14 | 17 | 6 | 3 | 57 | 68 | 18 | 24 |
| Hong Kong, China | 4.6 | 6.8 | 92 | 100 | 91 | 100 | 100 | 100 | 100 | .. | .. | .. | .. |
| Colombia | 18.2 | 31.7 | 64 | 75 | 26 | 32 | 35 | 20 | 20 | 95 | 97 | 53 | 51 |
| Congo, Dem. Rep. | 7.7 | 15.4 | 29 | 30 | 8 | 10 | 12 | 28 | 33 | .. | 53 | .. | 6 |
| Congo, Rep. | 0.7 | 1.9 | 41 | 63 | 27 | 41 | 43 | 65 | 65 | .. | 14 | .. | .. |
| Costa Rica | 1.0 | 2.0 | 43 | 52 | .. | .. | .. | 61 | 50 | .. | 98 | .. | 96 |
| Côte d'Ivoire | 2.8 | 7.4 | 35 | 46 | 15 | 21 | 25 | 44 | 44 | 78 | .. | 30 | .. |
| Croatia | 2.3 | 2.5 | 50 | 58 | .. | .. | .. | 28 | 42 | .. | .. | .. | .. |
| Cuba | 6.6 | 8.4 | 68 | 75 | 20 | 20 | 20 | 29 | 27 | .. | 96 | .. | 91 |
| Czech Republic | 7.6 | 7.7 | 75 | 75 | 12 | 12 | 12 | 15 | 16 | .. | .. | .. | .. |
| Denmark | 4.3 | 4.5 | 84 | 85 | 27 | 26 | 26 | 32 | 31 | .. | .. | .. | .. |
| Dominican Republic | 2.9 | 5.4 | 51 | 65 | 34 | 61 | 67 | 50 | 66 | 66 | 75 | 52 | 64 |
| Ecuador | 3.7 | 7.9 | 47 | 62 | 23 | 32 | 37 | 29 | 29 | .. | 70 | .. | 37 |
| Egypt, Arab Rep. | 17.9 | 28.9 | 44 | 45 | 23 | 23 | 24 | 38 | 36 | 96 | 98 | 80 | 91 |
| El Salvador | 1.9 | 2.9 | 42 | 47 | 16 | 22 | 25 | 39 | 48 | .. | 88 | .. | 78 |
| Eritrea | 0.3 | 0.8 | 14 | 19 | .. | .. | .. | .. | .. | .. | 66 | .. | 1 |
| Estonia | 1.0 | 0.9 | 70 | 69 | .. | .. | .. | .. | .. | .. | 93 | .. | .. |
| Ethiopia | 4.0 | 11.3 | 11 | 18 | 3 | 4 | 6 | 30 | 23 | 58 | 58 | 6 | 6 |
| Finland | 2.9 | 3.5 | 60 | 67 | 13 | 23 | 25 | 22 | 33 | 100 | 100 | 100 | 100 |
| France | 39.5 | 44.5 | 73 | 76 | 21 | 21 | 20 | 23 | 22 | .. | .. | .. | .. |
| Gabon | 0.3 | 1.0 | 50 | 81 | .. | .. | .. | .. | .. | .. | 25 | .. | 4 |
| Gambia, The | 0.1 | 0.4 | 20 | 33 | .. | .. | .. | .. | .. | .. | 41 | .. | 35 |
| Georgia | 2.6 | 3.0 | 52 | 61 | 22 | 26 | 29 | 42 | 43 | .. | .. | .. | .. |
| Germany | 64.7 | 71.9 | 83 | 88 | 39 | 41 | 43 | 10 | 9 | .. | .. | .. | .. |
| Ghana | 3.4 | 7.4 | 31 | 38 | 9 | 10 | 14 | 30 | 27 | 59 | 62 | 61 | 64 |
| Greece | 5.6 | 6.3 | 58 | 60 | 31 | 30 | 30 | 54 | 49 | .. | .. | .. | .. |
| Guatemala | 2.6 | 4.6 | 37 | 40 | 11 | 28 | 32 | 29 | 70 | 94 | 98 | 66 | 76 |
| Guinea | 0.9 | 2.4 | 19 | 33 | 12 | 25 | 32 | 65 | 75 | 94 | 94 | 41 | 41 |
| Guinea-Bissau | 0.1 | 0.3 | 17 | 24 | .. | .. | .. | .. | .. | .. | 88 | .. | 34 |
| Haiti | 1.3 | 2.8 | 24 | 36 | 13 | 22 | 28 | 55 | 62 | 48 | 50 | 15 | 16 |
| Honduras | 1.2 | 3.0 | 35 | 47 | .. | .. | .. | 33 | 32 | 85 | 94 | .. | 57 |

| | 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 | 2000 | 1980 | 2000 | 1980 | 2000 | 2015 | 1980 | 2000 | 1990 | 2000 | 1990 | 2000 |
| Hungary | 6.1 | 6.4 | 57 | 64 | 19 | 18 | 19 | 34 | 28 | 100 | 100 | 98 | 98 |
| India | 158.8 | 288.5 | 23 | 28 | 8 | 10 | 12 | 5 | 6 | 58 | 73 | 8 | 14 |
| Indonesia | 32.9 | 86.1 | 22 | 41 | 8 | 10 | 12 | 18 | 13 | 76 | 87 | 44 | 52 |
| Iran, Islamic Rep. | 19.4 | 39.2 | 50 | 62 | 21 | 23 | 24 | 26 | 18 | 86 | 86 | 74 | 74 |
| Iraq | 8.5 | 17.9 | 66 | 77 | 29 | 31 | 34 | 39 | 27 | .. | 93 | .. | 31 |
| Ireland | 1.9 | 2.2 | 55 | 59 | .. | .. | .. | 48 | 44 | .. | .. | .. | .. |
| Israel | 3.4 | 5.7 | 89 | 91 | 37 | 35 | 33 | 41 | 38 | .. | .. | .. | .. |
| Italy | 37.6 | 38.7 | 67 | 67 | 24 | 19 | 21 | 14 | 11 | .. | .. | .. | .. |
| Jamaica | 1.0 | 1.5 | 47 | 56 | .. | .. | .. | .. | .. | .. | 98 | .. | 65 |
| Japan | 89.0 | 100.0 | 76 | 79 | 34 | 38 | 39 | 25 | 26 | .. | .. | .. | .. |
| Jordan | 1.3 | 3.6 | 60 | 74 | 29 | 29 | 32 | 49 | 39 | 100 | 100 | 95 | 98 |
| Kazakhstan | 8.0 | 8.4 | 54 | 56 | 6 | 8 | 8 | 12 | 15 | .. | 100 | .. | 98 |
| Kenya | 2.7 | 10.0 | 16 | 33 | 5 | 8 | 10 | 32 | 23 | 94 | 96 | 81 | 81 |
| Korea, Dem. Rep. | 9.8 | 13.4 | 57 | 60 | 11 | 14 | 16 | 19 | 24 | .. | .. | .. | .. |
| Korea, Rep. | 21.7 | 38.7 | 57 | 82 | 40 | 47 | 45 | 38 | 26 | .. | 76 | .. | .. |
| Kuwait | 1.2 | 1.9 | 90 | 98 | 60 | 60 | 55 | 67 | 61 | .. | .. | .. | .. |
| Kyrgyz Republic | 1.4 | 1.6 | 38 | 33 | .. | .. | .. | .. | .. | .. | 100 | .. | 100 |
| Lao PDR | 0.4 | 1.2 | 13 | 24 | .. | .. | .. | .. | .. | .. | 84 | .. | 34 |
| Latvia | 1.7 | 1.6 | 68 | 69 | .. | .. | .. | 49 | 47 | .. | .. | .. | .. |
| Lebanon | 2.2 | 3.9 | 74 | 90 | 40 | 47 | 48 | 55 | 53 | .. | 100 | .. | 87 |
| Lesotho | 0.2 | 0.6 | 13 | 28 | .. | .. | .. | .. | .. | .. | 93 | .. | 92 |
| Liberia | 0.7 | 1.4 | 35 | 45 | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Libya | 2.1 | 4.6 | 69 | 88 | 26 | 34 | 34 | 38 | 39 | 97 | 97 | 96 | 96 |
| Lithuania | 2.1 | 2.5 | 61 | 68 | .. | .. | .. | .. | 23 | .. | .. | .. | .. |
| Macedonia, FYR | 1.0 | 1.3 | 54 | 62 | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Madagascar | 1.6 | 4.6 | 18 | 30 | 6 | 10 | 13 | 33 | 33 | 70 | 70 | 25 | 30 |
| Malawi | 0.6 | 1.6 | 9 | 15 | .. | .. | .. | .. | .. | 96 | 96 | 70 | 70 |
| Malaysia | 5.8 | 13.4 | 42 | 57 | 7 | 6 | 6 | 16 | 10 | .. | .. | .. | 98 |
| Mali | 1.2 | 3.3 | 19 | 30 | .. | .. | .. | 40 | 35 | 95 | 93 | 62 | 58 |
| Mauritania | 0.4 | 1.5 | 27 | 58 | .. | .. | .. | .. | .. | 44 | 44 | 19 | 19 |
| Mauritius | 0.4 | 0.5 | 42 | 41 | .. | .. | .. | .. | .. | 100 | 100 | 100 | 99 |
| Mexico | 44.8 | 72.9 | 66 | 74 | 28 | 28 | 25 | 31 | 25 | 85 | 87 | 28 | 32 |
| Moldova | 1.6 | 2.0 | 40 | 46 | .. | .. | .. | .. | .. | .. | 100 | .. | .. |
| Mongolia | 0.9 | 1.4 | 52 | 59 | .. | .. | .. | .. | .. | .. | 46 | .. | 2 |
| Morocco | 8.0 | 16.1 | 41 | 56 | 15 | 18 | 20 | 26 | 22 | 95 | 100 | 31 | 42 |
| Mozambique | 1.6 | 7.1 | 13 | 40 | 6 | 17 | 21 | 47 | 43 | .. | 69 | .. | 26 |
| Myanmar | 8.1 | 13.2 | 24 | 28 | 7 | 9 | 11 | 27 | 32 | 65 | 65 | 38 | 39 |
| Namibia | 0.2 | 0.5 | 23 | 31 | .. | .. | .. | .. | .. | 84 | 96 | 14 | 17 |
| Nepal | 0.9 | 2.7 | 7 | 12 | .. | .. | .. | .. | .. | 68 | 75 | 16 | 20 |
| Netherlands | 12.5 | 14.2 | 88 | 89 | 14 | 14 | 14 | 8 | 8 | 100 | 100 | 100 | 100 |
| New Zealand | 2.6 | 3.3 | 83 | 87 | .. | .. | .. | 30 | 33 | .. | .. | .. | .. |
| Nicaragua | 1.6 | 3.3 | 53 | 65 | .. | .. | .. | 34 | 29 | 97 | 96 | 53 | 68 |
| Niger | 0.7 | 2.2 | 13 | 21 | .. | .. | .. | .. | .. | 71 | 79 | 4 | 5 |
| Nigeria | 19.1 | 55.8 | 27 | 44 | 8 | 12 | 15 | 23 | 24 | 77 | 85 | 51 | 45 |
| Norway | 2.9 | 3.4 | 71 | 76 | .. | .. | .. | 22 | 29 | 100 | .. | .. | .. |
| Oman | 0.3 | 2.0 | 32 | 84 | .. | .. | .. | .. | .. | 98 | 98 | 61 | 61 |
| Pakistan | 23.2 | 51.1 | 28 | 37 | 15 | 21 | 25 | 22 | 23 | 78 | 94 | 13 | 42 |
| Panama | 1.0 | 1.6 | 50 | 58 | .. | .. | .. | 62 | 71 | .. | 99 | .. | 87 |
| Papua New Guinea | 0.4 | 0.9 | 13 | 17 | .. | .. | .. | .. | .. | 92 | 92 | 80 | 80 |
| Paraguay | 1.3 | 3.1 | 42 | 56 | 22 | 23 | 26 | 52 | 41 | 92 | 95 | 87 | 95 |
| Peru | 11.2 | 18.7 | 65 | 73 | 25 | 29 | 30 | 39 | 40 | 81 | 90 | 26 | 40 |
| Philippines | 18.0 | 44.3 | 38 | 59 | 14 | 16 | 17 | 33 | 25 | 85 | 92 | 64 | 71 |
| Poland | 20.7 | 25.4 | 58 | 66 | 18 | 18 | 18 | 16 | 14 | .. | .. | .. | .. |
| Portugal | 2.9 | 6.4 | 29 | 64 | 19 | 57 | 68 | 46 | 59 | .. | .. | .. | .. |
| Puerto Rico | 2.1 | 2.9 | 67 | 75 | 34 | 35 | 36 | 51 | 47 | .. | .. | .. | .. |
| Romania | 10.9 | 12.6 | 49 | 56 | 9 | 9 | 10 | 18 | 16 | .. | 86 | .. | 10 |
| Russian Federation | 97.0 | 106.4 | 70 | 73 | 18 | 19 | 21 | 8 | 9 | .. | .. | .. | .. |

# 3.10 Urbanization

| | 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 | 2000 | 1980 | 2000 | 1980 | 2000 | 2015 | 1980 | 2000 | 1990 | 2000 | 1990 | 2000 |
| Rwanda | 0.2 | 0.5 | 5 | 6 | .. | .. | .. | .. | .. | .. | 12 | .. | 8 |
| Saudi Arabia | 6.2 | 17.8 | 66 | 86 | 19 | 25 | 24 | 16 | 19 | .. | 100 | .. | 100 |
| Senegal | 2.0 | 4.5 | 36 | 47 | 17 | 22 | 27 | 48 | 46 | 86 | 94 | 38 | 48 |
| Sierra Leone | 0.8 | 1.8 | 24 | 37 | .. | .. | .. | .. | .. | .. | 23 | .. | 31 |
| Singapore | 2.4 | 4.0 | 100 | 100 | 100 | 89 | 82 | 100 | 89 | 100 | 100 | .. | .. |
| Slovak Republic | 2.6 | 3.1 | 52 | 57 | .. | .. | .. | .. | .. | .. | 100 | .. | 100 |
| Slovenia | 0.9 | 1.0 | 48 | 50 | .. | .. | .. | .. | .. | 100 | .. | .. | .. |
| Somalia | 1.4 | 2.4 | 22 | 28 | .. | .. | .. | 27 | 50 | .. | .. | .. | .. |
| South Africa | 13.3 | 23.5 | 48 | 55 | 27 | 32 | 36 | 12 | 13 | .. | 99 | .. | 73 |
| Spain | 27.2 | 30.6 | 73 | 78 | 20 | 17 | 18 | 16 | 13 | .. | .. | .. | .. |
| Sri Lanka | 3.2 | 4.6 | 22 | 24 | .. | .. | .. | .. | .. | 93 | 91 | 79 | 83 |
| Sudan | 3.9 | 11.2 | 20 | 36 | 6 | 9 | 11 | 30 | 24 | 87 | 87 | 48 | 48 |
| Swaziland | 0.1 | 0.3 | 18 | 26 | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Sweden | 6.9 | 7.4 | 83 | 83 | 17 | 18 | 18 | 20 | 21 | 100 | 100 | 100 | 100 |
| Switzerland | 3.6 | 4.9 | 57 | 68 | .. | .. | .. | 20 | 20 | 100 | 100 | 100 | 100 |
| Syrian Arab Republic | 4.1 | 8.8 | 47 | 55 | 28 | 28 | 31 | 34 | 26 | .. | 98 | .. | 81 |
| Tajikistan | 1.4 | 1.7 | 34 | 28 | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Tanzania | 2.7 | 9.4 | 15 | 28 | 5 | 12 | 18 | 30 | 25 | 97 | 98 | 86 | 86 |
| Thailand | 7.9 | 13.1 | 17 | 22 | 10 | 12 | 15 | 59 | 56 | 97 | 97 | 83 | 96 |
| Togo | 0.6 | 1.5 | 23 | 33 | .. | .. | .. | .. | .. | 71 | 69 | 24 | 17 |
| Trinidad and Tobago | 0.7 | 1.0 | 63 | 74 | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Tunisia | 3.3 | 6.3 | 52 | 66 | 18 | 20 | 21 | 35 | 30 | 97 | .. | 48 | .. |
| Turkey | 19.5 | 49.2 | 44 | 75 | 19 | 27 | 30 | 23 | 19 | 98 | 98 | 70 | 70 |
| Turkmenistan | 1.3 | 2.3 | 47 | 45 | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Uganda | 1.1 | 3.2 | 9 | 14 | .. | .. | .. | 42 | 38 | 96 | 96 | 82 | 72 |
| Ukraine | 30.9 | 33.7 | 62 | 68 | 14 | 15 | 17 | 7 | 8 | .. | .. | .. | .. |
| United Arab Emirates | 0.7 | 2.5 | 72 | 86 | .. | .. | .. | 31 | 37 | .. | .. | .. | .. |
| United Kingdom | 50.0 | 53.5 | 89 | 90 | 25 | 23 | 23 | 15 | 14 | 100 | 100 | 100 | 100 |
| United States | 167.6 | 217.4 | 74 | 77 | 38 | 38 | 37 | 9 | 8 | 100 | 100 | 100 | 100 |
| Uruguay | 2.5 | 3.0 | 85 | 91 | 42 | 37 | 35 | 49 | 41 | .. | 96 | .. | 89 |
| Uzbekistan | 6.5 | 9.1 | 41 | 37 | 11 | 9 | 8 | 28 | 24 | .. | 100 | .. | 100 |
| Venezuela, RB | 12.0 | 21.1 | 79 | 87 | 28 | 29 | 30 | 21 | 15 | .. | 75 | .. | 69 |
| Vietnam | 10.3 | 18.8 | 19 | 24 | 14 | 13 | 14 | 34 | 24 | 86 | 86 | 70 | 70 |
| West Bank and Gaza | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Yemen, Rep. | 1.6 | 4.3 | 19 | 25 | .. | .. | .. | 15 | 30 | 80 | 87 | 27 | 31 |
| Yugoslavia, Fed. Rep. | 4.5 | 5.6 | 46 | 52 | 11 | 14 | 15 | 24 | 27 | .. | .. | .. | .. |
| Zambia | 2.3 | 4.5 | 40 | 45 | 9 | 16 | 22 | 23 | 37 | 86 | 99 | 48 | 64 |
| Zimbabwe | 1.6 | 4.5 | 22 | 35 | 9 | 14 | 19 | 39 | 39 | 98 | 99 | 51 | 51 |
| **World** | **1,759.9 s** | **2,847.8 s** | **40 w** | **47 w** | **.. w** | **.. w** | **.. w** | **18 w** | **17 w** | **78 w** | **84 w** | **29 w** | **35 w** |
| **Low income** | 388.2 | 785.1 | 24 | 32 | .. | .. | .. | 16 | 18 | 68 | 78 | 25 | 30 |
| **Middle income** | 776.5 | 1,350.8 | 38 | 50 | .. | .. | .. | 19 | 16 | 75 | 82 | 29 | 38 |
| Lower middle income | 486.9 | 859.5 | 31 | 42 | .. | .. | .. | 16 | 13 | 69 | 79 | 28 | 35 |
| Upper middle income | 289.6 | 491.3 | 62 | 76 | .. | .. | .. | 25 | 21 | .. | 88 | .. | 57 |
| **Low & middle income** | 1,164.7 | 2,135.9 | 32 | 41 | .. | .. | .. | 18 | 17 | 72 | 81 | 27 | 33 |
| East Asia & Pacific | 309.8 | 652.4 | 22 | 35 | .. | .. | .. | 15 | 10 | 64 | 74 | 28 | 34 |
| Europe & Central Asia | 249.3 | 310.1 | 59 | 65 | 16 | 18 | 20 | 15 | 15 | .. | .. | .. | .. |
| Latin America & Carib. | 233.4 | 388.7 | 65 | 75 | 29 | 32 | 32 | 27 | 25 | 85 | 87 | 39 | 48 |
| Middle East & N. Africa | 83.5 | 172.9 | 48 | 59 | 21 | 22 | 24 | 30 | 25 | 92 | 94 | 63 | 67 |
| South Asia | 201.0 | 385.0 | 22 | 28 | 8 | 12 | 14 | 9 | 12 | 63 | 76 | 12 | 21 |
| Sub-Saharan Africa | 87.7 | 226.9 | 23 | 34 | .. | .. | .. | 28 | 29 | 80 | 81 | 47 | 41 |
| **High income** | 595.1 | 711.9 | 75 | 79 | .. | .. | .. | 17 | 17 | .. | .. | .. | .. |
| Europe EMU | 210.1 | 235.3 | 73 | 77 | 26 | 27 | 28 | 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 (see *Definitions* for table 2.16).

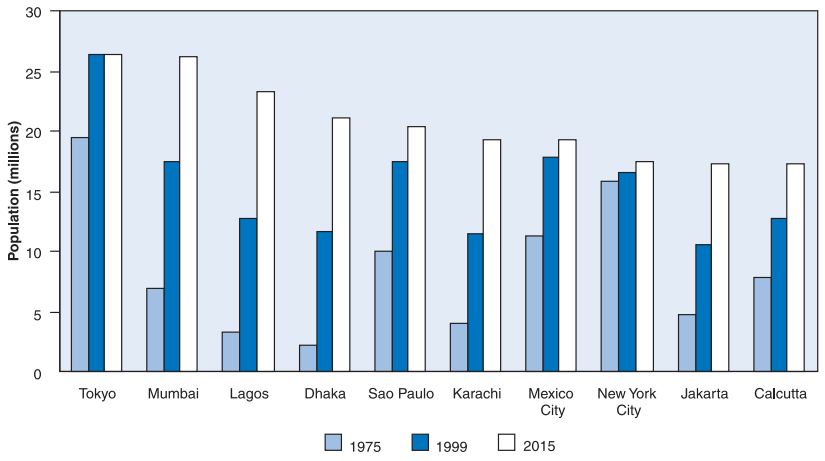
## Definitions

• **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 1999 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.

**Figure 3.10**




*Source:* United Nations, Department of Economic and Social Affairs 2001.

# 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | thousands | Proportion of people with secure tenure % | | % | minutes | Access to potable water % | Sewerage connection % | Electricity % | Telephone % | % |
| | | 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 | 132 [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 | Belem | 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 Andre | 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 |
| | Yaounde | 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 Concepcion | .. | .. | .. | 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 |
| | Vina 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 | .. |
| | Medellin | 2,901 [b] | .. | .. | 38 | 35 | 100 | 99 | 100 | 87 | .. |
| Congo | 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 | 97 | 100 | 94 | .. |
| Cuba | Baracoa | .. | 96.2 | .. | .. | .. | 83 | 3 | 93 | 32 | .. |
| | Camaguey | .. | 84.7 | .. | 2 | 60 | 72 | 47 | 97 | .. | .. |
| | Cienfuegos | .. | 96.3 | 4.0 | .. | 80 | 100 | 73 | 100 | 9 | 2 |
| | Ciudad Habana | .. | .. | 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 | .. |
| Dem. Rep. of Congo | 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 |
| Ecuador | Ambato | 286 [b] | .. | .. | .. | .. | 90 | 81 | 91 | 87 | .. |

| | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | thousands | Proportion of people with secure tenure % | | % | minutes | Access to potable water % | Sewerage connection % | Electricity % | Telephone % | % |
| | | 2000 | 1998[a] | 1998[a] | 1998[a] | 1998[a] | 1998[a] | 1998[a] | 1998[a] | 1998[a] | 1998[a] |
| | 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 | 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 | Quetzaltenango | 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 PDR | 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 | Colon | 132 [b] | .. | 14.2 | .. | 15 | .. | .. | .. | .. | .. |
| Paraguay | Asuncion | 1,262 [c] | 90.2 | 10.7 | .. | 25 | 46 | 8 | 86 | 17 | .. |
| Peru | Cajamarca | .. | 90.0 | 3.9 | .. | 20 | 86 | 69 | 81 | 38 | 62 |
| | Huanuco | 747 [b] | .. | 30.0 | .. | 20 | 57 | 28 | 80 | 32 | .. |

# 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | thousands | Proportion of people with secure tenure % | | % | minutes | Access to potable water % | Sewerage connection % | Electricity % | Telephone % | % |
| | | 2000 | 1998[a] | 1998[a] | 1998[a] | 1998[a] | 1998[a] | 1998[a] | 1998[a] | 1998[a] | 1998[a] |
| | 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 | 102 | 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 |
| Syria | 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 | Lome | 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 refer to 1998 and are from UNCHS c. Data refer to 2000 and are from the United Nations Population Division's *World Urbanization Prospects: The 1999 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. Compiling comparable data has been difficult, and the available indicators have been scattered among international agencies with different mandates. 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 UNCHS selection of cities 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 in the table.

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*).

### Table 3.11a

**House prices vary widely relative to household income**

| Country | City | House price to income ratio | Country | City | House price to income ratio |
|---|---|---|---|---|---|
| Peru | Huanuco | 30.0 | Bulgaria | Troyan | 3.7 |
| Bolivia | Santa Cruz de la Sierra | 29.3 | Korea, Rep. | Hanam | 3.7 |
| Liberia | Monrovia | 28.0 | El Salvador | San Salvador | 3.5 |
| Brazil | Santo André | 23.4 | Russian Federation | Veliky Novgorod | 3.4 |
| Lao PDR | Vientiane | 23.2 | Zimbabwe | Chegutu | 3.4 |
| Lithuania | Vilnius | 20.0 | Singapore | Singapore | 3.1 |
| Bangladesh | Dhaka | 16.7 | Sweden | Amal | 2.9 |
| Latvia | Riga | 15.6 | Ecuador | Quito | 2.4 |
| Uganda | Jinja | 15.4 | Poland | Katowice | 1.7 |
| Indonesia | Jakarta | 14.6 | Libya | Tripoli | 0.8 |

*Source:* Table 3.11.

## 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 except through due legal process including residences owned, purchased, or privately rented; residence in social housing; and subtenancy. • **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 refer to 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. 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.

## Data sources

The data in the table 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 | 2000 | 2000 |
| Afghanistan | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Albania | 11 | *44* | *3* | 10 | 2 | *29* | 3 | *1* | .. | .. | 0.57 | 0.30 |
| Algeria | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 0.27 | 0.15 |
| Angola | 19 | .. | .. | .. | 14 | .. | .. | .. | .. | .. | 0.30 | 0.15 |
| Argentina | 181 | *181* | 27 | *30* | 134 | *140* | 1 | .. | 43,119 | *27,458* | 1.07 | 0.52 |
| Armenia | 5 | .. | 2 | .. | 1 | .. | .. | .. | .. | .. | 0.51 | 0.34 |
| Australia | 530 | .. | 11 | *13* | 450 | .. | 18 | .. | *138,501* | .. | 0.57 | 0.57 |
| Austria | 421 | *536* | 30 | *22* | 387 | *495* | 71 | *77* | .. | .. | 0.82 | 0.74 |
| Azerbaijan | 52 | *49* | 7 | 16 | 36 | *38* | *5* | *1* | .. | .. | *0.46* | *0.22* |
| Bangladesh | 1 | *1* | 0 | *1* | 0 | *0* | 1 | *1* | .. | .. | 0.46 | 0.29 |
| Belarus | 61 | *135* | 13 | 20 | 59 | *135* | .. | *53* | *10,026* | 4,964 | *0.34* | *0.13* |
| Belgium | 423 | *497* | 30 | *35* | 385 | *448* | 14 | *25* | .. | *158,759* | 0.96 | 0.78 |
| Benin | 3 | .. | 2 | .. | 2 | .. | 34 | .. | .. | .. | 0.48 | 0.39 |
| Bolivia | 41 | .. | 6 | 8 | 25 | .. | 9 | .. | 1,139 | .. | 0.80 | 0.50 |
| Bosnia and Herzegovina | 114 | .. | 24 | .. | 101 | .. | .. | .. | .. | .. | 0.68 | 0.57 |
| Botswana | 19 | *70* | 3 | *11* | 10 | *30* | .. | *1* | .. | .. | 0.42 | 0.39 |
| Brazil | 88 | .. | 8 | 17 | .. | .. | .. | .. | .. | .. | 0.92 | 0.34 |
| Bulgaria | 163 | *266* | 39 | 60 | 146 | *233* | 55 | *63* | .. | .. | 0.70 | 0.58 |
| Burkina Faso | 4 | .. | 3 | .. | 2 | .. | *9* | .. | .. | .. | 0.68 | 0.46 |
| Burundi | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1.01 | 0.71 |
| Cambodia | 1 | *6* | 0 | 31 | 0 | *5* | 9 | *41* | *314* | 7,210 | 0.61 | 0.44 |
| Cameroon | 10 | .. | 3 | .. | 6 | .. | .. | .. | .. | .. | 0.56 | 0.47 |
| Canada | 605 | *581* | 20 | *19* | 468 | *459* | 12 | *11* | .. | .. | 0.58 | 0.47 |
| Central African Republic | *1* | *0* | 0 | *0* | 1 | *0* | 0 | .. | 1,494 | .. | *0.81* | *0.65* |
| Chad | 5 | .. | 0 | .. | 1 | .. | 0 | .. | .. | .. | 0.68 | 0.60 |
| Chile | 81 | *135* | 13 | 25 | 52 | *88* | 2 | *2* | .. | .. | 0.64 | 0.47 |
| China | 5 | .. | 4 | 11 | 1 | .. | 3 | .. | .. | .. | 0.40 | 0.45 |
| Hong Kong, China | 66 | *78* | 253 | *287* | 42 | *58* | 4 | *5* | 8,192 | *10,781* | 1.46 | 0.80 |
| Colombia | .. | *51* | .. | *19* | .. | *43* | 8 | *12* | 50,945 | *41,587* | 0.49 | 0.35 |
| Congo, Dem. Rep. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1.00 | 0.93 |
| Congo, Rep. | 18 | .. | 3 | .. | 12 | .. | .. | .. | .. | .. | 0.53 | 0.30 |
| Costa Rica | 87 | *133* | 7 | *14* | 55 | *88* | 14 | *22* | .. | *507,796* | 0.65 | 0.44 |
| Côte d'Ivoire | 23 | .. | 6 | .. | 15 | .. | .. | .. | .. | .. | 0.76 | 0.51 |
| Croatia | .. | .. | .. | 44 | .. | .. | .. | .. | .. | 13,764 | 0.76 | 0.60 |
| Cuba | *37* | *32* | *16* | *6* | *18* | *16* | *19* | *16* | .. | .. | *0.50* | *0.18* |
| Czech Republic | 246 | *363* | 46 | 67 | 228 | *335* | 113 | *78* | .. | .. | 0.77 | 0.68 |
| Denmark | 368 | *411* | 27 | 31 | 320 | *353* | 9 | *12* | 36,304 | 45,165 | 1.01 | 0.90 |
| Dominican Republic | 75 | .. | 48 | .. | 21 | .. | .. | .. | .. | .. | 0.71 | 0.39 |
| Ecuador | 35 | *46* | 8 | *14* | 31 | *41* | *2* | *2* | 10,306 | 14,449 | 0.31 | 0.18 |
| Egypt, Arab Rep. | 29 | .. | 33 | .. | 21 | .. | 6 | .. | .. | .. | 0.26 | 0.10 |
| El Salvador | 33 | *61* | 14 | *36* | 17 | *30* | 0 | *5* | 2,002 | 3,646 | 0.67 | 0.40 |
| Eritrea | 1 | .. | 1 | .. | 1 | .. | .. | .. | .. | .. | 0.56 | 0.33 |
| Estonia | 211 | *394* | 22 | 11 | 154 | *331* | 66 | *1* | .. | 6,412 | 0.60 | 0.55 |
| Ethiopia | 1 | 2 | 2 | 3 | 1 | 1 | 0 | *0* | .. | 1,642 | 0.46 | 0.27 |
| Finland | 441 | *462* | 29 | *31* | 386 | *403* | 12 | *35* | 39,750 | *46,010* | 1.06 | 0.84 |
| France | 494 | *564* | 32 | 38 | 405 | *469* | *55* | .. | 422,000 | 519,400 | 0.99 | 0.82 |
| Gabon | 26 | .. | 4 | .. | 19 | .. | .. | .. | .. | .. | 0.53 | 0.37 |
| Gambia, The | 14 | .. | 5 | .. | 6 | .. | .. | .. | .. | .. | 0.64 | 0.47 |
| Georgia | 107 | *63* | 27 | 15 | 89 | *49* | 5 | *1* | 4,620 | .. | *0.46* | *0.25* |
| Germany | 405 | .. | 53 | .. | 386 | *508* | 18 | *36* | 446,000 | *589,500* | 0.91 | 0.78 |
| Ghana | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 0.20 | 0.19 |
| Greece | 248 | *348* | 22 | *31* | 171 | *254* | 120 | *203* | .. | *77,954* | 0.72 | 0.71 |
| Guatemala | .. | *57* | .. | *45* | .. | *52* | .. | *12* | .. | 3,455 | 0.53 | 0.42 |
| Guinea | 4 | .. | 1 | .. | 2 | .. | .. | .. | .. | .. | 0.85 | 0.69 |
| Guinea-Bissau | 7 | .. | 2 | .. | 4 | .. | .. | .. | .. | .. | .. | .. |
| Haiti | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 0.64 | 0.35 |
| Honduras | 22 | *62* | 9 | *28* | .. | *52* | .. | *15* | *3,288* | .. | 0.62 | 0.46 |

| | 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 | 2000 | 2000 |
| Hungary | 212 | *272* | 21 | *15* | 188 | *238* | 16 | *14* | 22,898 | .. | 0.81 | 0.79 |
| India | 4 | *8* | 2 | *3* | 2 | *5* | 15 | *27* | .. | .. | 0.60 | 0.39 |
| Indonesia | 16 | *25* | 10 | *14* | 7 | *14* | 34 | *62* | .. | .. | 0.17 | 0.06 |
| Iran, Islamic Rep. | 34 | .. | 14 | .. | 25 | .. | *36* | .. | .. | .. | 0.05 | 0.02 |
| Iraq | 14 | .. | 6 | .. | 1 | .. | .. | .. | .. | .. | 0.03 | *0.01* |
| Ireland | 270 | .. | 10 | *14* | 227 | .. | 6 | .. | 24,205 | .. | 0.72 | 0.72 |
| Israel | 210 | *270* | 74 | 107 | 174 | *220* | 8 | *12* | 18,212 | 35,863 | 1.14 | 0.64 |
| Italy | 529 | *591* | 99 | *73* | 476 | *539* | *45* | *66* | 344,726 | .. | 0.97 | 0.83 |
| Jamaica | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 0.62 | 0.49 |
| Japan | 469 | *560* | 52 | *62* | 283 | *395* | 146 | *115* | 628,581 | *765,056* | 1.06 | 0.76 |
| Jordan | 60 | .. | 26 | .. | .. | .. | *0* | .. | *1,098* | .. | 0.45 | 0.15 |
| Kazakhstan | 76 | *86* | 8 | *12* | 50 | *66* | .. | *10* | 18,248 | *3,215* | 0.36 | 0.29 |
| Kenya | 13 | .. | 5 | .. | 10 | .. | 1 | .. | 5,170 | .. | 0.71 | 0.60 |
| Korea, Dem. Rep. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | *0.73* | *0.41* |
| Korea, Rep. | 79 | *238* | 60 | *128* | 48 | *167* | 32 | *59* | 30,464 | *67,266* | 0.92 | 0.66 |
| Kuwait | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 0.21 | 0.18 |
| Kyrgyz Republic | 44 | *39* | 10 | *10* | 44 | *39* | .. | .. | 5,220 | .. | 0.44 | 0.33 |
| Lao PDR | 9 | .. | 3 | .. | 6 | .. | *18* | .. | .. | .. | 0.41 | 0.32 |
| Latvia | 135 | *260* | 6 | 9 | 106 | *218* | 76 | *8* | 3,932 | .. | 0.67 | 0.58 |
| Lebanon | 321 | *336* | 183 | .. | 300 | *313* | 13 | *15* | .. | .. | 0.53 | 0.31 |
| Lesotho | 11 | .. | 4 | .. | 3 | .. | .. | .. | .. | .. | 0.50 | 0.47 |
| Liberia | 15 | .. | 4 | .. | 7 | .. | .. | .. | .. | .. | .. | .. |
| Libya | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 0.25 | 0.16 |
| Lithuania | 159 | *322* | 12 | 17 | 132 | *334* | 52 | *5* | .. | .. | 0.55 | 0.45 |
| Macedonia, FYR | 132 | .. | 30 | .. | 121 | .. | 1 | .. | 3,102 | .. | 0.76 | 0.56 |
| Madagascar | 6 | .. | 2 | .. | 4 | .. | .. | .. | 41,500 | .. | 0.76 | 0.45 |
| Malawi | 4 | .. | 4 | .. | 2 | .. | .. | .. | .. | .. | 0.69 | 0.68 |
| Malaysia | 124 | *200* | 26 | *69* | 101 | *170* | 167 | *224* | .. | .. | 0.28 | 0.16 |
| Mali | 4 | .. | 2 | .. | 2 | .. | .. | .. | .. | .. | 0.70 | 0.43 |
| Mauritania | 9 | .. | 3 | .. | 7 | .. | .. | .. | .. | .. | 0.67 | 0.40 |
| Mauritius | 60 | *98* | 35 | 49 | 44 | *73* | 54 | *96* | .. | .. | .. | .. |
| Mexico | 119 | *151* | 41 | *44* | 82 | *102* | 3 | .. | 55,095 | .. | 0.61 | 0.45 |
| Moldova | 53 | *70* | 17 | *24* | 48 | *54* | 45 | .. | .. | *538* | 0.45 | 0.40 |
| Mongolia | 21 | *30* | 1 | 2 | 6 | *17* | 22 | *11* | 340 | 40 | 0.38 | 0.38 |
| Morocco | 37 | *52* | 15 | 21 | 28 | *41* | 1 | *1* | .. | .. | 0.82 | 0.53 |
| Mozambique | 4 | .. | 2 | 0 | 3 | .. | .. | .. | 1,889 | .. | 0.56 | 0.54 |
| Myanmar | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | *0.00* | *0.00* |
| Namibia | 71 | *0* | 1 | 2 | 39 | .. | 1 | .. | 1,896 | 2,706 | 0.47 | 0.44 |
| Nepal | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 0.63 | 0.37 |
| Netherlands | 405 | *427* | 58 | *58* | 368 | *383* | 44 | *25* | 90,150 | *109,955* | 1.03 | 0.78 |
| New Zealand | 524 | *540* | 19 | 29 | 436 | *481* | 24 | *12* | .. | .. | 0.48 | 0.34 |
| Nicaragua | 19 | *10* | 5 | 8 | 10 | *3* | 3 | *2* | 108 | 523 | 0.62 | 0.54 |
| Niger | 6 | .. | 4 | 5 | 5 | .. | .. | .. | 178 | 240 | 0.68 | 0.48 |
| Nigeria | *33* | .. | *21* | 14 | *12* | .. | *5* | .. | .. | .. | 0.27 | 0.27 |
| Norway | 458 | *505* | 22 | 25 | 380 | *407* | 48 | *54* | .. | *30,148* | 1.19 | 1.15 |
| Oman | 130 | .. | 9 | .. | 83 | .. | 3 | .. | .. | .. | 0.31 | 0.29 |
| Pakistan | 6 | *8* | 4 | *4* | 4 | *5* | 8 | *15* | 18,933 | *218,779* | 0.53 | 0.27 |
| Panama | 75 | *113* | 18 | *27* | 60 | *83* | 2 | *3* | .. | .. | 0.53 | 0.41 |
| Papua New Guinea | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 0.53 | 0.34 |
| Paraguay | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 0.72 | 0.34 |
| Peru | .. | *43* | .. | *15* | .. | *27* | .. | .. | .. | .. | 0.80 | 0.54 |
| Philippines | 10 | *31* | 4 | *11* | 7 | *10* | 6 | *14* | *6,189* | *9,548* | 0.37 | 0.28 |
| Poland | 168 | *286* | 18 | 33 | 138 | *240* | 36 | *37* | 59,608 | 138,100 | 0.76 | 0.65 |
| Portugal | 222 | *348* | 34 | .. | 162 | *310* | 5 | *77* | 28,623 | *93,020* | 0.77 | 0.54 |
| Puerto Rico | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | *0.34* | *0.32* |
| Romania | 72 | *154* | 11 | *17* | 56 | *133* | 13 | *14* | 23,907 | *36,884* | 0.46 | 0.35 |
| Russian Federation | *87* | *153* | *14* | 48 | *65* | *120* | .. | .. | .. | *60,950* | 0.33 | 0.29 |

# 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 | 2000 | 2000 |
| Rwanda | 2 | .. | 1 | 2 | 1 | .. | .. | .. | .. | .. | 0.89 | 0.84 |
| Saudi Arabia | 165 | .. | 19 | .. | 98 | .. | 0 | .. | .. | .. | 0.24 | 0.10 |
| Senegal | 11 | .. | 6 | 8 | 8 | .. | 0 | .. | .. | .. | 0.73 | 0.52 |
| Sierra Leone | 10 | *3* | 4 | 2 | 7 | *2* | 2 | *0* | *996* | 529 | *0.00* | *0.00* |
| Singapore | 130 | *132* | 142 | *170* | 89 | *97* | 40 | *34* | .. | .. | 0.84 | 0.38 |
| Slovak Republic | 194 | *260* | 57 | *33* | 163 | *229* | 61 | *8* | .. | 0 | 0.69 | 0.68 |
| Slovenia | 306 | *455* | 42 | 46 | 289 | *418* | 8 | *5* | 5,620 | 9,245 | 0.63 | 0.66 |
| Somalia | 2 | .. | 1 | 0 | 1 | .. | .. | .. | .. | .. | .. | .. |
| South Africa | 160 | *143* | 26 | *11* | 97 | *94* | 8 | *4* | .. | .. | 0.50 | 0.50 |
| Spain | 360 | *472* | 43 | *53* | 309 | *389* | 79 | *34* | 100,981 | *201,896* | 0.73 | 0.65 |
| Sri Lanka | 20 | *34* | 4 | *7* | 6 | *15* | 23 | *40* | 3,468 | *15,630* | 0.66 | 0.27 |
| Sudan | 9 | .. | 21 | 28 | 8 | .. | .. | .. | .. | .. | 0.28 | 0.24 |
| Swaziland | 72 | *70* | 18 | 17 | 35 | *34* | 3 | *3* | .. | .. | 0.47 | 0.44 |
| Sweden | 464 | *478* | 29 | 21 | 426 | *437* | 11 | *29* | 61,040 | 69,200 | 0.94 | 0.80 |
| Switzerland | 491 | *526* | 46 | 54 | 449 | *486* | 114 | *104* | 48,660 | 53,506 | 0.78 | 0.84 |
| Syrian Arab Republic | 26 | *30* | 10 | *11* | 10 | *9* | .. | .. | .. | .. | 0.44 | 0.13 |
| Tajikistan | 3 | .. | 1 | .. | 0 | .. | .. | .. | .. | .. | 0.45 | 0.55 |
| Tanzania | 5 | .. | 2 | 2 | 1 | .. | .. | .. | .. | .. | 0.75 | 0.73 |
| Thailand | 46 | .. | 36 | .. | 14 | .. | 86 | .. | 45,769 | .. | 0.39 | 0.35 |
| Togo | 24 | .. | 11 | .. | 16 | .. | 8 | .. | .. | .. | 0.48 | 0.40 |
| Trinidad and Tobago | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 0.39 | 0.20 |
| Tunisia | 48 | .. | 19 | 40 | 23 | .. | .. | .. | .. | .. | 0.49 | 0.29 |
| Turkey | 50 | *85* | 8 | *14* | 34 | *63* | 10 | *15* | 27,041 | *49,846* | 0.88 | 0.66 |
| Turkmenistan | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 0.02 | 0.02 |
| Uganda | 2 | *5* | .. | *4* | 1 | *2* | 0 | *3* | .. | .. | 0.86 | 0.75 |
| Ukraine | 63 | .. | 19 | .. | 63 | *104* | .. | *49* | 59,500 | *61,200* | 0.37 | 0.30 |
| United Arab Emirates | 121 | .. | 52 | .. | 97 | .. | .. | .. | .. | .. | 0.25 | 0.26 |
| United Kingdom | 400 | *418* | 64 | *62* | 341 | *373* | 14 | *12* | 399,000 | *462,400* | 1.17 | 1.22 |
| United States | 758 | *760* | 30 | *34* | 573 | *478* | 17 | *14* | 2,527,441 | 2,653,043 | 0.47 | 0.48 |
| Uruguay | 138 | *174* | 45 | *63* | 122 | *158* | 74 | *110* | .. | .. | 1.19 | 0.53 |
| Uzbekistan | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 0.43 | 0.28 |
| Venezuela, RB | .. | .. | .. | .. | .. | .. | .. | .. | .. | *563* | 0.12 | *0.08* |
| Vietnam | .. | .. | .. | .. | .. | .. | 45 | .. | .. | .. | 0.38 | 0.27 |
| West Bank and Gaza | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | *0.01* | *0.00* |
| Yemen, Rep. | 34 | .. | 8 | .. | 14 | .. | .. | .. | 8,681 | 11,476 | 0.21 | 0.06 |
| Yugoslavia, Fed. Rep. | 137 | *190* | 31 | *36* | 133 | *176* | *3* | .. | .. | .. | 0.56 | 0.56 |
| Zambia | 15 | .. | 3 | .. | 8 | .. | .. | .. | .. | .. | 1.00 | 1.00 |
| Zimbabwe | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 0.85 | 0.72 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **World** | **120 w** | ***176 w*** | **91 w** | ***141 w*** | **0.61 m** | **0.45 m** |
| **Low income** | 9 | *10* | 6 | *9* | 0.58 | 0.40 |
| **Middle income** | 40 | 65 | 26 | 49 | 0.55 | 0.41 |
| Lower middle income | 15 | 33 | 9 | 24 | 0.53 | 0.39 |
| Upper middle income | 116 | 191 | 93 | 150 | 0.58 | 0.45 |
| **Low & middle income** | 26 | *60* | 17 | *47* | 0.56 | 0.41 |
| East Asia & Pacific | 11 | 16 | 5 | 10 | 0.39 | 0.34 |
| Europe & Central Asia | 98 | 205 | 83 | 171 | 0.58 | 0.55 |
| Latin America & Carib. | 92 | 158 | *77* | 119 | 0.62 | 0.41 |
| Middle East & N. Africa | 58 | .. | 32 | .. | 0.27 | 0.16 |
| South Asia | 4 | *8* | 2 | *5* | 0.59 | 0.33 |
| Sub-Saharan Africa | 24 | .. | 14 | .. | 0.65 | 0.47 |
| **High income** | 536 | *610* | 414 | *459* | 0.81 | 0.69 |
| Europe EMU | 453 | *558* | 379 | *496* | 0.87 | 0.76 |

## 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 5.8). These developments have increased demand for roads and vehicles, adding to urban congestion, air pollution, health hazards, traffic accidents, and injuries.

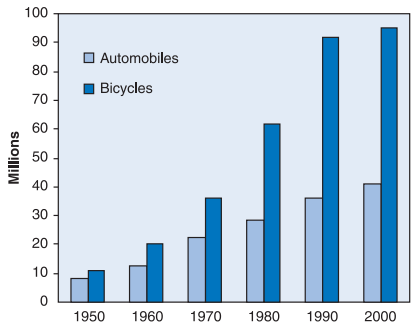
Congestion, the most visible cost of expanding vehicle ownership, is reflected in the indicators in the table. Other relevant indicators—such as average vehicle speed in major cities or the cost of traffic congestion, which takes a heavy toll on economic productivity—are not included here because data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

**Figure 3.12**

**World production of automobiles and bicycles has increased significantly since 1950**




*Source:* American Automobile Manufacturers' Association as cited in the WorldWatch Institute (2001)

## 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*).

## 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 | Total suspended particulates | Sulfur dioxide | Nitrogen dioxide |
|---|---|---|---|---|---|
| | | thousands | micrograms per cubic meter | micrograms per cubic meter | micrograms per cubic meter |
| | | 2000 | 1995[a] | 1998[b] | 1998[b] |
| Argentina | Córdoba City | 1,423 | 97 | .. | 97 |
| Australia | Melbourne | 3,187 | 35 | 0 | 30 |
| | Perth | 1,313 | 45 | 5 | 19 |
| | Sydney | 3,664 | 54 | 28 | 81 |
| Austria | Vienna | 2,070 | 47 | 14 | 42 |
| Belgium | Brussels | 1,122 | 78 | 20 | 48 |
| Brazil | Rio de Janeiro | 10,582 | 139 | 129 | .. |
| | São Paulo | 17,755 | 86 | 43 | 83 |
| Bulgaria | Sofia | 1,192 | 195 | 39 | 122 |
| Canada | Montreal | 3,448 | 34 | 10 | 42 |
| | Toronto | 4,651 | 36 | 17 | 43 |
| | Vancouver | 2,033 | 29 | 14 | 37 |
| Chile | Santiago | 5,538 | .. | 29 | 81 |
| China | Anshan | 1,453 | 305 | 115 | 88 |
| | Beijing | 10,839 | 377 | 90 | 122 |
| | Changchun | 3,093 | 381 | 21 | 64 |
| | Chengdu | 3,294 | 366 | 77 | 74 |
| | Chongqing | 5,312 | 320 | 340 | 70 |
| | Dalian | 2,628 | 185 | 61 | 100 |
| | Guangzhu | 3,893 | 295 | 57 | 136 |
| | Guiyang | 2,533 | 330 | 424 | 53 |
| | Harbin | 2,928 | 359 | 23 | 30 |
| | Jinan | 2,568 | 472 | 132 | 45 |
| | Kunming | 1,701 | 253 | 19 | 33 |
| | Lanzhou | 1,730 | 732 | 102 | 104 |
| | Liupanshui | 2,023 | 408 | 102 | .. |
| | Nanchang | 1,722 | 279 | 69 | 29 |
| | Pinxiang | 1,502 | 276 | 75 | .. |
| | Quingdao | 2,316 | .. | 190 | 64 |
| | Shanghai | 12,887 | 246 | 53 | 73 |
| | Shenyang | 4,828 | 374 | 99 | 73 |
| | Taiyuan | 2,415 | 568 | 211 | 55 |
| | Tianjin | 9,156 | 306 | 82 | 50 |
| | Urumqi | 1,643 | 515 | 60 | 70 |
| | Wuhan | 5,169 | 211 | 40 | 43 |
| | Zhengzhou | 2,070 | 474 | 63 | 95 |
| | Zibo | 2,675 | 453 | 198 | 43 |
| Colombia | Bogotá | 6,288 | 120 | .. | .. |
| Croatia | Zagreb | 810 | 71 | 31 | .. |
| Cuba | Havana | 2,256 | .. | 1 | 5 |
| Czech Republic | Prague | 1,226 | 59 | 14 | 33 |
| Denmark | Copenhagen | 1,388 | 61 | 7 | 54 |
| Ecuador | Guayaquil | 2,293 | 127 | 15 | .. |
| | Quito | 1,754 | 175 | 22 | .. |
| Egypt, Arab Rep. | Cairo | 10,552 | .. | 69 | .. |
| Finland | Helsinki | 1,167 | 40 | 4 | 35 |
| France | Paris | 9,624 | 14 | 14 | 57 |
| Germany | Berlin | 3,324 | 50 | 18 | 26 |
| | Frankfurt | 3,687 | 36 | 11 | 45 |
| | Munich | 2,294 | 45 | 8 | 53 |
| Ghana | Accra | 1,976 | 137 | .. | .. |
| Greece | Athens | 3,116 | 178 | 34 | 64 |
| Hungary | Budapest | 1,825 | 63 | 39 | 51 |
| Iceland | Reykjavik | 168 | 24 | 5 | 42 |
| India | Ahmedabad | 4,160 | 299 | 30 | 21 |
| | Bangalore | 5,561 | 123 | .. | .. |
| | Calcutta | 12,918 | 375 | 49 | 34 |

## About the data

In many towns and cities exposure to air pollution is the main environmental threat to human health. Winter smog—made up of soot, dust, and sulfur dioxide—has long been associated with temporary spikes in the number of deaths. Long-term exposure to high levels of soot and small particles in the air also contributes to a wide range of chronic respiratory diseases and exacerbates heart disease and other conditions. 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—often more than 1,000 kilometers from their source. Acid deposition changes the chemical balance of soils and can lead to the leaching of trace minerals and nutrients critical to trees and plants. The links between forest damage and acid deposition are complex. Direct exposure to high levels of acid deposition can cause defoliation and dieback.

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 air pollution 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. For example, data are reported for just 5 cities in Africa but for more than 87 cities in China. 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. World Health Organization (WHO) annual mean guidelines for air quality standards are 90 micrograms per cubic meter for total suspended particulates, and 50 for sulfur dioxide and nitrogen dioxide.

| | City | City population | Total suspended particulates | Sulfur dioxide | Nitrogen dioxide |
|---|---|---|---|---|---|
| | | thousands | micrograms per cubic meter | micrograms per cubic meter | micrograms per cubic meter |
| | | 2000 | 1995[a] | 1998[b] | 1998[b] |
| | Chennai | 6,002 | 130 | 15 | 17 |
| | Delhi | 11,695 | 415 | 24 | 41 |
| | Hyderabad | 6,842 | 152 | 12 | 17 |
| | Kanpur | 2,450 | 459 | 15 | 14 |
| | Lucknow | 2,568 | 463 | 26 | 25 |
| | Mumbai | 18,066 | 240 | 33 | 39 |
| | Nagpur | 2,062 | 185 | 6 | 13 |
| | Pune | 3,489 | 208 | | |
| Indonesia | Jakarta | 11,018 | 271 | .. | .. |
| Iran, Islamic Rep. | Tehran | 7,225 | 248 | 209 | .. |
| Ireland | Dublin | 985 | .. | 20 | .. |
| Italy | Milan | 4,251 | 77 | 31 | 248 |
| | Rome | 2,688 | 73 | .. | .. |
| | Torino | 1,294 | 151 | .. | .. |
| Japan | Osaka | 11,013 | 43 | 19 | 63 |
| | Tokyo | 26,444 | 49 | 18 | 68 |
| | Yokohama | 3,178 | .. | 100 | 13 |
| Kenya | Nairobi | 2,310 | 69 | .. | .. |
| Korea, Rep. | Seoul | 9,888 | 84 | 44 | 60 |
| | Pusan | 3,830 | 94 | 60 | 51 |
| | Seoul | 9,888 | 84 | 44 | 60 |
| | Taegu | 2,675 | 72 | 81 | 62 |
| Malaysia | Kuala Lumpur | 1,378 | 85 | 24 | .. |
| Mexico | Mexico City | 18,131 | 279 | 74 | 130 |
| Netherlands | Amsterdam | 1,144 | 40 | 10 | 58 |
| New Zealand | Auckland | 1,102 | 26 | 3 | 20 |
| Norway | Oslo | 970 | 15 | 8 | 43 |
| Philippines | Manila | 10,870 | 200 | 33 | .. |
| Poland | Lodz | 1,055 | .. | 21 | 43 |
| | Warsaw | 2,269 | .. | 16 | 32 |
| Portugal | Lisbon | 3,826 | 61 | 8 | 52 |
| Romania | Bucharest | 2,054 | 82 | 10 | 71 |
| Russian Federation | Moscow | 9,321 | 100 | 109 | .. |
| | Omsk | 1,216 | 100 | 20 | 34 |
| Singapore | Singapore | 3,567 | .. | 20 | 30 |
| Slovak Republic | Bratislava | 460 | 62 | 21 | 27 |
| South Africa | Capetown | 2,993 | .. | 21 | 72 |
| | Durban | 1,335 | .. | 31 | .. |
| | Johannesburg | 2,335 | .. | 19 | 31 |
| Spain | Barcelona | 2,819 | 117 | 11 | 43 |
| | Madrid | 4,072 | 42 | 24 | 66 |
| Sweden | Stockholm | 1,583 | 9 | 3 | 20 |
| Switzerland | Zurich | 983 | 31 | 11 | 39 |
| Thailand | Bangkok | 7,281 | 223 | 11 | 23 |
| Turkey | Ankara | 3,203 | 57 | 55 | 46 |
| | Istanbul | 9,451 | .. | 120 | .. |
| Ukraine | Kiev | 2,670 | 100 | 14 | 51 |
| United Kingdom | Birmingham | 2,272 | .. | 9 | 45 |
| | London | 7,640 | .. | 25 | 77 |
| | Manchester | 2,252 | .. | 26 | 49 |
| United States | Chicago | 6,951 | .. | 14 | 57 |
| | Los Angeles | 13,140 | .. | 9 | 74 |
| | New York | 16,640 | .. | 26 | 79 |
| Venezuela, RB | Caracas | 3,151 | 53 | 33 | 57 |

a. Data are for the most recent year available in 1990-95. Most are for 1995. b. Data are for the most recent year available in 1990-98. Most are for 1995.

## Definitions

• **City population** is the number of residents of the city as defined by national authorities and reported to the United Nations. • **Total suspended particulates** refer to smoke, soot, dust, and liquid droplets from combustion that are in the air. Particulate levels indicate the quality of the air people are breathing and the state of a country's technology and pollution controls. • **Sulfur dioxide** ($SO_2$) 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** ($NO_2$) 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. $NO_2$ is emitted by bacteria, nitrogenous fertilizers, aerobic decomposition of organic matter in oceans and soils, combustion of fuels and biomass, motor vehicles, and industrial activities.

## Data sources

The data in the table 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 and WHO's *Urban Air Pollution in Megacities of the World* (1992), the Organisation for Economic Co-operation and Development's *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.

# 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[b] |
| Afghanistan | .. | .. | .. | .. | .. | .. | .. | .. |
| Albania | 1993 | .. | .. | 1995 | 2000 | 2000 | .. | 1994 |
| Algeria | 2001 | .. | .. | 1994 | 1993 | 1993 | 1996 | 1995 |
| Angola | .. | .. | .. | 2000 [c] | 2000 | 2000 | 1994 | 1998 |
| Argentina | 1992 | .. | .. | 1994 | 1990 | 1990 | 1996 | 1995 |
| Armenia | .. | .. | .. | 1994 | 2000 | 2000 | .. | 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 [c] | 1986 | 1989 | .. | 1993 |
| Belgium | .. | .. | .. | 1996 | 1989 | 1989 | 1998 | 1997 |
| Benin | 1993 | .. | .. | 1994 | 1993 | 1993 | 1997 | 1994 |
| Bolivia | 1994 | 1986 | 1988 | 1995 | 1995 | 1995 | 1995 | 1995 |
| Bosnia and Herzegovina | .. | .. | .. | .. | 1992 | 1992 | 1994 | .. |
| Botswana | 1990 | 1986 | 1991 | 1994 | 1992 | 1992 | 1994 | 1996 |
| Brazil | .. | .. | 1988 | 1994 | 1990 | 1990 | 1994 | 1994 |
| Bulgaria | .. | .. | 1994 | 1995 | 1991 | 1991 | 1996 | 1996 |
| Burkina Faso | 1993 | 1994 | .. | 1994 | 1989 | 1989 | .. | 1993 |
| Burundi | 1994 | 1981 | 1989 | 1997 | 1997 | 1997 | .. | 1997 |
| Cambodia | 1999 | .. | .. | 1996 | .. | .. | .. | 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 | 1994 | .. | 1995 |
| Congo, Dem. Rep. | .. | 1986 | 1990 | 1995 | 1995 | 1995 | 1994 | 1995 |
| Congo, Rep. | .. | .. | 1990 | 1997 | 1995 | 1995 | .. | 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 | 1992 | 1992 | 1994 | 1997 |
| Cuba | .. | .. | .. | 1994 | 1992 | 1992 | 1994 | 1994 |
| Czech Republic | 1994 | .. | .. | 1994 | 1993 | 1993 | 1996 | 1994 |
| Denmark | 1994 | .. | .. | 1994 | 1988 | 1989 | .. | 1994 |
| Dominican Republic | .. | 1984 | 1995 | 2000 | 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 | 1993 | 1993 | .. | 1994 |
| Eritrea | 1995 | .. | .. | 1995 | .. | .. | .. | 1996 |
| Estonia | 1998 | .. | .. | 1994 | 1997 | 1997 | .. | 1994 |
| Ethiopia | 1994 | .. | 1991 | 1994 | 1995 | 1995 | .. | 1994 |
| Finland | 1995 | .. | .. | 1994 | 1986 | 1989 | 1996 | 1994 |
| France | 1990 | .. | .. | 1994 | 1988 | 1989 | 1996 | 1994 |
| Gabon | .. | .. | 1990 | 2000 | 1994 | 1994 | .. | 2000 |
| Gambia, The | 1992 | 1981 | 1989 | 1994 | 1990 | 1990 | 1998 | 1994 |
| Georgia | 1998 | .. | .. | 1994 | 1996 | 1996 | 1996 | 1994 |
| Germany | .. | .. | .. | 1994 | 1988 | 1989 | 1994 | 1994 |
| Ghana | 1992 | 1985 | 1988 | 1995 | 1989 | 1989 | 1994 | 1994 |
| Greece | .. | .. | .. | 1994 | 1989 | 1989 | 1995 | 1994 |
| Guatemala | 1994 | 1984 | 1988 | 1996 | 1987 | 1990 | 1997 | 1995 |
| Guinea | 1994 | 1983 | 1988 | 1994 | 1992 | 1992 | 1994 | 1993 |
| Guinea-Bissau | 1993 | .. | 1991 | 1996 | .. | .. | 1994 | 1996 |
| Haiti | 1999 | 1985 | .. | 1996 | 2000 | 2000 | 1996 | 1996 |
| Honduras | 1993 | 1989 | .. | 1996 | 1994 | 1994 | 1994 | 1995 |

## Table 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 | |

**Being prepared**

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

***Note:*** Status is as of January 2002.

*Source:* World Bank regional data; World Resources Institute, International Institute for Environment and Development, and IUCN, *1996 World Directory of Country Environmental Studies*.

| | 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[b] |
| Hungary | 1995 | .. | .. | 1994 | 1988 | 1989 | .. | 1994 |
| India | 1993 | 1989 | 1994 | 1994 | 1991 | 1992 | 1995 | 1994 |
| Indonesia | 1993 | 1994 | 1993 | 1994 | 1992 | 1992 | 1994 | 1994 |
| Iran, Islamic Rep. | .. | .. | .. | 1996 | 1991 | 1991 | .. | 1996 |
| Iraq | .. | .. | .. | .. | .. | .. | 1994 | .. |
| Ireland | .. | .. | .. | 1994 | 1988 | 1989 | .. | 1996 |
| Israel | .. | .. | .. | 1996 | 1992 | 1992 | .. | 1995 |
| Italy | .. | .. | .. | 1994 | 1988 | 1989 | 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 | 1989 | 1989 | 1994 | 1994 |
| Korea, Dem. Rep. | .. | .. | .. | 1995 | 1995 | 1995 | .. | 1995 |
| Korea, Rep. | .. | .. | .. | 1994 | 1992 | 1992 | 1996 | 1995 |
| Kuwait | .. | .. | .. | 1995 | 1993 | 1993 | 1994 | .. |
| Kyrgyz Republic | 1995 | .. | .. | 2000 [c] | 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 | .. | .. | .. | .. | .. | .. | .. | .. |
| Libya | .. | .. | .. | 1999 [c] | 1990 | 1990 | .. | .. |
| Lithuania | .. | .. | .. | 1995 | 1995 | 1995 | .. | 1996 |
| Macedonia, FYR | .. | .. | .. | 2000 | 1994 | 1994 | 1994 | 1997 [c] |
| Madagascar | 1988 | .. | 1991 | 1996 | 1997 | 1997 | 2001 | 1996 |
| Malawi | 1994 | 1982 | .. | 1994 | 1991 | 1991 | .. | 1994 |
| Malaysia | 1991 | 1979 | 1988 | 1994 | 1989 | 1989 | 1997 | 1994 |
| Mali | .. | 1991 | 1989 | 1995 | 1995 | 1995 | 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 | .. | .. | .. | 1995 | 1997 | 1997 | .. | 1996 |
| Mongolia | 1995 | .. | .. | 1994 | 1996 | 1996 | 1997 | 1993 |
| Morocco | .. | 1980 | 1988 | 1996 | 1996 | 1996 | .. | 1995 |
| Mozambique | 1994 | .. | .. | 1995 | 1994 | 1994 | 1997 | 1995 |
| Myanmar | .. | 1982 | 1989 | 1995 | 1994 | 1994 | 1996 | 1995 |
| Namibia | 1992 | .. | .. | 1995 | 1993 | 1993 | 1994 | 1997 |
| Nepal | 1993 | 1983 | .. | 1994 | 1994 | 1994 | 1998 | 1994 |
| Netherlands | 1994 | .. | .. | 1994 | 1988 | 1989 | 1996 | 1994 |
| New Zealand | 1994 | .. | .. | 1994 | 1987 | 1988 | 1996 | 1993 |
| Nicaragua | 1994 | 1981 | .. | 1996 | 1993 | 1993 | 2000 | 1996 |
| Niger | .. | 1985 | 1991 | 1995 | 1993 | 1993 | .. | 1995 |
| Nigeria | 1990 | .. | 1992 | 1994 | 1989 | 1989 | 1994 | 1994 |
| Norway | .. | .. | 1994 | 1994 | 1986 | 1988 | 1996 | 1993 |
| Oman | .. | 1981 | .. | 1995 | 1999 | 1999 | 1994 | 1995 |
| Pakistan | 1994 | 1994 | 1991 | 1994 | 1993 | 1993 | 1997 | 1994 |
| Panama | 1990 | 1980 | .. | 1995 | 1989 | 1989 | 1996 | 1995 |
| Papua New Guinea | 1992 | 1994 | 1993 | 1994 | 1993 | 1993 | 1997 | 1993 |
| Paraguay | .. | 1985 | .. | 1994 | 1993 | 1993 | 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 | 1989 | 1989 | 1997 | 1994 |
| Puerto Rico | .. | .. | .. | .. | .. | .. | .. | .. |
| Romania | 1995 | .. | .. | 1994 | 1993 | 1993 | 1997 | 1994 |
| Russian Federation | 1999 | .. | 1994 | 1995 | 1986 | 1989 | 1997 | 1995 |

## Table 3.14b

**States that have signed the Convention on Climate Change**

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

***Note:*** Status is as of December 2001.

a. Ratification or accession signed.

*Source:* Secretariat of the United Nations Framework Convention on Climate Change.

| | 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[b] |
| Rwanda | 1991 | 1987 | .. | 1998 | .. | .. | .. | 1996 |
| Saudi Arabia | .. | .. | .. | 1995 | 1993 | 1993 | .. | .. |
| Senegal | 1984 | 1990 | 1991 | 1995 | 1993 | 1993 | 1994 | 1995 |
| Sierra Leone | 1994 | .. | .. | 1995 | .. | .. | 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 | .. | .. | .. | .. | .. | .. | 1994 | .. |
| South Africa | 1993 | .. | .. | 2000 | 1990 | 1990 | 1997 | 2000 |
| Spain | .. | .. | .. | 1994 | 1988 | 1989 | 1997 | 1994 |
| Sri Lanka | 1994 | 1983 | 1991 | 1994 | 1990 | 1990 | 1994 | 1994 |
| Sudan | .. | 1989 | .. | 1994 | 1993 | 1993 | 1994 | 1996 |
| Swaziland | .. | .. | .. | 1997 | .. | .. | .. | 1995 |
| Sweden | .. | .. | .. | 1994 | 1987 | 1988 | 1996 | 1994 |
| Switzerland | .. | .. | .. | 1994 | 1988 | 1989 | .. | 1995 |
| Syrian Arab Republic | 1999 | 1981 | .. | 1996 | 1990 | 1990 | .. | 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 | 1994 | 1994 | .. | 1996 |
| Uganda | 1994 | 1982 | 1988 | 1994 | 1988 | 1988 | 1994 | 1993 |
| Ukraine | 1999 | .. | .. | 1997 | 1986 | 1988 | 1999 | 1995 |
| United Arab Emirates | .. | .. | .. | 1996 | 1990 | 1990 | .. | .. |
| United Kingdom | 1995 | .. | 1994 | 1994 | 1987 | 1989 | 1997 | 1994 |
| United States | 1995 | .. | 1995 | 1994 | 1986 | 1988 | .. | 1993 |
| Uruguay | .. | .. | .. | 1994 | 1989 | 1991 | 1994 | 1994 |
| Uzbekistan | .. | .. | .. | 1994 | 1993 | 1993 | .. | 1995 |
| Venezuela, RB | .. | .. | .. | 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, FR (Serb./Mont.) | .. | .. | .. | 1997 | 1990 | 1991 | 2001 | |
| Zambia | 1994 | 1988 | .. | 1994 | 1990 | 1990 | 1994 | 1993 |
| Zimbabwe | 1987 | 1982 | .. | 1994 | 1993 | 1993 | 1994 | 1995 |

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

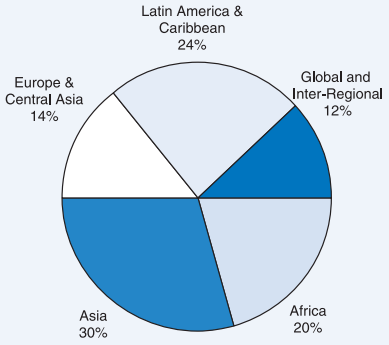
## Figure 3.14

**A global focus on biodiversity and climate change**

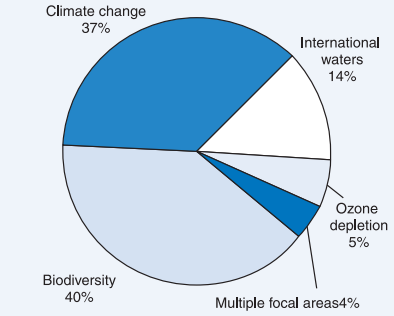
Allocation of funds by the Global Environmental Facility, February 1995-June 2000

Total allocation: $2,937 million

**By region**




**By focal area**




*Source:* Global Environmental Facility data.

## 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 biological diversity 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 (NEAPs), 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). The NEAP is 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 (signedin 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 (SEDAC), Center for International Earth Science Information Network (CIESIN); 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 damage | Adjusted net savings |
|---|---|---|---|---|---|---|---|---|---|
| | % of GNI 2000 | % of GNI 2000 | % of GNI 2000 | % of GNI 2000 | % of GNI 2000 | % of GNI 2000 | % of GNI 2000 | % of GNI 2000 | % of GNI 2000 |
| Afghanistan | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Albania | 13.7 | 9.0 | 4.7 | 2.8 | 1.4 | 0.0 | 0.0 | 0.3 | 5.9 |
| Algeria | .. | 11.2 | .. | 4.5 | 38.1 | 0.0 | 0.0 | 1.2 | .. |
| Angola | -1.8 | 16.1 | -17.9 | 4.4 | .. | 0.0 | 0.0 | 0.8 | .. |
| Argentina | 13.1 | 12.0 | 1.1 | 3.2 | 2.2 | 0.1 | 0.0 | 0.3 | 1.7 |
| Armenia | 2.5 | 8.2 | -5.7 | 1.8 | 0.0 | 0.0 | 0.0 | 1.1 | -5.0 |
| Australia | 18.9 | 16.1 | 2.7 | 5.4 | 1.8 | 1.5 | 0.0 | 0.6 | 4.3 |
| Austria | 24.3 | 14.6 | 9.8 | 5.0 | 0.1 | 0.0 | 0.0 | 0.2 | 14.5 |
| Azerbaijan | 24.5 | 15.1 | 9.5 | 3.0 | .. | 0.0 | 0.0 | 5.3 | .. |
| Bangladesh | 23.3 | 6.1 | 17.2 | 1.7 | 1.2 | 0.0 | 1.0 | 0.4 | 16.3 |
| Belarus | 22.8 | 9.3 | 13.5 | 5.5 | 1.2 | 0.0 | 0.0 | 1.5 | 16.4 |
| Belgium | 23.9 | 14.5 | 9.4 | 3.1 | 0.0 | 0.0 | 0.0 | 0.3 | 12.2 |
| Benin | 10.5 | 7.9 | 2.6 | 2.7 | 0.3 | 0.0 | 1.4 | 0.3 | 3.4 |
| Bolivia | 12.9 | 9.4 | 3.5 | 5.5 | 4.6 | 0.7 | 0.0 | 0.9 | 2.9 |
| Bosnia and Herzegovina | .. | 8.8 | .. | .. | 0.0 | 0.0 | 0.0 | 0.7 | .. |
| Botswana | 12.5 | 11.3 | 1.2 | 7.8 | 0.0 | 0.4 | 0.0 | 0.4 | 8.1 |
| Brazil | 15.9 | 11.2 | 4.7 | 4.8 | 2.1 | 0.8 | 0.0 | 0.3 | 6.3 |
| Bulgaria | 11.0 | 9.9 | 1.1 | 3.1 | 0.3 | 0.6 | 0.0 | 2.8 | 0.5 |
| Burkina Faso | 24.0 | 7.1 | 16.8 | 1.4 | 0.0 | 0.0 | 1.2 | 0.3 | 16.7 |
| Burundi | 0.9 | 6.4 | -5.5 | 3.1 | 0.0 | 0.2 | 3.0 | 0.2 | -5.8 |
| Cambodia | 17.5 | 7.5 | 10.0 | 1.8 | 0.0 | 0.0 | 0.4 | 0.1 | 11.3 |
| Cameroon | 15.9 | 9.1 | 6.8 | 2.3 | 9.5 | 0.0 | 0.0 | 0.2 | -0.5 |
| Canada | 25.3 | 13.0 | 12.3 | 6.5 | 4.4 | 0.2 | 0.0 | 0.5 | 13.7 |
| Central African Republic | 12.0 | 7.6 | 4.5 | 1.6 | 0.0 | 0.0 | 0.0 | 0.2 | 5.9 |
| Chad | 4.5 | 7.0 | -2.6 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.6 |
| Chile | 22.6 | 10.0 | 12.7 | 3.4 | 0.3 | 6.3 | 0.0 | 0.5 | 8.9 |
| China | 39.7 | 9.1 | 30.6 | 2.0 | 3.2 | 0.2 | 0.1 | 2.4 | 26.8 |
| Hong Kong, China | 32.5 | 12.9 | 19.5 | 2.8 | 0.0 | 0.0 | 0.0 | 0.1 | 22.2 |
| Colombia | 13.0 | 10.3 | 2.7 | 3.1 | 8.8 | 0.3 | 0.0 | 0.5 | -3.8 |
| Congo, Dem. Rep. | -4.0 | 7.3 | -11.3 | 0.9 | 2.6 | 0.2 | 0.0 | 0.3 | *-13.5* |
| Congo, Rep. | 41.9 | 13.3 | 28.5 | 6.5 | .. | 0.0 | 0.0 | 0.4 | .. |
| Costa Rica | 13.4 | 6.2 | 7.2 | 5.1 | 0.0 | 0.0 | 0.5 | 0.3 | 11.6 |
| Côte d'Ivoire | 7.3 | 9.2 | -1.9 | 4.5 | 0.0 | 0.0 | 0.9 | 1.0 | 0.8 |
| Croatia | 19.6 | 11.2 | 8.4 | .. | 1.2 | 0.0 | 0.0 | 0.7 | .. |
| Cuba | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Czech Republic | 25.4 | 11.3 | 14.1 | 4.6 | 0.2 | 0.0 | 0.0 | 1.5 | 17.0 |
| Denmark | 24.5 | 15.2 | 9.2 | 8.2 | 0.8 | 0.0 | 0.0 | 0.2 | 16.4 |
| Dominican Republic | 19.6 | 5.4 | 14.2 | 2.1 | 0.0 | 0.7 | 0.0 | 0.6 | 14.9 |
| Ecuador | 32.3 | 10.2 | 22.1 | 3.2 | 29.6 | 0.1 | 0.0 | 1.1 | -5.5 |
| Egypt, Arab Rep. | 22.9 | 9.6 | 13.2 | 4.4 | 5.5 | 0.0 | 0.0 | 0.8 | 11.3 |
| El Salvador | 14.1 | 10.3 | 3.8 | 2.2 | 0.0 | 0.0 | 0.7 | 0.3 | 5.0 |
| Eritrea | .. | 5.9 | .. | 1.4 | 0.0 | 0.0 | 0.0 | .. | .. |
| Estonia | 17.8 | 14.7 | 3.1 | 6.4 | 0.5 | 0.0 | 0.0 | 2.7 | 6.2 |
| Ethiopia | 9.1 | 6.3 | 2.8 | 2.7 | 0.0 | 0.0 | 12.4 | 0.3 | -7.3 |
| Finland | 28.1 | 16.4 | 11.7 | 7.1 | 0.0 | 0.0 | 0.0 | 0.3 | 18.4 |
| France | 21.5 | 12.6 | 9.0 | 5.6 | 0.0 | 0.0 | 0.0 | 0.2 | 14.3 |
| Gabon | 15.0 | 12.7 | 2.3 | 2.1 | 41.6 | 0.0 | 0.0 | 0.4 | -37.6 |
| Gambia, The | 6.3 | 7.9 | -1.6 | 3.6 | 0.0 | 0.0 | 0.1 | 0.4 | 1.5 |
| Georgia | 9.1 | 16.1 | -7.0 | 2.5 | 0.6 | 0.0 | 0.0 | 1.0 | -6.1 |
| Germany | 21.1 | 14.9 | 6.2 | 4.4 | 0.1 | 0.0 | 0.0 | 0.3 | 10.2 |
| Ghana | 13.4 | 7.3 | 6.1 | 4.4 | 0.0 | 1.4 | 3.2 | 0.6 | 5.3 |
| Greece | 16.3 | 8.5 | 7.8 | 2.3 | 0.1 | 0.0 | 0.0 | 0.5 | 9.4 |
| Guatemala | 12.3 | 9.9 | 2.4 | 1.5 | 1.0 | 0.0 | 1.0 | 0.3 | 1.6 |
| Guinea | 14.0 | 8.2 | 5.8 | 1.5 | 0.0 | 4.0 | 0.7 | 0.3 | 2.2 |
| Guinea-Bissau | .. | 7.4 | .. | 2.7 | 0.0 | 0.0 | 0.0 | 0.6 | .. |
| Haiti | 1.9 | 1.8 | 0.1 | 1.6 | 0.0 | 0.0 | 2.5 | 0.2 | -1.1 |
| Honduras | 31.3 | 5.6 | 25.8 | 3.5 | 0.0 | 0.2 | 0.0 | 0.5 | 28.6 |

| | Gross national savings | Consumption of fixed capital | Net national savings | Education expenditure | Energy depletion | Mineral depletion | Net forest depletion | Carbon dioxide damage | Adjusted net savings |
|---|---|---|---|---|---|---|---|---|---|
| | % of GNI 2000 | % of GNI 2000 | % of GNI 2000 | % of GNI 2000 | % of GNI 2000 | % of GNI 2000 | % of GNI 2000 | % of GNI 2000 | % of GNI 2000 |
| Hungary | 24.8 | 11.5 | 13.3 | 4.6 | 0.7 | 0.0 | 0.0 | 0.9 | 16.3 |
| India | 23.5 | 9.6 | 13.9 | 3.3 | 2.2 | 0.4 | 1.0 | 1.6 | 12.2 |
| Indonesia | 21.5 | 5.6 | 15.9 | 0.6 | 10.9 | 1.4 | 0.3 | 1.0 | 2.9 |
| Iran, Islamic Rep. | 34.6 | 9.7 | 24.9 | 3.2 | 38.6 | 0.1 | 0.0 | 1.8 | -12.5 |
| Iraq | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Ireland | 30.5 | 12.1 | 18.5 | 5.5 | 0.0 | 0.1 | 0.0 | 0.4 | 23.5 |
| Israel | 15.0 | 14.9 | 0.1 | 6.3 | 0.0 | 0.0 | 0.0 | 0.4 | 6.0 |
| Italy | 20.6 | 13.6 | 7.0 | 4.6 | 0.1 | 0.0 | 0.0 | 0.2 | 11.2 |
| Jamaica | 22.4 | 11.1 | 11.4 | 6.8 | 0.0 | 1.8 | 0.0 | 0.9 | 15.5 |
| Japan | 29.4 | 15.9 | 13.5 | 4.6 | 0.0 | 0.0 | 0.0 | 0.1 | 18.0 |
| Jordan | 21.9 | 10.6 | 11.4 | 5.6 | 0.0 | 0.0 | 0.0 | 1.2 | 15.8 |
| Kazakhstan | 21.5 | 10.1 | 11.5 | 4.6 | 40.6 | 0.0 | 0.0 | 5.1 | -29.6 |
| Kenya | 11.3 | 7.9 | 3.4 | 6.1 | 0.0 | 0.0 | 0.9 | 0.5 | 8.1 |
| Korea, Dem. Rep. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Korea, Rep. | 31.3 | 12.1 | 19.2 | 3.4 | 0.0 | 0.0 | 0.0 | 0.6 | 21.9 |
| Kuwait | 42.7 | 6.5 | 36.1 | 4.2 | 48.1 | 0.0 | 0.0 | 0.7 | -8.4 |
| Kyrgyz Republic | 4.8 | 8.0 | -3.2 | 5.5 | 1.5 | 0.0 | 0.0 | 3.6 | -2.9 |
| Lao PDR | 16.4 | 7.9 | 8.5 | 1.8 | 0.0 | 0.1 | 0.0 | 0.2 | 10.1 |
| Latvia | 20.2 | 10.7 | 9.5 | 6.2 | 0.0 | 0.0 | 0.0 | 0.8 | 15.0 |
| Lebanon | -0.5 | 10.3 | *-10.8* | 1.6 | 0.0 | 0.0 | 0.0 | 0.6 | *-9.8* |
| Lesotho | 18.4 | 6.3 | 12.1 | 6.4 | 0.0 | 0.0 | 1.6 | .. | .. |
| Liberia | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Libya | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Lithuania | 15.0 | 10.2 | 4.8 | 5.3 | 0.4 | 0.0 | 0.0 | 0.9 | 8.9 |
| Macedonia, FYR | 13.8 | 10.0 | 3.8 | .. | 0.0 | 0.0 | 0.0 | 2.2 | .. |
| Madagascar | 7.1 | 7.5 | -0.4 | 1.8 | 0.0 | 0.0 | 0.0 | 0.2 | 1.2 |
| Malawi | -0.7 | 6.9 | -7.6 | 3.8 | 0.0 | 0.0 | 4.0 | 0.3 | -8.1 |
| Malaysia | 42.2 | 11.8 | 30.4 | 4.3 | 10.8 | 0.0 | 0.3 | 1.0 | 22.5 |
| Mali | 10.9 | 7.3 | *3.6* | 2.2 | 0.0 | 0.0 | 0.0 | 0.1 | *5.7* |
| Mauritania | 30.8 | 8.0 | 22.7 | 3.7 | 0.0 | 20.6 | 0.0 | 2.2 | 3.7 |
| Mauritius | 23.1 | 10.9 | 12.2 | 3.3 | 0.0 | 0.0 | 0.0 | 0.3 | 15.2 |
| Mexico | 20.7 | 10.6 | 10.1 | 4.5 | 5.9 | 0.1 | 0.0 | 0.5 | 8.1 |
| Moldova | 12.2 | 7.2 | 4.9 | 8.4 | 0.0 | 0.0 | 0.0 | 4.4 | 9.0 |
| Mongolia | 22.4 | 10.9 | 11.5 | .. | 0.0 | 1.6 | 0.0 | 5.3 | .. |
| Morocco | 23.6 | 9.6 | 14.0 | 4.7 | 0.0 | 0.5 | 0.0 | 0.7 | 17.6 |
| Mozambique | 10.1 | 7.7 | 2.5 | 3.7 | 0.0 | 0.0 | 0.0 | 0.2 | 5.9 |
| Myanmar | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Namibia | 27.5 | 13.3 | 14.2 | 8.4 | 0.0 | 0.1 | 0.0 | 0.0 | 22.5 |
| Nepal | 22.0 | 2.3 | 19.7 | 2.1 | 0.0 | 0.0 | 4.9 | 0.3 | 16.6 |
| Netherlands | 28.7 | 14.6 | 14.1 | 5.1 | 0.5 | 0.0 | 0.0 | 0.3 | 18.4 |
| New Zealand | 18.6 | 11.1 | 7.5 | 6.9 | 1.6 | 0.1 | 0.0 | 0.4 | 12.2 |
| Nicaragua | 14.1 | 9.3 | 4.7 | 2.6 | 0.0 | 0.1 | 0.3 | 1.1 | 5.9 |
| Niger | 1.4 | 7.0 | -5.6 | 3.0 | 0.0 | 0.0 | 3.2 | 0.4 | -6.3 |
| Nigeria | 29.9 | 8.6 | 21.2 | 0.8 | 51.6 | 0.0 | 0.8 | 1.5 | -31.8 |
| Norway | 36.8 | 16.2 | 20.6 | 6.9 | 7.7 | 0.0 | 0.0 | 0.2 | 19.5 |
| Oman | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Pakistan | 12.6 | 7.9 | 4.7 | 2.4 | 3.2 | 0.0 | 0.9 | 1.1 | 1.9 |
| Panama | 22.1 | 7.9 | 14.2 | 4.8 | 0.0 | 0.0 | 0.0 | 0.4 | 18.5 |
| Papua New Guinea | 17.7 | 9.2 | 8.6 | .. | 13.9 | 10.8 | 0.0 | 0.4 | .. |
| Paraguay | 9.7 | 9.5 | 0.2 | 3.5 | 0.0 | 0.0 | 0.0 | 0.3 | 3.3 |
| Peru | 17.8 | 10.4 | 7.4 | 2.6 | 1.4 | 1.3 | 0.0 | 0.3 | 7.0 |
| Philippines | 28.9 | 8.1 | 20.8 | 2.9 | 0.0 | 0.1 | 0.8 | 0.6 | 22.2 |
| Poland | 20.6 | 11.0 | 9.6 | 5.1 | 0.4 | 0.1 | 0.0 | 1.5 | 12.7 |
| Portugal | 18.1 | 15.2 | 2.9 | 5.6 | 0.0 | 0.0 | 0.0 | 0.3 | 8.1 |
| Puerto Rico | .. | 11.3 | .. | .. | 0.0 | 0.0 | 0.0 | 0.3 | .. |
| Romania | 15.2 | 9.9 | 5.3 | 3.3 | 4.1 | 0.0 | 0.0 | 1.7 | 2.8 |
| Russian Federation | 35.4 | 10.3 | 25.1 | 3.9 | 38.4 | 0.0 | 0.0 | 4.0 | -13.4 |

# 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 damage | Adjusted net savings |
|---|---|---|---|---|---|---|---|---|---|
| | % of GNI 2000 | % of GNI 2000 | % of GNI 2000 | % of GNI 2000 | % of GNI 2000 | % of GNI 2000 | % of GNI 2000 | % of GNI 2000 | % of GNI 2000 |
| Rwanda | 14.2 | 7.3 | 6.9 | 3.3 | 0.0 | 0.0 | 3.9 | 0.2 | 6.0 |
| Saudi Arabia | 31.3 | 10.0 | 21.3 | 6.2 | 53.9 | 0.0 | 0.0 | 1.0 | -27.3 |
| Senegal | 13.6 | 8.3 | 5.3 | 3.4 | 0.0 | 0.1 | 0.0 | 0.6 | 8.1 |
| Sierra Leone | .. | 6.7 | .. | 1.1 | 0.0 | 0.1 | 3.4 | 0.4 | .. |
| Singapore | 51.5 | 13.3 | 38.2 | 2.3 | 0.0 | 0.0 | 0.0 | 0.6 | 39.9 |
| Slovak Republic | 26.9 | 10.9 | 15.9 | 4.3 | 0.1 | 0.0 | 0.0 | 1.3 | 18.8 |
| Slovenia | 24.6 | 12.0 | 12.6 | 5.2 | 0.0 | 0.0 | 0.0 | 0.6 | 17.2 |
| Somalia | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| South Africa | 15.1 | 13.3 | 1.7 | 6.9 | 1.4 | 0.9 | 0.2 | 1.7 | 4.5 |
| Spain | 23.0 | 12.9 | 10.1 | 4.6 | 0.0 | 0.0 | 0.0 | 0.3 | 14.4 |
| Sri Lanka | 21.7 | 5.2 | 16.5 | 2.6 | 0.0 | 0.0 | 0.8 | 0.3 | 18.0 |
| Sudan | 2.7 | 9.4 | -6.7 | 0.9 | 0.0 | 0.1 | 0.0 | 0.3 | -6.2 |
| Swaziland | 13.7 | 9.4 | 4.3 | 6.5 | 0.0 | 0.0 | 0.0 | 0.2 | 10.6 |
| Sweden | 20.8 | 14.1 | 6.7 | 7.5 | 0.0 | 0.1 | 0.0 | 0.1 | 14.0 |
| Switzerland | 33.8 | 14.9 | 19.0 | 4.8 | 0.0 | 0.0 | 0.0 | 0.1 | 23.6 |
| Syrian Arab Republic | 20.1 | 9.8 | 10.3 | 2.6 | 38.8 | 0.0 | 0.0 | 2.0 | -27.9 |
| Tajikistan | 15.0 | 7.2 | 7.8 | 2.0 | 0.6 | 0.0 | 0.0 | 4.1 | 5.2 |
| Tanzania | 14.5 | 7.5 | 6.9 | 3.4 | 0.0 | 0.1 | 0.0 | 0.2 | 10.1 |
| Thailand | 30.3 | 14.9 | 15.4 | 3.5 | 1.3 | 0.0 | 0.3 | 1.0 | 16.2 |
| Togo | 10.2 | 7.6 | 2.6 | 4.3 | 0.0 | 0.1 | 1.2 | 0.5 | 5.2 |
| Trinidad and Tobago | 18.4 | 12.4 | 6.1 | 3.4 | 31.5 | 0.0 | 0.0 | 2.3 | *-24.3* |
| Tunisia | 24.6 | 10.0 | 14.7 | 6.6 | 4.7 | 0.0 | 0.2 | 0.7 | 15.6 |
| Turkey | 20.0 | 6.8 | 13.2 | 3.2 | 0.3 | 0.0 | 0.0 | 0.7 | 15.3 |
| Turkmenistan | 29.1 | 9.4 | 19.6 | .. | .. | 0.0 | 0.0 | 5.8 | .. |
| Uganda | 11.4 | 7.5 | 3.9 | 2.2 | 0.0 | 0.0 | 2.3 | 0.1 | 3.7 |
| Ukraine | 24.1 | 19.4 | 4.7 | 6.1 | 7.6 | 0.0 | 0.0 | 7.4 | -4.2 |
| United Arab Emirates | .. | 11.9 | .. | 1.7 | 41.9 | 0.0 | 0.0 | 1.0 | .. |
| United Kingdom | 15.2 | 11.6 | 3.6 | 4.7 | 1.1 | 0.0 | 0.0 | 0.2 | 7.0 |
| United States | 18.0 | 11.9 | 6.1 | 4.7 | 1.1 | 0.0 | 0.0 | 0.4 | 9.3 |
| Uruguay | 11.3 | 11.6 | -0.3 | 3.0 | 0.0 | 0.0 | 0.3 | 0.2 | 2.3 |
| Uzbekistan | 13.9 | 7.9 | 5.9 | 7.8 | .. | 0.0 | 0.0 | 9.6 | .. |
| Venezuela, RB | 29.0 | 7.2 | 21.8 | 5.0 | 26.4 | 0.3 | 0.0 | 0.9 | -0.7 |
| Vietnam | 29.4 | 8.0 | 21.4 | 2.8 | 8.4 | 0.0 | 1.2 | 1.0 | 13.6 |
| West Bank and Gaza | .. | 8.3 | .. | .. | 0.0 | 0.0 | 0.0 | .. | .. |
| Yemen, Rep. | 36.3 | 9.5 | 26.7 | 5.7 | 49.2 | 0.0 | 0.0 | 1.5 | -18.2 |
| Yugoslavia, Fed. Rep. | .. | 8.9 | .. | 4.6 | 2.3 | 0.0 | 0.0 | 3.0 | .. |
| Zambia | .. | 7.9 | .. | 2.0 | 0.1 | 2.7 | 0.0 | 0.5 | .. |
| Zimbabwe | .. | 8.8 | .. | 7.5 | 0.4 | 2.6 | 0.0 | 1.4 | .. |
| **World** | **22.9 w** | **12.7 w** | **10.2 w** | **4.6 w** | **2.2 w** | **0.1 w** | **0.0 w** | **0.5 w** | **12.0 w** |
| **Low income** | 20.7 | 8.7 | 11.9 | 2.8 | 7.2 | 0.5 | 0.9 | 1.5 | 4.7 |
| **Middle income** | 25.3 | 10.3 | 14.9 | 3.8 | 8.0 | 0.3 | 0.1 | 1.2 | 9.1 |
| Lower middle income | 32.4 | 9.7 | 22.7 | 2.9 | 10.1 | 0.2 | 0.1 | 2.0 | 13.1 |
| Upper middle income | 20.9 | 10.8 | 10.0 | 4.4 | 6.5 | 0.4 | 0.0 | 0.7 | 6.9 |
| **Low & middle income** | 24.6 | 10.1 | 14.5 | 3.6 | 7.9 | 0.3 | 0.2 | 1.3 | 8.4 |
| East Asia & Pacific | 34.0 | 9.9 | 24.1 | 2.5 | 3.2 | 0.2 | 0.1 | 1.7 | 21.3 |
| Europe & Central Asia | 25.9 | 10.0 | 15.9 | 4.2 | 12.7 | 0.0 | .. | 2.3 | .. |
| Latin America & Carib. | 17.0 | 10.6 | 6.4 | 4.2 | 5.1 | 0.6 | 0.0 | 0.4 | 4.4 |
| Middle East & N. Africa | 28.1 | 10.0 | 18.1 | 4.8 | 31.6 | 0.1 | 0.0 | 1.1 | -10.0 |
| South Asia | 21.9 | 9.0 | 13.0 | 3.1 | 2.1 | 0.3 | 1.0 | 1.4 | 11.3 |
| Sub-Saharan Africa | 14.8 | 10.7 | 4.1 | 4.7 | 9.7 | 0.6 | 0.7 | 1.1 | -3.3 |
| **High income** | 22.5 | 13.4 | 9.1 | 4.8 | 0.8 | 0.0 | 0.0 | 0.3 | 12.8 |
| Europe EMU | 22.0 | 13.8 | 8.2 | 4.7 | 0.1 | 0.0 | .. | 0.3 | .. |

## 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 if 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 indicates 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 types of adjustments. First, estimates of capital consumption of produced assets are deducted to obtain net national savings. Then current expenditures on education are added to net national savings (in standard national accounting these expenditures are treated as consumption). Next, 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. Finally, a deduction is made for damage from carbon dioxide emissions. (In earlier editions of the *World Development Indicators* these adjustments were made to gross domestic savings and the adjusted net saving figures were referred to as "genuine savings").

Education expenditures are treated as an addition to savings effort. However, owing to 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 gaps in the accounting of natural resource depletion and costs of pollution. Key estimates missing on the resource side include the value of fossil water extracted from aquifers, depletion and degradation of soils, and net depletion of fish stocks. The most important pollutants affecting human health and economic assets are also excluded, because no internationally comparable data are widely available on damage from particulate emissions, ground-level ozone, or sulfur oxides.

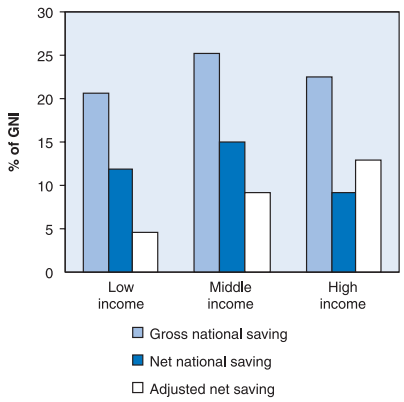
Estimates of resource depletion are based on the calculation of unit resource rents. An economic rent represents an excess return to a given factor of production—that is, in this case the returns from resource extraction or harvest are higher than the normal rate of return on capital. Natural resources 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 is calculated as the marginal social cost associated with a unit of pollution multiplied by the increase in the stock of pollutant in the receiving medium. For 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.

### Figure 3.15

**Adjusted net savings were far lower in low-income economies than in others in 2000.**




*Source:* Table 3.15.

## Definitions

• **Gross national savings** are calculated as the difference between GNI 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 the 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 crude oil, natural gas, and coal. • **Mineral depletion** is equal to the product of unit resource rents and the physical quantities of minerals extracted. It refers to bauxite, copper, iron, lead, nickel, phosphate, tin, zinc, gold, and silver. • **Net forest depletion** is calculated as the product of unit resource rents and the excess of roundwood harvest over natural growth. • **Carbon dioxide 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. • **Adjusted net savings** are equal to net national savings plus education expenditure and minus energy depletion, mineral depletion, net forest depletion, and carbon dioxide 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 2000. The education expenditure data are from the United Nations Statistics Division's *Statistical Yearbook 1997,* extrapolated to 2000. 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 conceptual underpinnings of the savings measure appear in Hamilton and Clemens (1999).