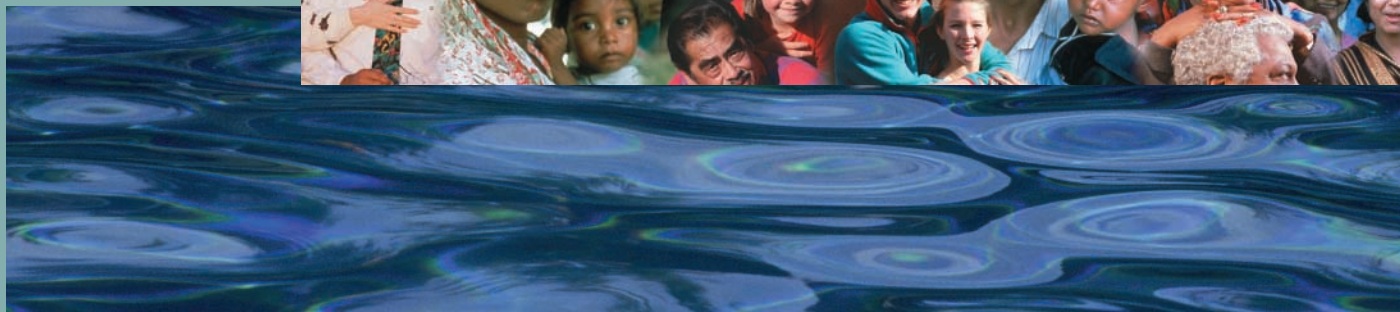
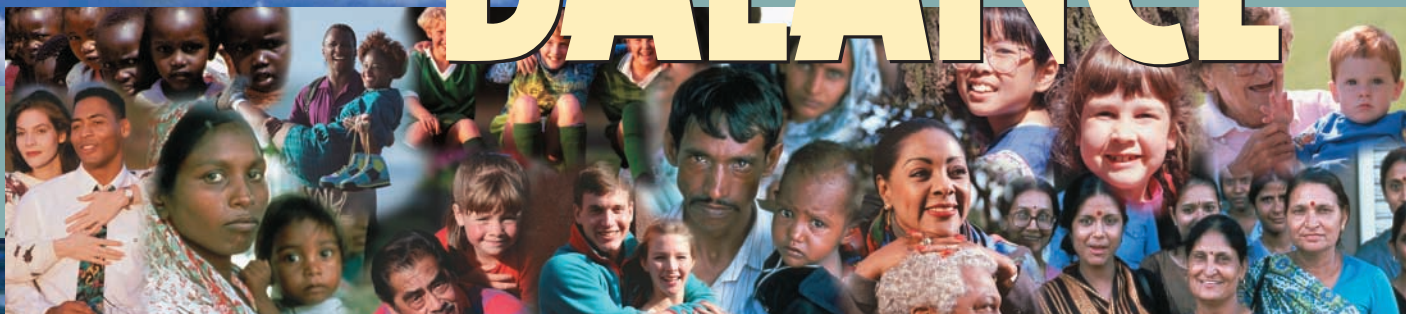


# PEOPLE

*Population and  
Natural Resources  
at the Turn  
of the Millennium*

*in the* **BALANCE**



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Bonnie Dye

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# SUMMARY

At the turn of the millennium, the future of the relationship between people and critical natural resources has begun to appear more hopeful than it has for some time. Human population growth is slowing down. While slowing, however, significant growth continues, meaning that more people will be sharing such finite resources as fresh water and cropland. And in some regions—notably in sub-Saharan Africa and parts of Asia—large families and early pregnancies provide strong momentum for population growth that could continue for generations to come. But the braking of this growth has been significant enough that many analysts of natural resources are more optimistic about their future availability than they were in the early 1990s.

This publication updates key data on population growth and the state of critical natural resources as the millennium turns. Among its key findings:

► By the year 2025, between 2.4 billion and 3.2 billion people could live in either water-scarce or water-stressed conditions, depending on future rates of population growth. This compares with 505 million people in these circumstances in the year 2000. Water shortage is likely to grow especially acute in the Middle East and in much of Africa.

► An estimated 420 million people live today in countries that have less than .07 hectare of cultivated land per person. This benchmark is considered the bare minimum capable of supplying a vegetarian diet for one person, under ideal conditions without use of artificial chemical inputs or loss of soil and soil nutrients. The number of people living

in such critically land-scarce countries is projected to increase to between 557 million and 1.04 billion in 2025.

► Global fish production climbed modestly in 1997, mostly from the expansion of aquaculture in China. Most fisheries worldwide remain fully exploited or in decline, however, and the amount of fish caught per fisher is declining steadily.

► Today about 1.8 billion people live in 40 countries with less than 0.1 hectare of forested land per capita, an indicator of critically low levels of forest cover. Based on the medium population projection and current trends in deforestation, by 2025, the number of people affected could nearly triple to 4.6 billion.

► One-fifth of the world's population lives on the 12 percent of its land surface with the highest densities of non-human species. Human population is growing significantly faster in these *biodiversity hotspots* than in the world—or even in developing countries—as a whole.

► In 1996, measurable per capita emissions of CO<sub>2</sub> rose modestly. This continued a several-year trend of increasing per capita fossil-fuel consumption that, in combination with growing world population, raised the risk of climate change by accelerating the accumulation of greenhouse gases in the global atmosphere. With less than 5 percent of world population, the United States contributed more than 20 percent of these important emissions.

Population is hardly the only force applying pressure to the natural world and the resources it provides. But few would argue that the environmental challenges humanity faces in the 21st century and beyond will become easier to address as the number of human

beings continues to increase. For each of the natural resources considered here, the long ascent of population reveals itself as a critical variable influencing resource availability on local, regional and global scales.

The most hopeful aspect of the slowing of population growth remains little known among environmentalists and the general public. More and more, young people on every continent want to start bearing children later in life and to have smaller families than at any time in history. Likewise, in greater proportions than ever, women and girls in particular want to go to school and to college, and they want to find fulfilling and well-paid employment. Helping people in every country obtain the information and services they need to put these ambitions into effect is all that can be done, and all that needs to be done, to bring world population growth to a stable landing in the new century.

What is needed is for government and the private sector to make reproductive health services available to all who seek them, to make sure that girls and boys can go to and stay in school, and to make economic opportunities as accessible to women as to men. Combined with improved energy and natural-resource technologies and saner models of consumption and the “good life,” these strategies can bring humanity into enduring balance with the environment and the natural resources that people will always need. ■■■

# POPULATION TRENDS and ENVIRONMENTAL LINKAGES, 2000

How many people can a millennium support? Demographically, the one now ending could scarcely have been more different from the one that preceded it. From the year 1 to A.D. 1000, world population was essentially stable, with any increases eventually balanced by equal decreases. By demographers' best estimates, the first millennium began with 300 million people on the planet, and ended with about the same number.<sup>1</sup> As the second millennium closes, by contrast, there are 20 times more people on the planet, and no certainty about when or at what number world population growth will end.

The unprecedented growth of the past thousand years is linked in complex ways to the environmental challenges humanity faces in the next thousand. The data in this publication trace the impact of this growth on the changing availability of natural resources that are critical to human well-being. Population growth—and the related growth of natural-resource consumption—has strained the natural environment, but the demographic

trends of the past 30 years are also a source of hope for nature and humanity's future. The growth of world population is slowing down because women are increasingly delaying childbearing and having fewer children than ever before.

Human numbers are still rising at a pace that would result in a population of 12 billion people by the middle of the new century—if those growth rates continued without change. In much of the world, per capita income and natural-resource consumption are increasing even more rapidly. Along with many scientists, environmentalists worry that the 21st century will witness growing scarcities of key natural resources that could contribute to poverty, conflicts and increases in death rates. Yet, at the same time, the fact that birthrates are falling means that populations of most nations will become progressively older and in some cases will even shrink in the 21st century.

To unravel the competing concerns, it helps to understand that demographic patterns vary between regions and levels of economic development.

It also pays to consider the long view and not to assign too much certainty to demographic projections. We can examine ranges of likely outcomes [see chart, *The Range of Possibilities*, on p. 5], but we cannot know the future. The spread of most likely outcomes calculated by United Nations demographers suggests that the 21st century will end with between 5 billion and 16 billion people, but we cannot even be sure of this. Projections of global and national population change are neither forecasts nor estimates. Rather they are straightforward calculations based on current population trends in each country, modified by assumptions about future rates of births, deaths and migration.

Critically, population projections assume continued declines in both birth and death rates. Yet neither of these trends is assured, especially in the absence of major new investments in education and health care. The set of health services most closely related to population change is *reproductive health programs*. These programs contribute to lower birth rates through

providing contraceptive services, and prolong life by addressing the health of mothers and children and dampening transmission of the virus that causes AIDS. What happens to world population tomorrow depends critically on the investments that governments and others make today, especially in reproductive health but also in education and economic opportunities that improve the lives of girls and women.

Here is where we are after the turning of the calendar's zeros: There are more than six billion of us, almost four times as many as in 1900. Life expectancy has soared, especially the survival prospects for infants and children, the latter the dominant factor in the population growth of the 1900s. At the opening of the Third Millennium, our settlements and farm fields dominate much of the six habitable continents, and for the first time in history we are almost as likely to live in a city or suburb as in a village or on a farm. On average, each of us is or will become a parent to 2.5 children, and world population grows by about 1.3 percent annually. This means Earth is



home to roughly 78 million more people each year, 215,000 more each day, 9,000 more each hour.

All but 3 percent of this growth takes place in developing countries, yet the United States and some other industrialized countries also contribute to world population growth. And the average age of human beings is rising as birthrates decline and life expectancy increases. Yet 1 billion of the planet's inhabitants are between 15 and 24 years old, and in many countries school construction barely keeps pace with the need for new classrooms.

### Widening Gaps

It is increasingly a demographically uneven world, mirroring to some extent the economically uneven world in which one-fifth of the population, mostly living in industrialized countries, earns the vast majority of monetary income. Life expectancy continues to rise in much of the world. But over the last quarter century it fell in 18 countries,<sup>2</sup> most of them overwhelmed by the HIV/AIDS pandemic. In Europe,

family size has dropped well below the roughly two-child level at which parents replace themselves in the population, setting the stage for current or future population declines. In the United States, Canada and Australia, fertility rates are closer to replacement level. Due to both large proportions of young people and relatively high immigration rates, population growth averages around 1 percent annually in these countries, with no end to population growth in sight. In Latin America and in Asia—the continent on which most human beings live—access to contraception has helped fertility rates to fall by half in little more than a generation. Population growth rates in these regions resemble that of the world as a whole.

In most of Africa and in the Middle East the transition to later childbirths and small families has not yet advanced very far. Family size still averages five or six children, and significant increases in population appear to be in store for countries that already are critically short of cropland, forests and renewable fresh water. Population growth rates often exceed 2.6 percent, twice the global rate,

in a number of countries where governments have the fewest resources for needed education and health care.

### People and the Balance of Natural Resources

It may be that *human* resources are the most important for development and prosperity, yet history and current experience demonstrate that this is most true when *natural* resources are abundant, cheap and accessible to all. Today's globalized and computerized economy, for example, owes much to inexpensive fossil fuel for the low prices of food, transportation and indoor temperature control. These low prices, in turn, free up income for consumption of less essential goods. If fossil fuel—or fresh water, or cropland, or wood products—suddenly became scarce and expensive, appreciation for the importance of natural resources would return quickly. And despite innovative approaches to dealing with changes in natural-resource supply, the reality is that supplies of these resources are finite.

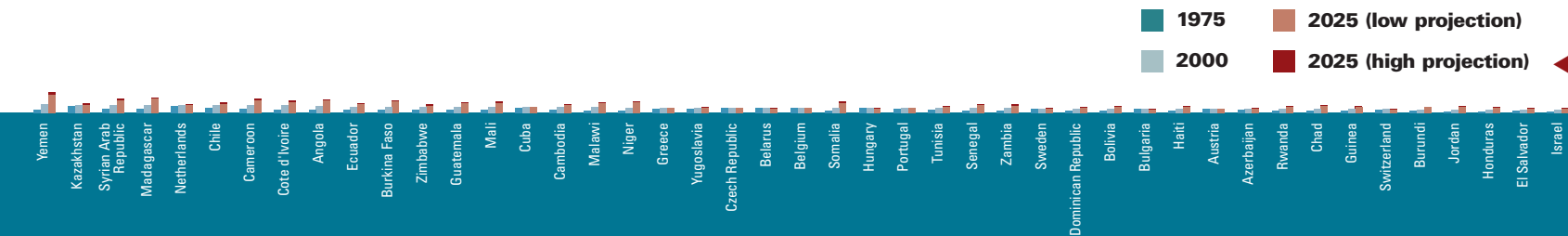
In the case of most critical natural resources, supplies are diminishing or degrading as more human beings use them with greater intensity. They must be shared among more people, and this can spark a sequence of competing claims and rising anxieties that challenges governments and other institutions. The long debate over the impact of population growth on the environment is gradually converging on overall agreement that contemporary population growth is among a handful of factors that strongly influence the sustainability of natural-resource use in many or most places. Population never acts alone in causing such environmental problems as water scarcity and global warming. Yet its influence cannot be severed from more direct causes of these problems, such as overdrawn aquifers and rising greenhouse gas emissions.

### The Growing Impact

Over long periods, population growth tends to expand the scale of human activities and thus magnifies the

### The Population of Nations, 1975, 2000 and 2025 (projected)

The bar representing projected 2025 population in each country is shaded to illustrate both the low population projection (light red shading) and the incremental difference the high projection would add (dark red shading).

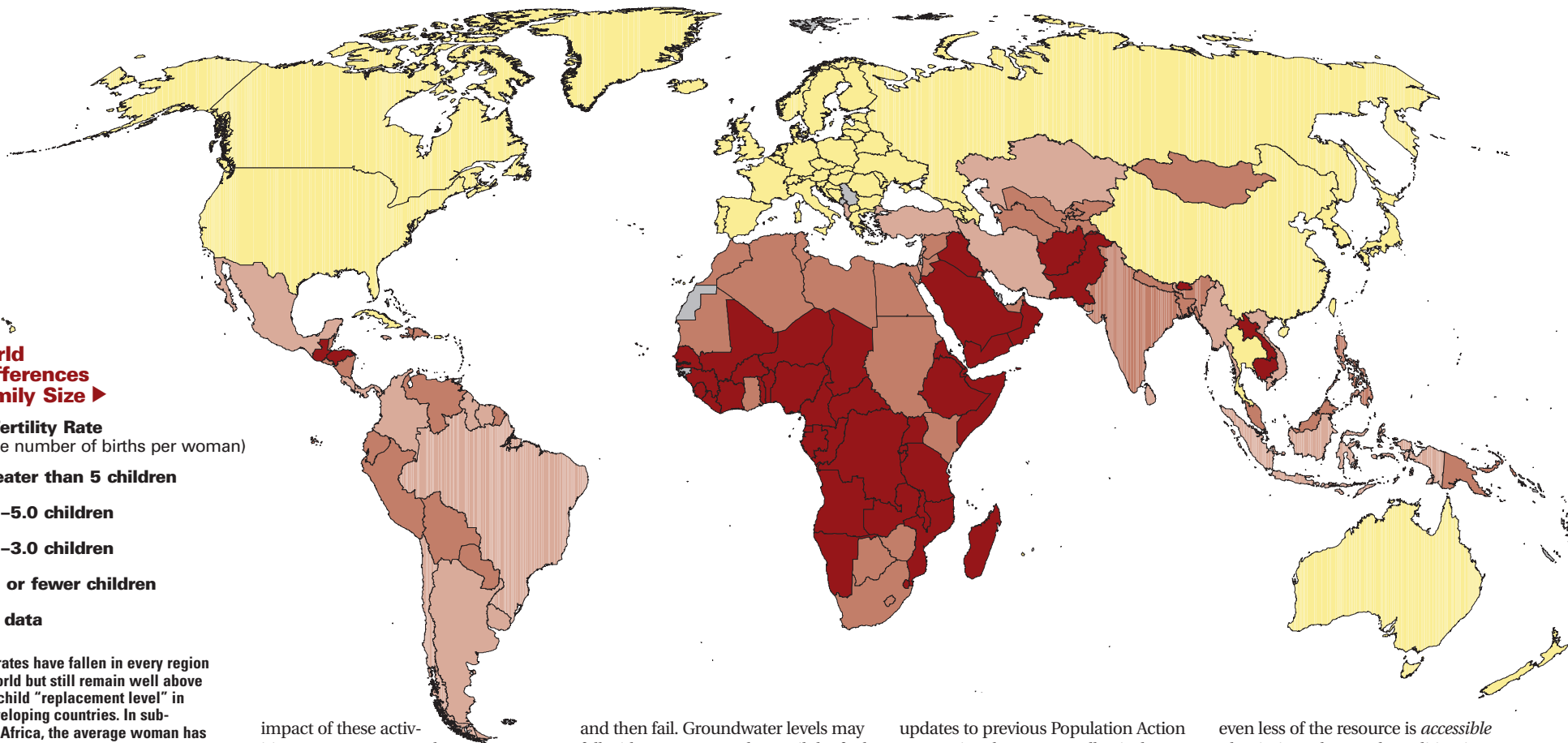


### A World of Differences in Family Size ▶

**Total Fertility Rate**  
(average number of births per woman)

- Greater than 5 children
- 3.1–5.0 children
- 2.2–3.0 children
- 2.1 or fewer children
- No data

Fertility rates have fallen in every region of the world but still remain well above the two-child “replacement level” in most developing countries. In sub-Saharan Africa, the average woman has more than five children in her lifetime.



impact of these activities on ecosystems and natural resources such as the atmosphere, forests and water supplies. Scale is critical in determining when human interactions with the environment become unsustainable. Often natural resource bases will accumulate stress for decades without apparent harm, until some previously unforeseen natural threshold is crossed, and resource decline or scarcity hits local inhabitants. Soil erosion may continue with no major damage until crop roots encounter rocky soil—

and then fail. Groundwater levels may fall with no great penalty, until the fuel needed to lift water out of deep wells becomes unavailable or too expensive. The accumulation of heat-trapping greenhouse gases over centuries may suddenly reach levels that trigger significant changes in temperatures and precipitation. These occurrences, called *jump effects*, tend to increase as population grows, often in concert with rising per capita consumption and changes in technology and policy. The databases, charts and maps in this publication—a compendium of

updates to previous Population Action International reports—collectively illustrate relationships between changing population size and the *availability* of key natural resources (in the sense of their simple presence in the physical environment) needed for health and well-being. For some of these resources, experts have identified benchmarks of per capita availability below which countries can be considered in conditions of stress or scarcity relative to that resource. Inequities within countries further exacerbate resource stress, and may mean that

even less of the resource is *accessible* (that is, in a place and condition in which users can actually gain access to it), especially to the poor. Wealthier countries may import specific resources or find substitutes for them. Nonetheless, per capita natural-resource availability remains an instructive indicator of the overall impact of population change on the natural world. Prior to 1950, most of the natural resources considered here had adequate per capita availability in almost every country. Today the numbers of

people living in countries scarce in renewable fresh water, cropland or forests are growing more rapidly than world population as a whole. Without major efforts to address this trend, the 21st century is likely to witness an upward spiral of natural-resource stress and scarcity.

### New Models of Consumption

Consumption patterns also influence relationships between population and natural resources. If every one of the world's 6 billion inhabitants consumed as much paper and petroleum as do each of the United States' 278 million inhabitants, the damage to forests, soils, air and climate would be catastrophic. Unless we are willing to tolerate an economically divided world, we must transform the model of the good life that now dominates the airwaves worldwide. The logical place to begin that transformation is within the wealthy countries themselves.

The role of consumption in environmental change, however, is impossible to disassociate from population, the size of which determines how much per capita natural-resource consumption can be sustained in an equitable society without extremes of income and consumption. Over short time periods, growth in per capita consumption may well be more decisive a factor in environmental degradation than population growth. Over the long term, the increase of the human species from a few million to several billion individuals has made per capita

consumption levels the environmental issue they are today. It is no accident, for example, that the industrial revolution began in the 18th century but that the rise of carbon dioxide concentrations in the atmosphere became dramatic only after world population had climbed beyond 1.5 billion people in the early 20th century. Something will have to change to accommodate the long-term growth of human appetites and activities, and a stabilized population and more sustainable models of consumption are both essential to such a shift.

### Managing Human Interactions

The role of population growth is also impossible to separate from the management of human affairs by governments and other legal, social and economic institutions. Most of the charts in this report consider how much of particular natural resources are available to each person in a country. Others show how much of a resource people are actually extracting from the earth, processing, using and disposing. But mediating the flow of natural resources between the earth and human beings are the social regulating valves known as *institutions*. These may be governments and their policies and programs. They also may be rules of law, economic markets, and such legal principles as the right to hold and dispose of property.

The development of these social structures and processes plays a critical role in the management and con-

servation of natural resources worldwide. Institutions may or may not work well. Acknowledging disparities in institutional development is essential to understanding the effects of population change, and indeed population change itself plays important roles in institutional development.

### Population and Hope

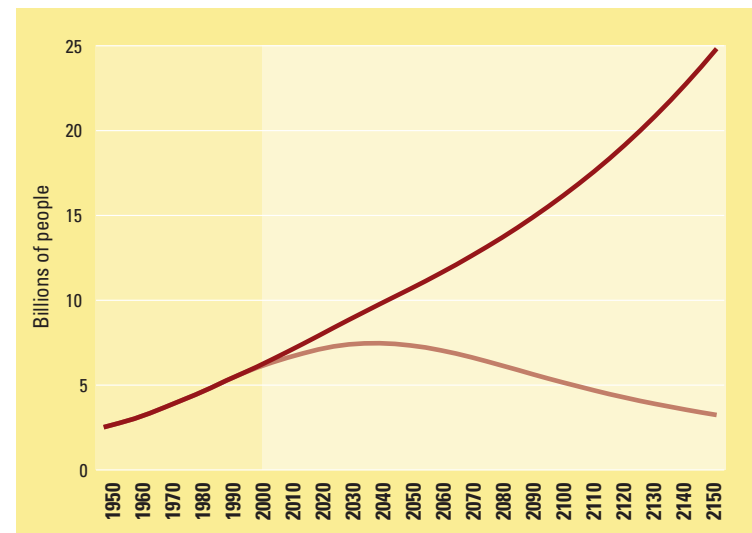
Future historians may see the 20th century as a demographic anomaly—seven decades of accelerating population growth, unlike any previously experienced, followed by three of subsidizing growth as use of contraception spread around the world. There is no certainty about future trends, however. And barring catastrophe, human population will continue expanding for decades to come. The planet's water and land resources will provide less amply for each person, and environmental problems will become more challenging to resolve. At what level and in what decade population growth halts, and what kind of societies witness this peak, will depend very much on how seriously governments and other social institutions take the commitments agreed to at the International Conference on Population and Development (ICPD) in Cairo in 1994.

In Cairo, the governments of the world agreed on a set of policies that could lead to a stabilized world population but which also make sense on other grounds. The relatively inexpensive strategies endorsed at this meeting are worth supporting regardless of

population's role in environmental or human well-being. The strategies are grounded not in demographic objectives but in fostering the development of each person's capacity to make major life decisions for herself or himself, decisions such as how long to stay in school or when to have a child. In Cairo, the governments of 179 nations agreed that an estimated \$17 billion annually by the year 2000 (rising to \$21.7 billion by 2015) would be required to assure universal access to basic reproductive health services within 20 years. Five years later, in 1999, the same governments reiterated the importance of reaching these financial goals. Unfortunately, except

**The Range of Possibilities: World Population Trends and Projections, 1950-2150**

- Low projection
- High projection

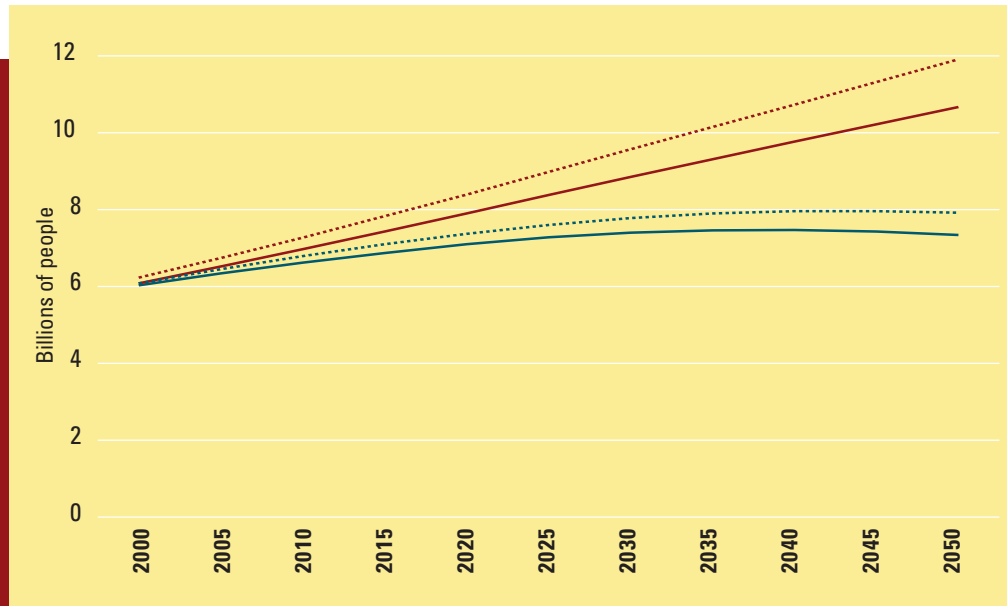


## FEWER THAN EXPECTED

### Lower Projections for 21st Century Population

Just 6 years ago the United Nations projected that world population in 2050 would be between 7.9 and 11.9 billion people. Due mostly to declines in birthrates—themselves a product of changing ideas about childbearing—UN demographers now project a range between 7.3 (only 1.2 billion more people than in mid-2000) and 10.7 billion people in 2050.

- ..... High (1994 Revision)
- High (1998 Revision)
- ..... Low (1994 Revision)
- Low (1998 Revision)



for a handful of donor- and developing-country governments, most have failed to provide their share of this total. In the United States, ideological divisions within Congress have resulted in this country falling far short of its needed contribution. Unless such trends reverse, reproductive health services will remain unavailable to many of the world's poorest people. And the projected declines in fertility and population growth that many experts point to as the likely future simply will not occur.

The primary objective of reproductive health care providers is not to alter global demographic trends but to improve the lives of individuals directly. Access to good reproductive health care—as well as to decent schools, and to opportunities to earn a living—can mean the difference between happiness and misery, sometimes even between life and death, for women

and their children. But an important side benefit of addressing these individual needs is that population growth will slow and eventually end for the best of reasons: higher proportions of intended pregnancies, leading to fewer births, occurring later in women's lives.

Most hopeful of all is the growing possibility that population will actually peak in the new century, perhaps at fewer than 8 billion people, compared to 6 billion today. While increases in death rates cannot be ruled out as a contributing factor to the slowing of population growth, declines in birthrates are far more influential today. Had birth rates not fallen in the latter half of the 20th century, world population would be 2.3 billion higher than it is today.<sup>3</sup> If governments and other institutions commit to reducing rates of both birth and death, population growth will continue to slow and eventually end.

### Away from Scarcity

As population stabilizes, so will the per capita availability of finite natural resources. If populations trend downward, governments and resource managers should be in the enviable position of having more water, more soil, more fish, and more forests each year for each person.

Per capita natural-resource consumption, of course, may continue to expand after population stabilizes, but this need not be. Technological change, tax restructuring and evolving perceptions about what constitutes “the good life” can all contribute to reductions in consumption even while income inequalities shrink and poverty eases. The dynamics of consumption, however, operate differently from those of population. Consumption patterns are more immediately subject to influence than are population trends,

which to a large extent are rooted in the birth rates of the past. And population can become so large that even minimal per capita consumption levels overwhelm the environment.

### Aging Populations

Easing population growth carries other implications for society. An aging population, for example, is the price a country with falling birth and death rates pays for longer lives in a less crowded world. The process can strain social security and health care systems, but the solution is not to encourage a process—population growth—that cannot go on indefinitely on a finite planet.

To fear an end to population growth is to fear the inevitable. And in all likelihood nations can adjust to stable or even gradually shrinking populations, and the aging that accompanies them, more easily than nations can indefinitely manage water scarcity, food insecurity or human-induced biodiversity loss and climate change that grow more acute with each passing decade.

### Action at the Global Level

The policies that contribute to the slowing of population growth are tested and cost-effective. **Improving access to a range of high-quality contraceptive services** remains a central strategy for closing the gap between reproductive intentions and outcomes. Lack of such access is a primary reason that today nearly two out of every five pregnancies are unin-



tended, and that more than 150 million women do not want to become pregnant but are not using any form of contraception. Similarly, **making sure that all girls and boys everywhere complete secondary school** not only improves human development and health outcomes, but also discourages early and frequent pregnancy and thus contributes powerfully to slower population growth. The same is true of **improving opportunities for women to find paying jobs or start their own businesses.**

There is a powerful synergy between policies that encourage these outcomes and the stability of both the natural environment and the institutions that preside over human affairs. The environment may be a pristine forest and its creatures, a stable global climate, or simply the clean water and productive soil a farmer needs to care for her family. The institutions are governments, courts, financial institutions and the laws and other arrangements that connect people to each other. And as the ICPD Programme of

Action recognizes, in an increasingly democratic world, it will take informed and motivated citizens to push governments to do the right thing, to live up to their obligations and commitments on the environment, population and development.

International agreements provide benchmarks for performance in these areas. In particular, **governments should support and fund the social investments called for by the Programme of Action** of the ICPD, which both focus on women's well-being and promise to contribute to slower population growth and the conservation of critical natural resources. When projecting future changes in environmental conditions, **environmental and policy analysts should take into account scenarios suggested by the full range of population projections** published by the United Nations Population Division and others, rather than merely those based on middle projections. **Both governments and non-governmental organizations should consider integrated, community-based approaches** that improve both natural-resource conservation and access to reproductive health services.

### Action at the Local Level

Individuals, too, can help bring about a world that is more secure and more supportive of life, health and happiness. **They can educate themselves on population dynamics, consumption**

**patterns,** and the impact of these forces on natural resources and the environment. They can be socially, politically and culturally active to elevate the issues they care about. They can **become more environmentally responsible** in their purchasing decisions and their use of energy and natural resources. And individuals and couples can **consider the impacts of their reproductive decisions** on their communities and the world as a whole.

There is no longer any doubt that these two seemingly disparate subjects—population and environment—belong together. The turn of the millennium is an ideal moment to consider the long time periods over which this linkage operates. And it reminds us that the goal of environmental conservation is a lasting harmony between human beings and the natural world. Historically, the rapid change to which population growth contributes no doubt provided a stimulus for human development and evolution. But as environmental constraints become more pressing and obvious, development and evolution are better served by populations that are stable or even slowly declining than by persistent growth that may well end only through unwelcome increases in death rates.

We live today in a world that often seems divorced from nature and its resources, but this is an illusion. Human well-being in the coming centuries will depend in large part, as

it always has, on the abundance and cleanliness of water and soil, the expanse and living diversity of forested land and marine waters, and the relative stability of the planet's climate. All of these will depend in large part on the pace—and the end point—of human population growth in the 21st century. And those, in turn, will have much to do with the capacity of couples to plan their families and of women to manage their own destinies. Helping to expand these capacities is worthy work for all who care not just about population and women health, but about nature, the human condition and the future of both. ■■■

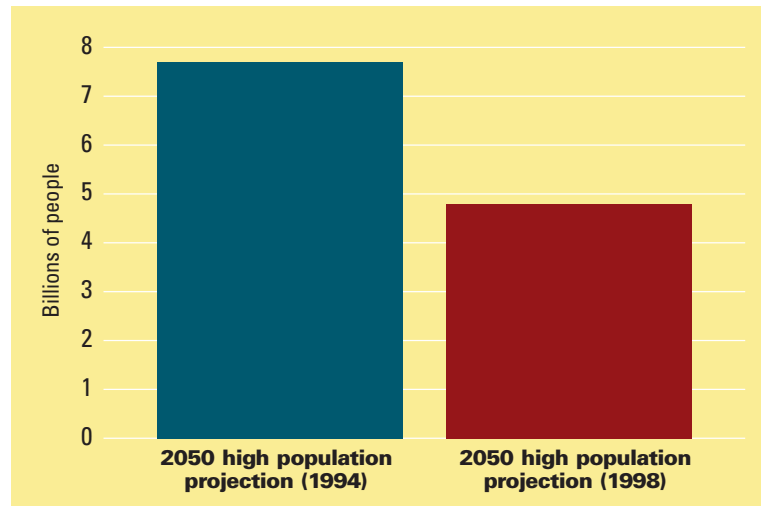
<sup>1</sup>United Nations Population Division, *Briefing Paper: 1998 Revision, World Population Estimates and Projections* (New York: United Nations, 1999) p. 2.

<sup>2</sup>United Nations Development Programme, *The Human Development Report 1999* (New York: United Nations, 1999), p. 130.

<sup>3</sup>Patrick Heuveline, "The Global and Regional Impact of Mortality and Fertility Transitions, 1950-2000," *Population and Development Review* 25, No. 4 (1999), 688.

### Less Natural Resource Scarcity than Expected

Population projected to live in countries where per capita renewable freshwater availability will be less than the water-stress benchmark of roughly 1,700 cubic meters, based on the 1994 and 1998 UN High Projections.



# PEOPLE and WATER



## Annual Renewable Fresh Water Per Capita, 1975, 2000 and 2025 (projected)

Fresh water renewed continually through the global water cycle is a finite natural resource that can be quantified for each country. Water engineers and planners use benchmarks of availability based on how much renewable fresh water is available to each inhabitant per year. Water scarcity is defined as less than 1,000 cubic meters per person. The less-severe condition of water stress is defined as between 1,000 cubic meters and roughly 1,700 cubic meters per person. The bars illustrate each nation's per capita availability for the years indicated, with the bar for 2025 showing both the low (light red shading) and high (dark red shading) population projections.

- 1975
- 2000
- 2025 (high population projection - greater scarcity)
- 2025 (low population projection - less scarcity)

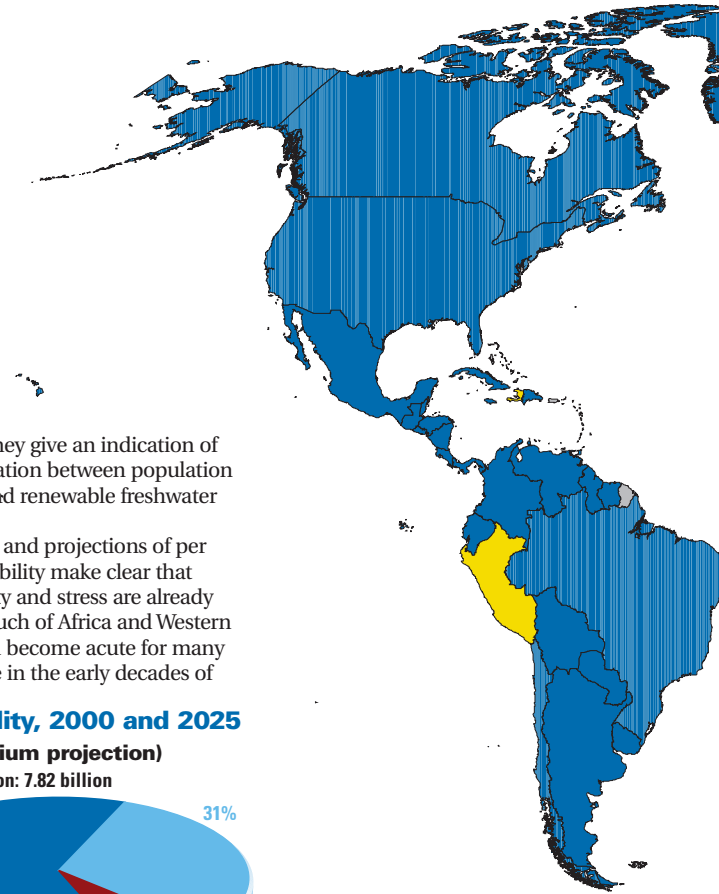
Fresh water is essential to health, economic development and life itself, yet there is no more of this critical natural resource today than in the distant past. Less than 3 percent of the planet's water is salt-free, and less than a third of that is liquid. Less still is *renewable*, continually available because it is refreshed by the earth's hydrological cycle as rain and snow falling on land. Renewable fresh water is all that people can rely on over the long term. (Only 0.2 percent of all water used worldwide comes from desalination.) And hydrologists have measured this water, watershed by watershed, nation by nation.

As human populations grow in any watershed or nation, less renewable fresh water is available for each person. Hydrologists use ratios of available fresh water to population to track trends in water scarcity and stress, conditions that are especially threatening to the development of poorer nations. As a general benchmark, when there is less than 1,000 cubic meters of renewable fresh water (1,000

metric tons, equivalent to 264,000 gallons) per person per year, the country is said to experience *water scarcity*. If the figure falls between 1,000 and roughly 1,700 cubic meters, the condition is *water stress*. In either of these categories, most developing countries find they are either over-exploiting non-renewable sources of water or paying for "virtual water" through food imports. The terms stress or scarcity do not take into account actual physical access to water sources, or the quality of the water, or the irregularity of availability due to drought and storms or wet and dry seasons. Nor do they measure inequality of access between rich and poor, urban and rural. The terms do, however, represent a starting

point, and they give an indication of the close relation between population dynamics and renewable freshwater availability.

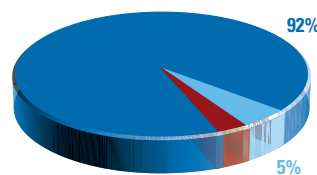
Estimates and projections of per capita availability make clear that water scarcity and stress are already issues for much of Africa and Western Asia and will become acute for many more people in the early decades of



## World Population by Freshwater Availability, 2000 and 2025

2000

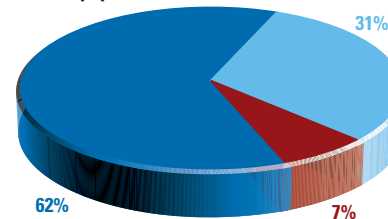
Total population: 6 billion



Relative Sufficiency

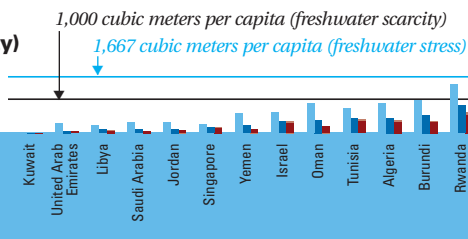
2025 (medium projection)

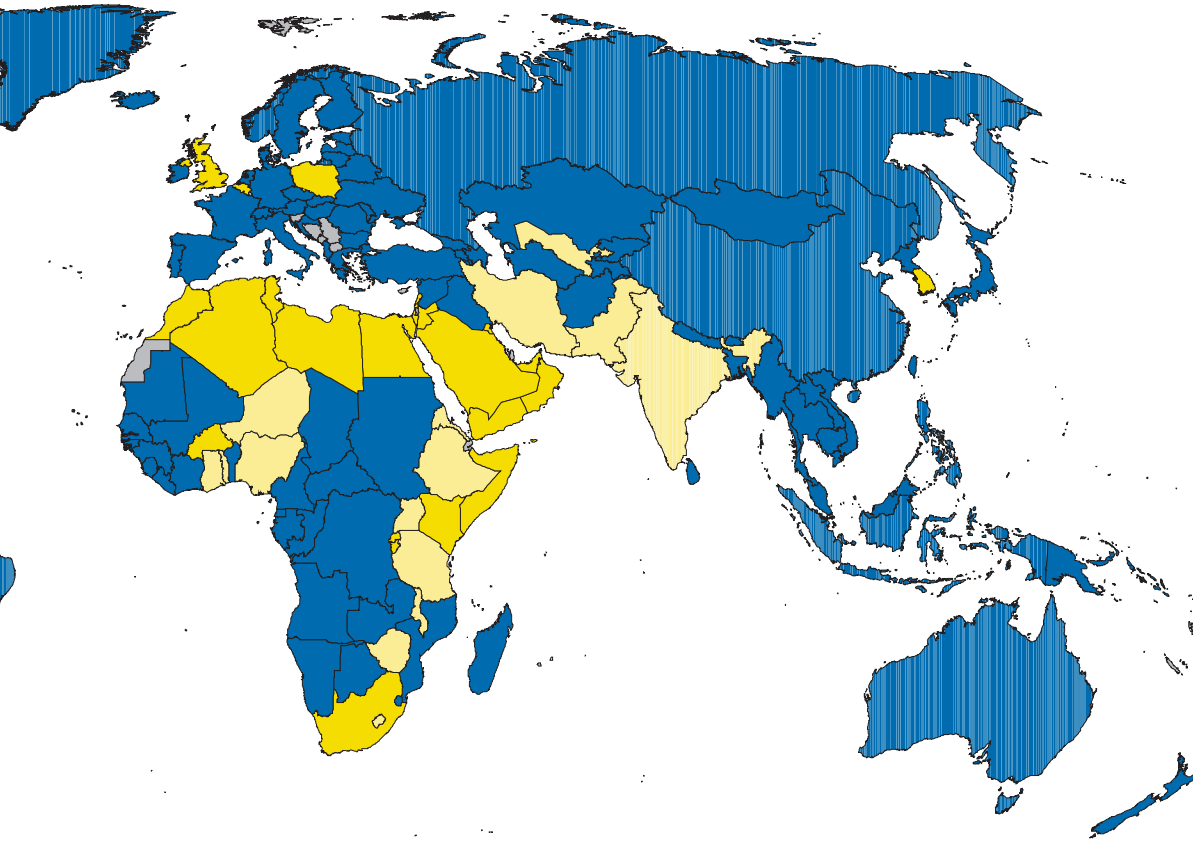
Total population: 7.82 billion



Stress

Scarcity





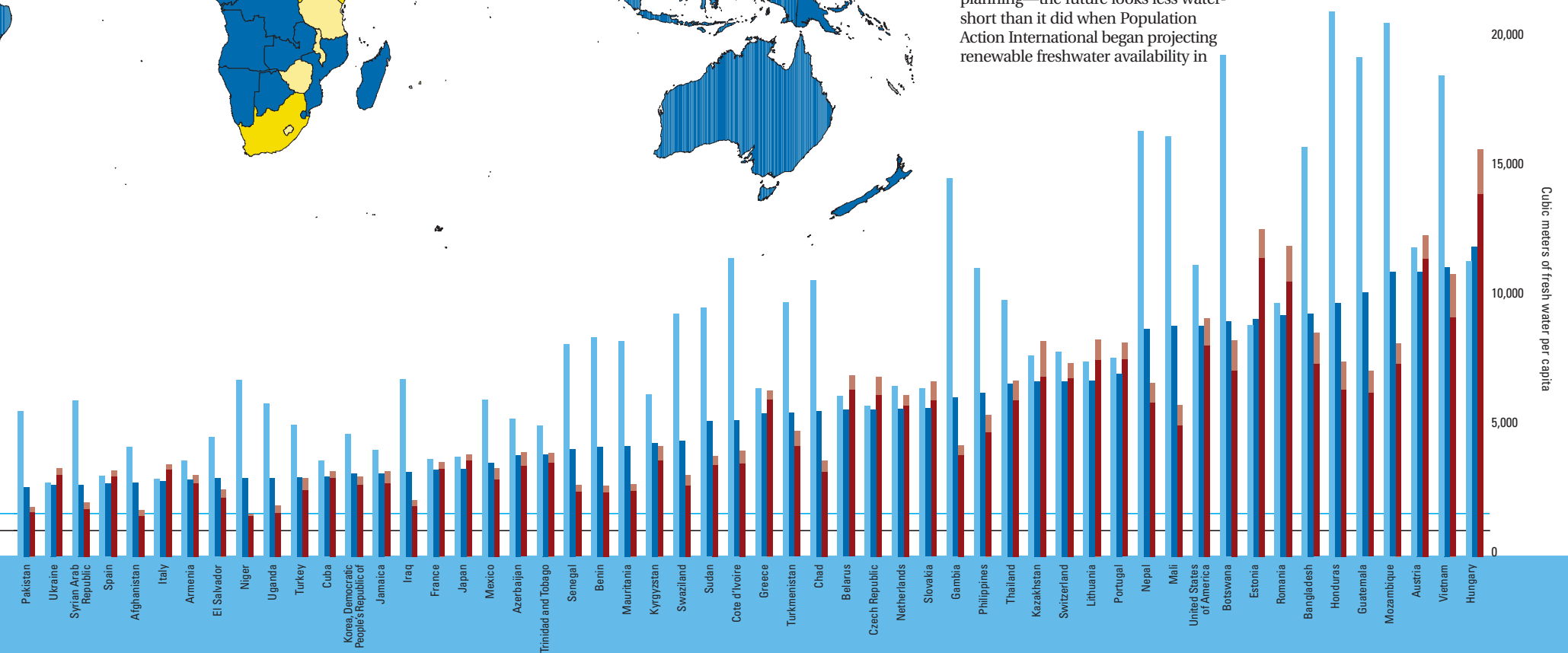
### ◀ Water-Short Countries in 2000 and 2025

- Water-stressed and water-scarce countries in 2000
- Additional water-stressed and water-scarce countries by 2025
- No data available

the 21st century. Based on the latest available population and freshwater data, somewhere between 2.4 billion and 3.2 billion people may be living in either water-scarce or water-stressed conditions by 2025, depending on future rates of growth, compared to 505 million people in the year 2000.

There is one hopeful sign, however: Because the growth of world population is slowing significantly—in large part due to the greater use of family planning—the future looks less water-short than it did when Population Action International began projecting renewable freshwater availability in

1993. Then, it appeared that between 2.8 billion and 3.3 billion people would be living in water-scarce countries in 2025. The impact of lower projected population is even more evident when considering the world of 2050. [See “Less Natural Resource Scarcity than Expected” on p. 7.] ■■



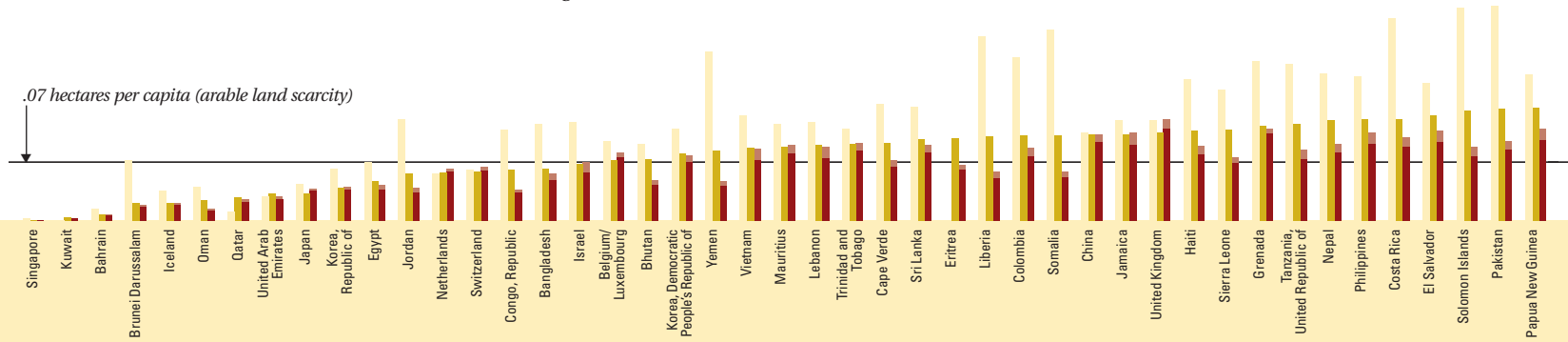
# PEOPLE and LAND



## Arable Land Per Capita, 1975, 2000 and 2025 (projected)

The United Nations Food and Agriculture Organization defines arable land as cropland or land cultivated with crops, plus land left fallow or used as pasture for less than five years. Each bar represents the amount of such land available to each inhabitant of each country. This is derived from a nation's total arable land divided by its total population, not just its farming population. The 2025 bar illustrates projected arable-land availability under both the low population projection (light red shading) and the high projection (dark red shading). ▼

- 1975
- 2000
- 2025 (high population projection - greater scarcity)
- 2025 (low population projection - less scarcity)



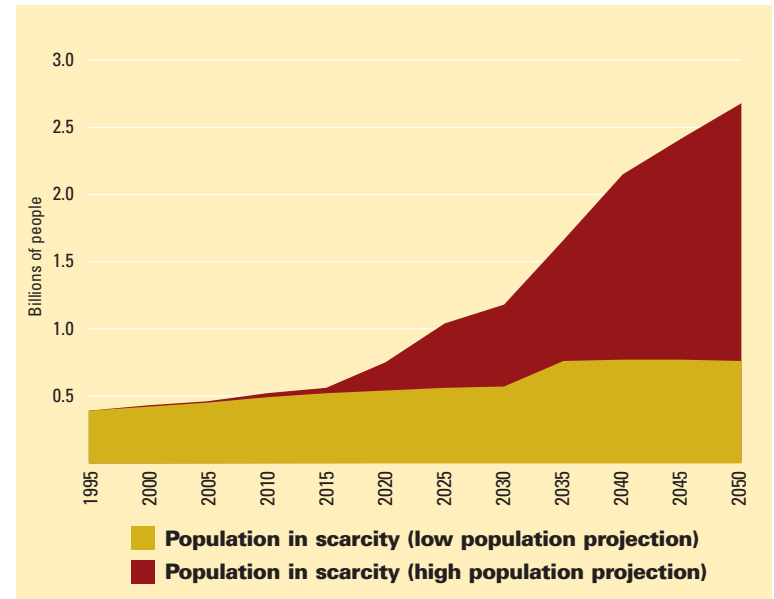
At the turn of the new century, grain and other basic food prices are relatively low, suggesting that global supply exceeds demand—at least for the moment, and with the use of some cropland and farming practices that cannot long be sustained. Yet roughly 800 million people are malnourished, in most cases because they cannot afford to buy enough food grown elsewhere. Most live in communities and countries that once were self-sufficient in food.

Dependence on imported food continues to increase with world population, especially in sub-Saharan Africa. Food-dependent nations need hard currency, earned by producing something else the world values, to pay for imported food, or they must rely on the surplus stocks—and fickle generosity—of food donors.

Globally, the net amount of land under crops is growing much more slowly than population, and the supply of land that could be easily converted to sustainable cultivation is limited. The per capita supply of farmland is thus falling as population grows. Farmers keep pace by increasing crop yields, extracting more production from each unit of land. (The need to increase production is one argument offered by advocates of the genetic modification of food.) Nonetheless, per capita grain production has been relatively stagnant for more than 15 years.

Much of the cost of today's food production will be borne by tomorrow's people and environment. In industrialized countries, farmers rely on polluting chemicals and on fossil fuels whose combustion contributes significantly to global climate change. In poorer countries, farmers mine nutrients from their soil or struggle to keep it from eroding away. Farmers everywhere irrigate land with groundwater that is disappearing further into the earth or may soon be sold to higher bidders in urban areas [see "People and Water"]. Some of the best farmland is disappearing under new pavement and housing, and the world's

## Population Projected to Live with Arable Land Scarcity, 1995-2050



rural poor increasingly find themselves forced to convert forest into cropland. None of these practices can continue indefinitely.

Because cropland varies in physical and climatological characteristics, a single benchmark of cropland scarcity is hard to determine. Population Action International has relied on the historical work of Canadian geographer Vaclav Smil to come up with the extremely conservative figure of 0.07 hectares per

person as the dividing point between scarcity and relative sufficiency.<sup>1</sup> This appears to be a bare minimum of fertile cropland required to feed one person a vegetarian diet with no use of pesticides or other chemical inputs. Countries with less land per capita have little hope of food self-sufficiency without major investments in agriculture that many cannot afford.

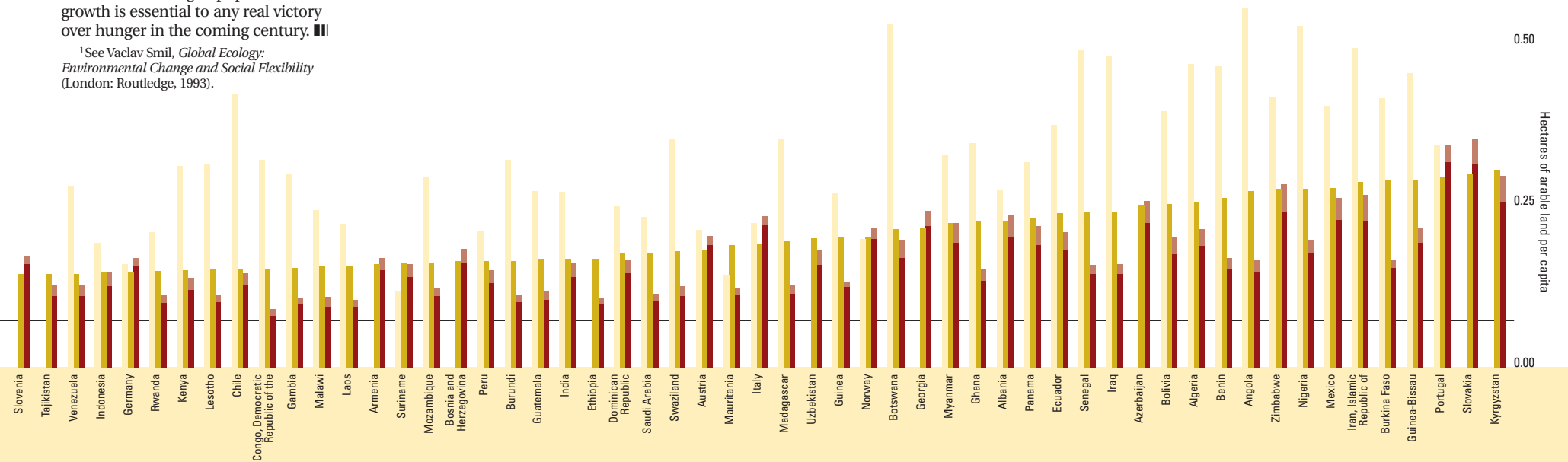
### ◀ World Hunger, 1997

The United Nations Food and Agriculture Organization defines adequate nourishment as consumption of at least 2,100 kilocalories (often called calories informally) per day. Countries are shaded to illustrate the proportion of their population who do not have access to enough food to satisfy this requirement.

- Greater than 35%
- 20-35%
- 5-20%
- 2.5-5%
- Less than 2.5%
- No data

The number of people living in countries scarce in per capita cropland grew from 175 million in 1975 to 420 million at the turn of the millennium. The figure appears poised for continued growth, with anywhere between 557 million and 1.04 billion people living in critically land-scarce countries in 2025, depending on rates of population growth over that time period. Continued slowing of population growth is essential to any real victory over hunger in the coming century. ■■

<sup>1</sup>See Vaclav Smil, *Global Ecology: Environmental Change and Social Flexibility* (London: Routledge, 1993).



# PEOPLE and FORESTS



**M**ore than just places to hike and camp, the world's forests provide goods and services essential to human and environmental well being. At the turn of the new millennium, when we need them more than ever, forests in many parts of the world are disappearing faster than ever before. As population has grown and forested land has retreated, the ratio of forests to human beings has declined significantly. Today it is less than half what it was in 1960. Much more efficient consumption of forest products and the eventual stabilization of human population will be needed to conserve the world's forests in the 21st century.

Trees themselves are a critical natural resource. Wood is one of the most widely used materials for construction and housing, and nearly 3 billion people depend on wood as their main source of energy. Fiber from trees is used to produce the paper on which most of the world still depends for education and communication. But

forests also harbor over half of the world's plant and animal species, making them a genetic resource that could fuel advances in medicine and food production for generations to come. Healthy forests enrich soils, filter sediment from water, and discourage flooding by absorbing and then slowly releasing vast quantities of water. By removing vast amounts of heat-trapping carbon dioxide from the atmos-

phere, growing forests also help regulate the global climate. We cannot accurately assess the cost of losing any specific tract of tree-covered land, but it would be foolish to believe that the ongoing retreat of the world's forests is a low-risk tradeoff for economic development and a healthy environment.

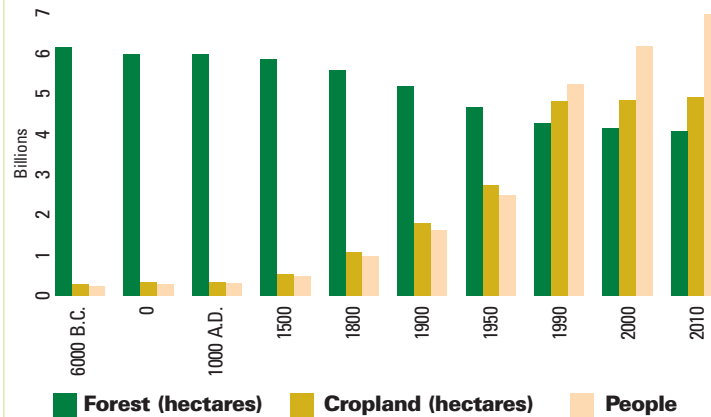
Even countries that have historically had few or no forests utilize the services of forests elsewhere, whether

through imports of wood products or through indirect environmental benefits. Forestry experts increasingly consider the ratio of forests to people in assessing the development prospects of poorer countries. Some have suggested 0.1 hectare per person—roughly a quarter acre—as a benchmark of the forest cover (as defined by the United Nations Food and Agriculture Organization) needed by most low-income countries to supply essential goods and services that forests provide. Countries in which per capita forest cover falls below this level rely heavily on wood imports and typically risk high levels of soil erosion, flooding and landslides.

The bar chart on these pages ranks the 100 countries that currently have the lowest levels of forest cover per person. (Some of these countries have not had significant forest cover in historical times and may have adapted reasonably well to their lack of wood and other forest resources.) The chart also projects each country's per capita forest availability in 2025, applying the UN medium population projection under the assumption that current trends in forest area change continue. Using the 0.1 hectare benchmark reveals that 1.8 billion people live in 40 countries with critically low levels of

## Historical and Projected Changes in Land Use and Population

Over the span of human history, the greatest cause of forest loss has been the development of sedentary agriculture, driven by the need to feed an increasing human population. This figure reveals the dramatic declines in forested land that occurred during the 19th and early 20th centuries. The pace of this decline slowed somewhat with the introduction of agricultural technologies such as synthetic fertilizers and high-yield crop strains. (Time series not drawn to scale.)



## Per Capita Forest Availability, 2000 and 2025 (medium projection)

This chart shows the 100 countries with the lowest levels of forest cover per capita, based on current availability. Each country is represented by two bars, the first showing per capita forest cover in 2000 and the second shows per capita forest cover for 2025, based on a continuation of trends in forest area and population change.

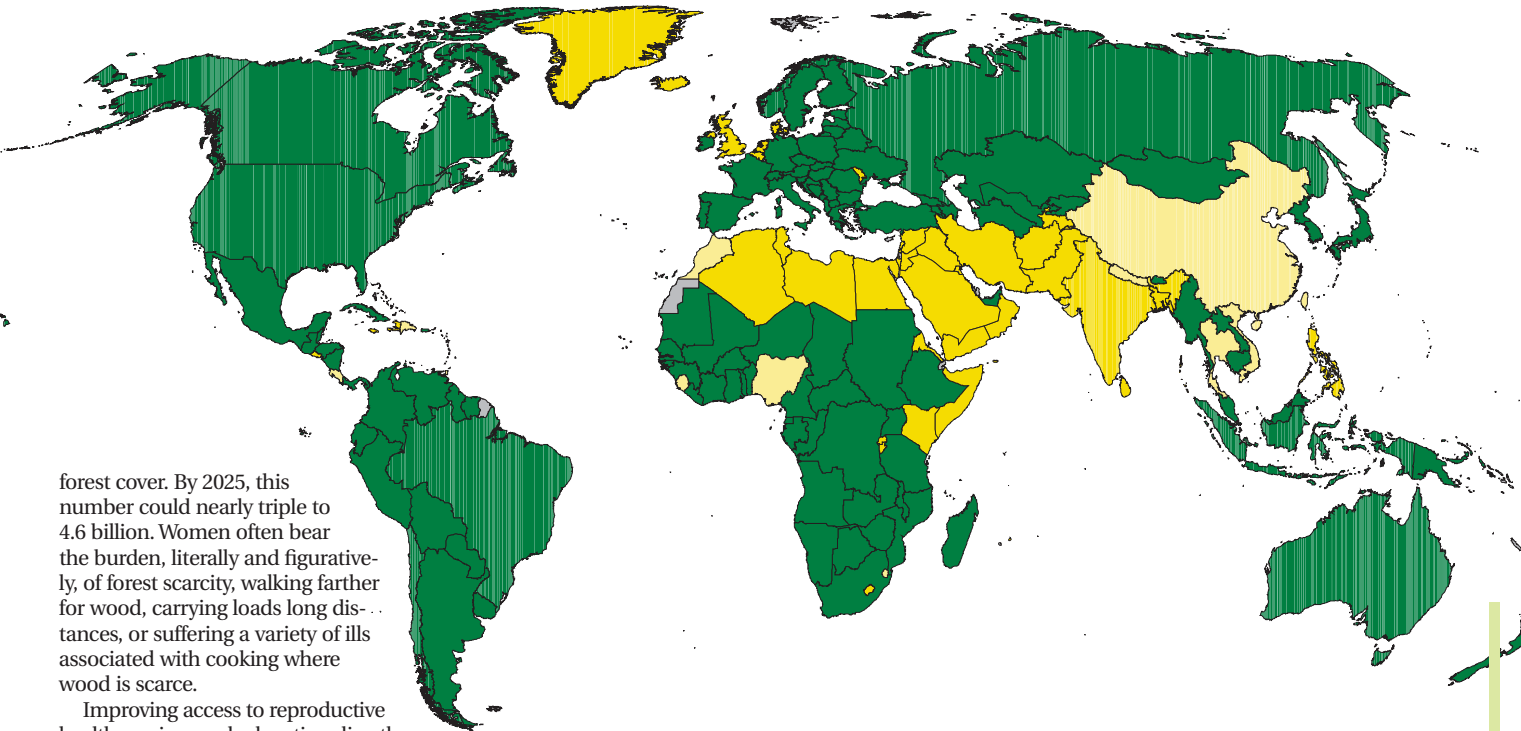
■ 2000 ■ 2025

0.1 hectare per capita (low forest cover)



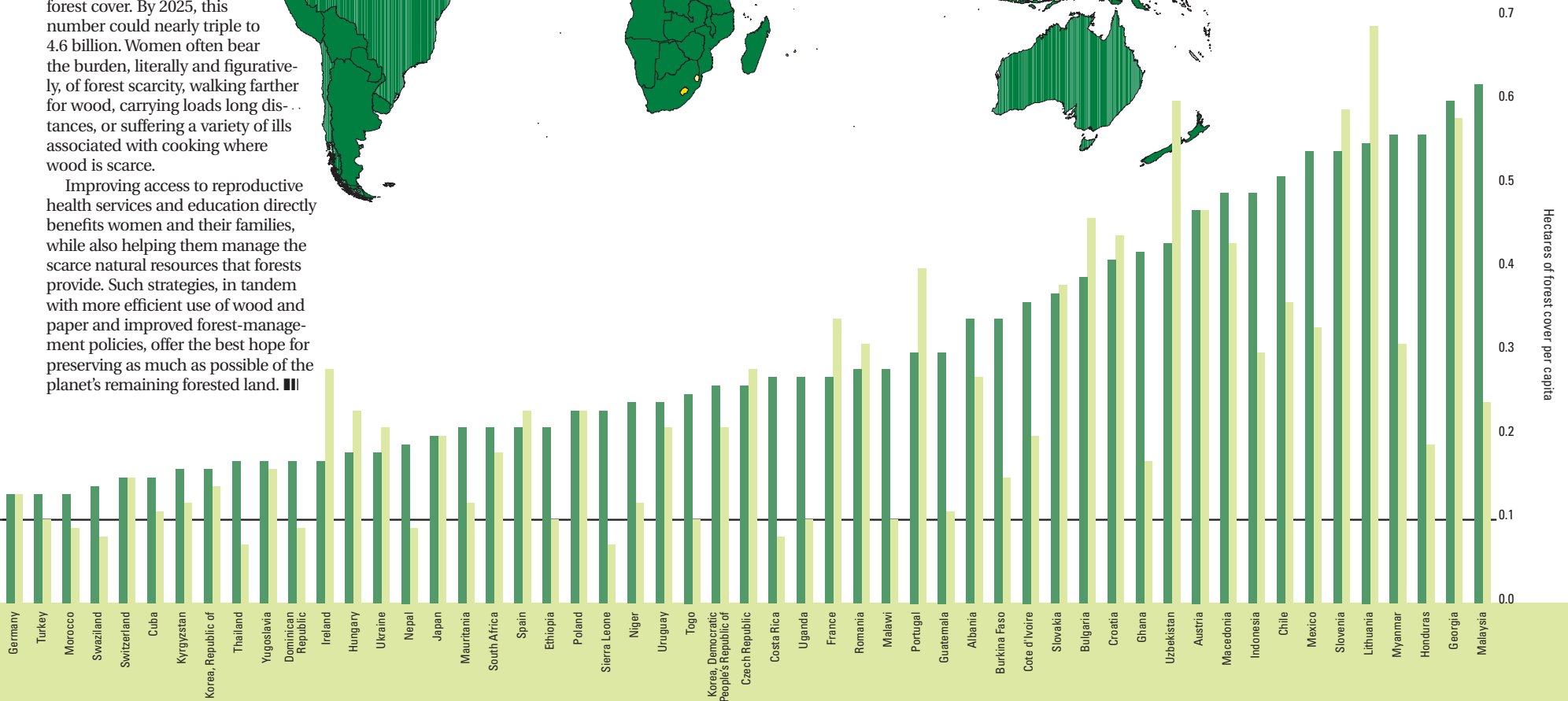
◀ Countries with Low Forest Cover, 2000 and 2025 (medium projection)

- Low forest cover countries in 2000
- Additional low forest cover countries by 2025
- Data not available



forest cover. By 2025, this number could nearly triple to 4.6 billion. Women often bear the burden, literally and figuratively, of forest scarcity, walking farther for wood, carrying loads long distances, or suffering a variety of ills associated with cooking where wood is scarce.

Improving access to reproductive health services and education directly benefits women and their families, while also helping them manage the scarce natural resources that forests provide. Such strategies, in tandem with more efficient use of wood and paper and improved forest-management policies, offer the best hope for preserving as much as possible of the planet's remaining forested land. ■■



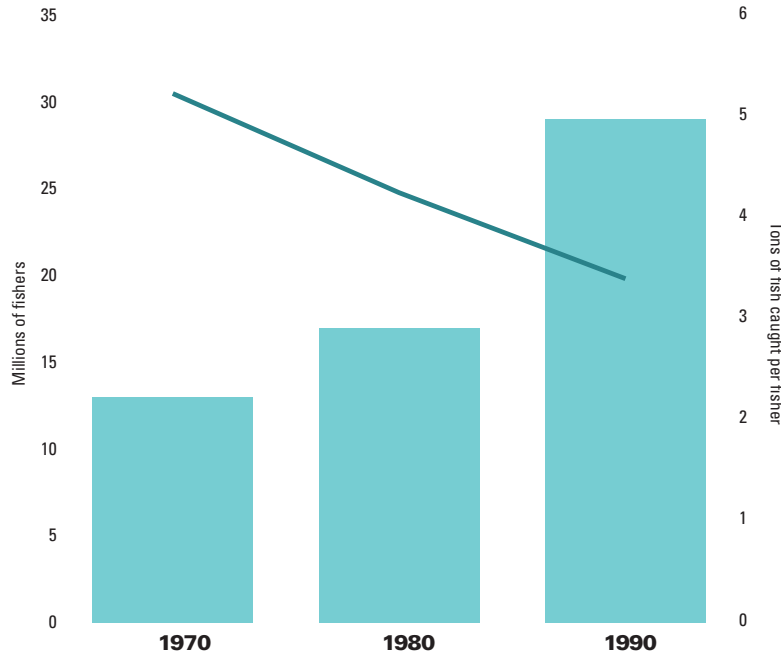
# PEOPLE and FISHERIES



and young children. Current trends in the price of fish, however, cast doubt on how much longer this important food will be widely available to the world's poor.

Based on the available data, it appears that production of fish overall continues to increase roughly in tandem with the growth of human population. These production increases come almost entirely from the rapid expansion of *aquaculture*, the raising

**H**istorically, fish have served as an inexpensive and widely available source of complete protein and essential nutrients, including a type of fatty acid critical to the development of the brains of infants



### More Fishers Fishing, Fewer Fish Caught ▶

Although the number of fishers more than doubled between 1970 and 1990 (vertical bars), the number of fish each fisher caught on average fell 30 percent (line). "Fisher" includes people who are engaged in aquatic life cultivation, inland and marine fishing on a part-time, full-time or occasional basis.

### The Global Fish Catch, 1984-1998 ▶

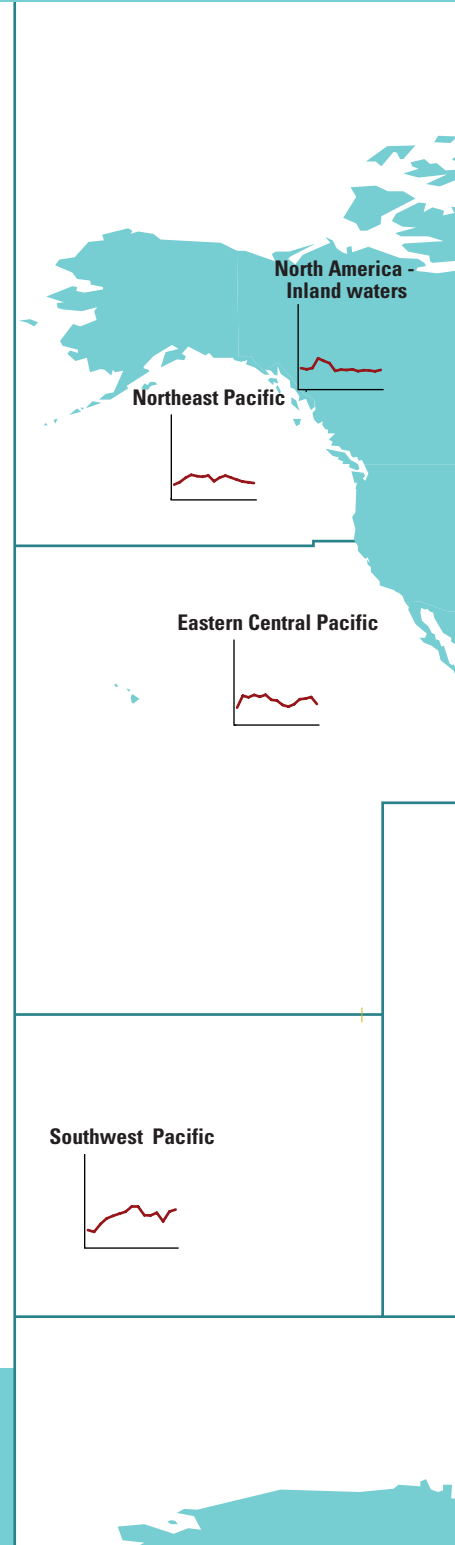
The thumbnail charts of recent trends in the world's major ocean and inland fisheries cover the years from 1984 to 1998 (left to right on the X axis). In order to make the trend lines easier to read, the tonnage scales of each year's catch (the Y axis) are not uniform and do not begin at zero. The charts are thus not comparable among each other but do accurately reflect year-to-year changes in each fishery's catch.

of fish either in marine or inland waters, not from any significant rise in the capture of fish in the wild. Aquaculture now provides one fish out of every three the world consumes, but more than two-thirds of the world's farm-raised fish are produced in a single country, China.

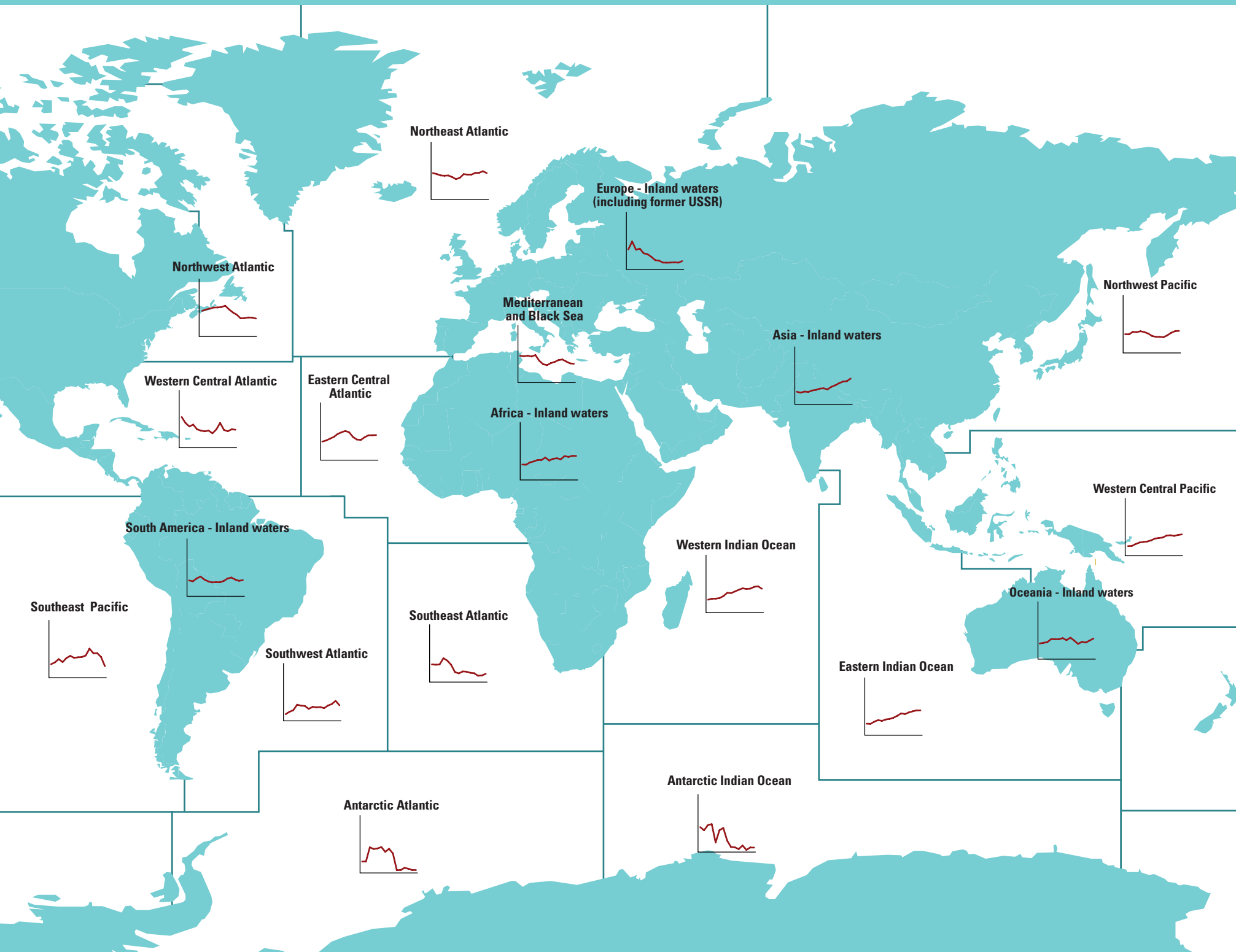
The annual global catch of wild fish from oceans, which once kept pace with increasing human demand, appears to be leveling off at just under 90 million metric tons. The composition of the wild catch continues to shift to smaller and less appetizing fish. Some species of fish—bluefin tuna, for example, which has at times commanded hundreds of dollars per kilogram—appear headed for commercial or even biological extinction. Today, 11 of the world's 15 major ocean fishing areas and more than two-thirds of ocean species are in decline and in urgent need of management. According to the UN Food and Agriculture Organization, the world's fishers are fully exploiting 44 percent of fish stocks and overfishing another 16 percent.<sup>1</sup>

The aquaculture industry is growing rapidly and has shown that it can expand global production of fish even as the world's oceans, lakes and rivers yield a smaller catch. Farm-raised fish, however, are not inexpensive enough to

(continued on page 16)

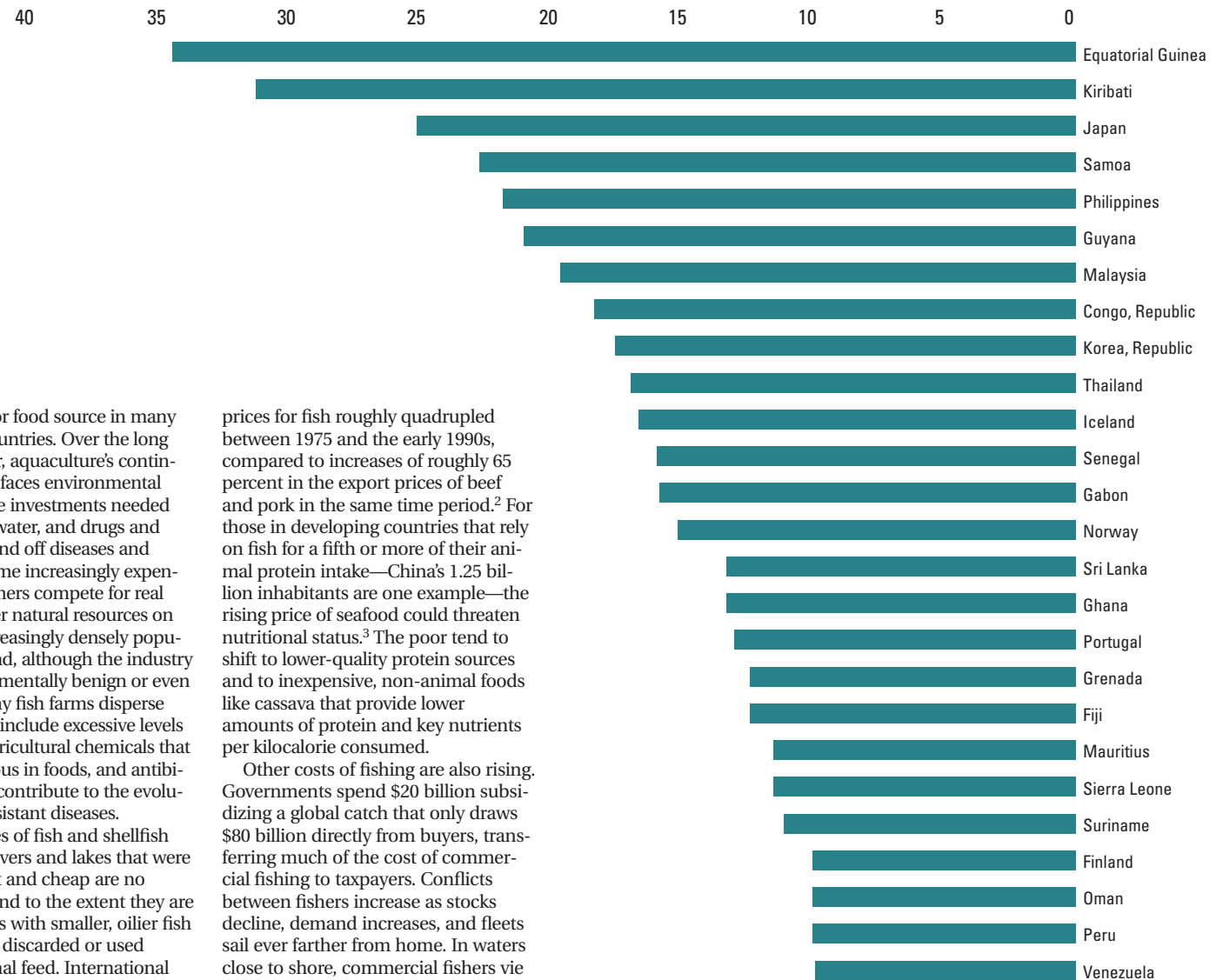






# PEOPLE and FISHERIES

Fish Protein as a Percentage of Total Protein Intake in 26 Countries ▼

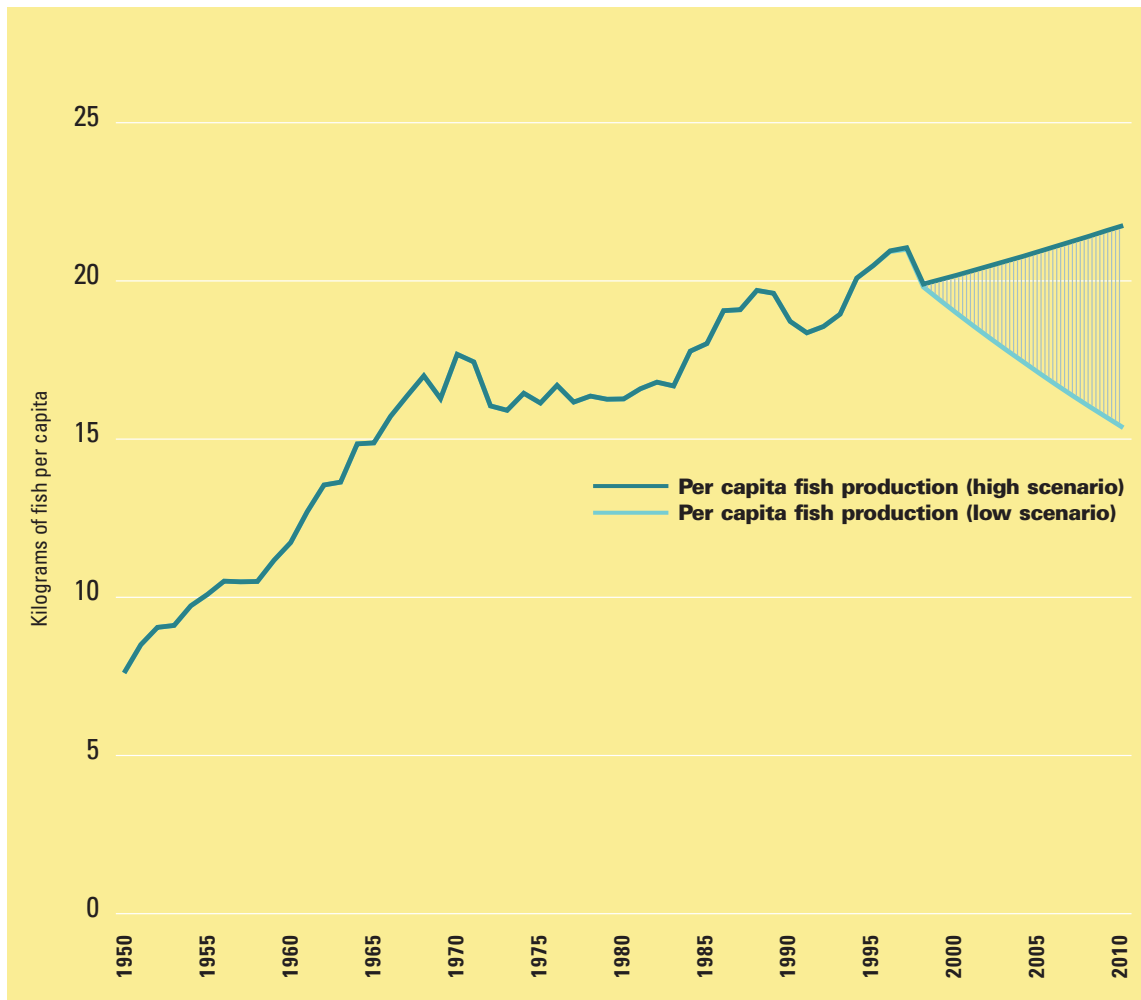


become a major food source in many low-income countries. Over the long term, moreover, aquaculture's continued expansion faces environmental constraints. The investments needed for land, fresh water, and drugs and chemicals to fend off diseases and pests will become increasingly expensive as fish farmers compete for real estate and other natural resources on the world's increasingly densely populated coasts. And, although the industry can be environmentally benign or even beneficial, many fish farms disperse pollutants that include excessive levels of nutrients, agricultural chemicals that can be hazardous in foods, and antibiotics that may contribute to the evolution of drug-resistant diseases.

Many species of fish and shellfish from oceans, rivers and lakes that were once abundant and cheap are no longer either, and to the extent they are substituted, it is with smaller, oilier fish that once were discarded or used mainly as animal feed. International

prices for fish roughly quadrupled between 1975 and the early 1990s, compared to increases of roughly 65 percent in the export prices of beef and pork in the same time period.<sup>2</sup> For those in developing countries that rely on fish for a fifth or more of their animal protein intake—China's 1.25 billion inhabitants are one example—the rising price of seafood could threaten nutritional status.<sup>3</sup> The poor tend to shift to lower-quality protein sources and to inexpensive, non-animal foods like cassava that provide lower amounts of protein and key nutrients per kilocalorie consumed.

Other costs of fishing are also rising. Governments spend \$20 billion subsidizing a global catch that only draws \$80 billion directly from buyers, transferring much of the cost of commercial fishing to taxpayers. Conflicts between fishers increase as stocks decline, demand increases, and fleets sail ever farther from home. In waters close to shore, commercial fishers vie



### ◀ Past and Projected Trends in Global Per Capita Fish Production, 1950-2010

The average production of fish worldwide for each person (fish production combines fish catch and fish culture) has risen unevenly since 1950, but the amount appears to have reached its upper limits as world population approached and passed 6 billion people in the late 1990s. Over the next decade per capita fish production could decline significantly. Projected increases in aquaculture production are likely to make up for losses in ocean and land-based wild fisheries in the face of continued world population growth. The range of uncertainty indicated for the years 1997-2010 represents the difference between two extreme scenarios for per capita fish production. The high scenario (upper bound of range) assumes low human population growth and relatively high fish production, while the low scenario assumes the reverse. The future most likely will be somewhere in between.

with less-powerful subsistence fishers for limited stocks. In much of the world, the population of fishers is growing and the size of each fisher's catch is declining as finite resources are subdivided among more people.

One illustration of population's role in the rising price of fish amounts to good news. The Food and Agriculture Organization is less pessimistic about future fish price increases today than it was in the early 1990s, largely because world population is growing more slowly today than was projected at that time. Overall demand for fish in the first decade of the 21st century is thus likely to be less strong than previously expected. But the world's growing population and its increasing wealth will all but certainly drive up demand for fish for some time to come. Any long-term solution to the growing imbalance between fish resources and human demands will require not only innovative approaches to conservation

and management but also an early end to population growth. ■■

<sup>1</sup>FAO, "FAO Focus on Fisheries and Food Security" (Rome: Food and Agriculture Organization, 1999).

<sup>2</sup>Norman Myers and Jennifer Kent, *Perverse Subsidies: Tax \$s Undercutting Our Economies and Environments Alike* (Winnipeg, Canada: International Institute for Sustainable Development, 1998).

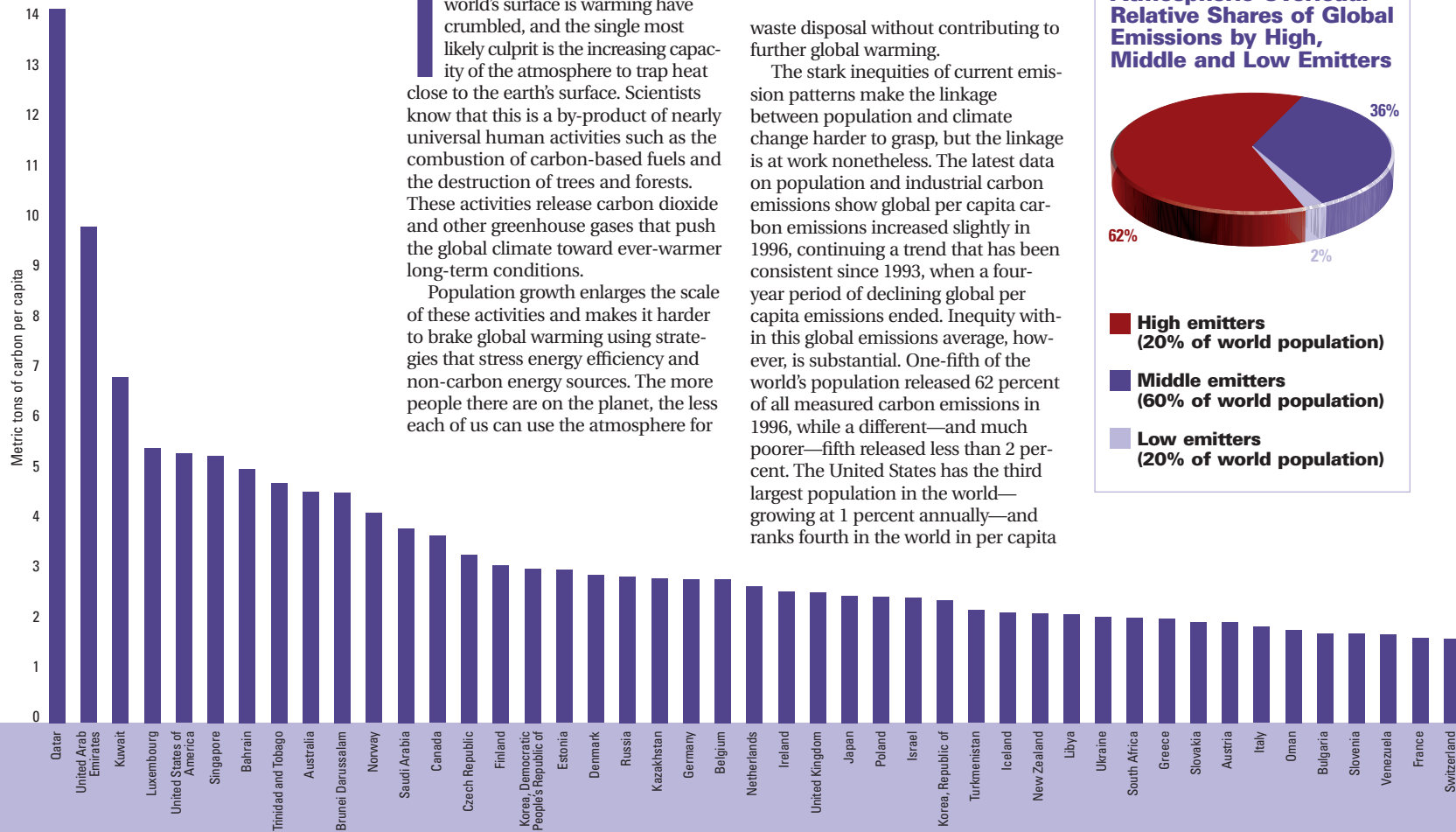
<sup>3</sup>FAO, Op. Cit.

# PEOPLE and CARBON DIOXIDE



## Per Capita Emissions of Carbon Dioxide from Fossil Fuel Use, 1996

This chart (and map, opposite) illustrate per capita emissions of carbon dioxide (CO<sub>2</sub>) from fossil fuel combustion in 1996. These data include a small component from cement production but do not include CO<sub>2</sub> emissions from deforestation and other land-use changes. ▶



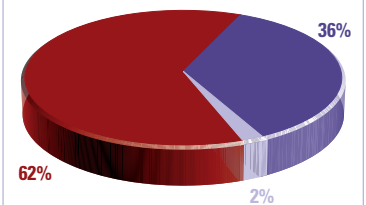
The last vestiges of doubt that the world's surface is warming have crumbled, and the single most likely culprit is the increasing capacity of the atmosphere to trap heat close to the earth's surface. Scientists know that this is a by-product of nearly universal human activities such as the combustion of carbon-based fuels and the destruction of trees and forests. These activities release carbon dioxide and other greenhouse gases that push the global climate toward ever-warmer long-term conditions.

Population growth enlarges the scale of these activities and makes it harder to brake global warming using strategies that stress energy efficiency and non-carbon energy sources. The more people there are on the planet, the less each of us can use the atmosphere for

waste disposal without contributing to further global warming.

The stark inequities of current emission patterns make the linkage between population and climate change harder to grasp, but the linkage is at work nonetheless. The latest data on population and industrial carbon emissions show global per capita carbon emissions increased slightly in 1996, continuing a trend that has been consistent since 1993, when a four-year period of declining global per capita emissions ended. Inequity within this global emissions average, however, is substantial. One-fifth of the world's population released 62 percent of all measured carbon emissions in 1996, while a different—and much poorer—fifth released less than 2 percent. The United States has the third largest population in the world—growing at 1 percent annually—and ranks fourth in the world in per capita

## Atmospheric Overload: Relative Shares of Global Emissions by High, Middle and Low Emitters

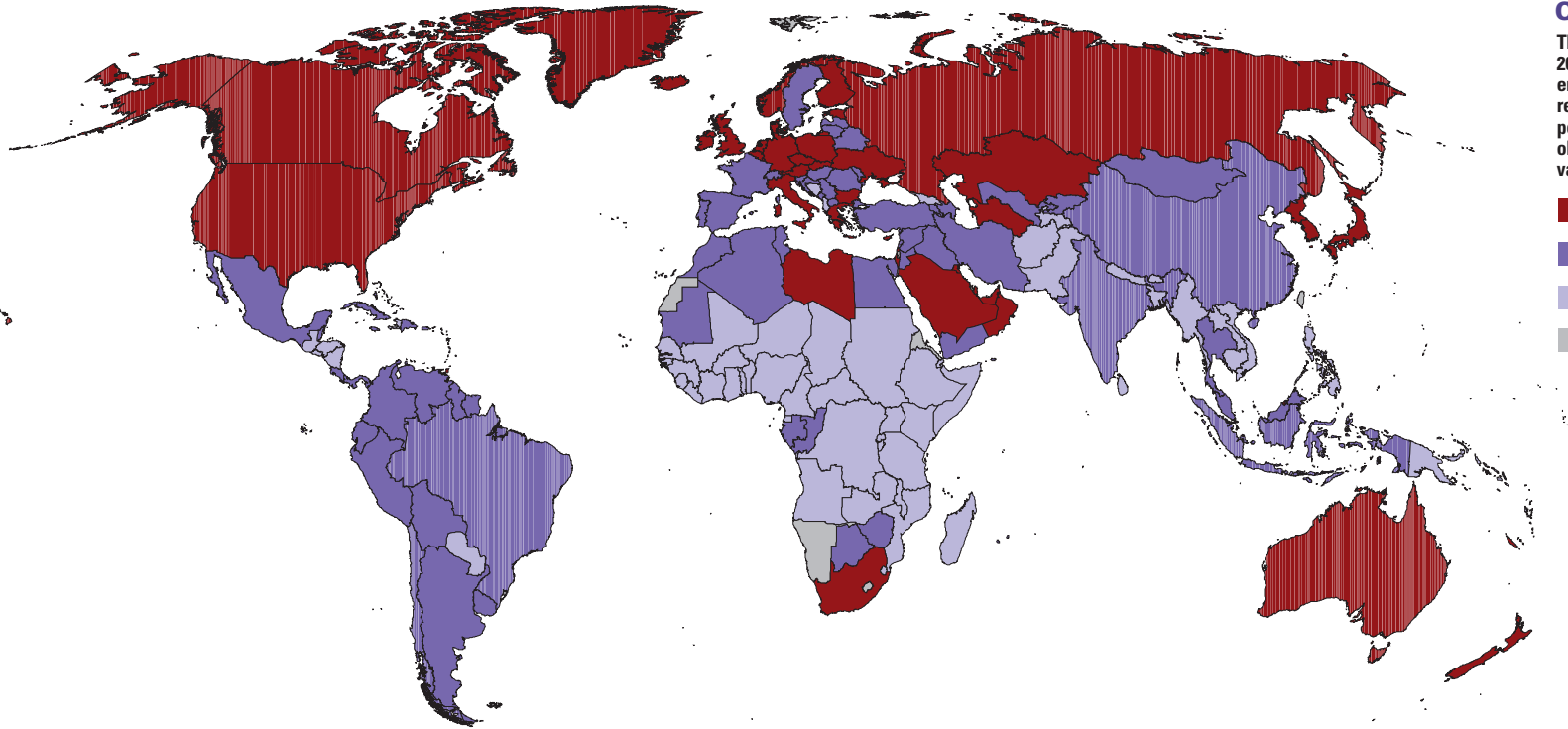


- High emitters (20% of world population)
- Middle emitters (60% of world population)
- Low emitters (20% of world population)

### ◀ Per Capita Emissions of Carbon Dioxide, 1996

This map shows those countries in which live the 20 percent highest and 20 percent lowest per capita emitters, with the medium emitters consisting of the remaining 60 percent of the world's population. The per capita weight is provided in carbon values; to obtain weight by CO<sub>2</sub> values, multiply the carbon values by 3.664.

- High emitters
- Medium emitters
- Low emitters
- No data



carbon emissions, with 5.37 metric tons of carbon emitted per capita in 1996. The people of most developing countries release a mere fraction of this amount, yet they have the least capacity for addressing the impacts of climate change. Clearly such disparities will need to shrink if the world is ever to cooperate on braking global warming.

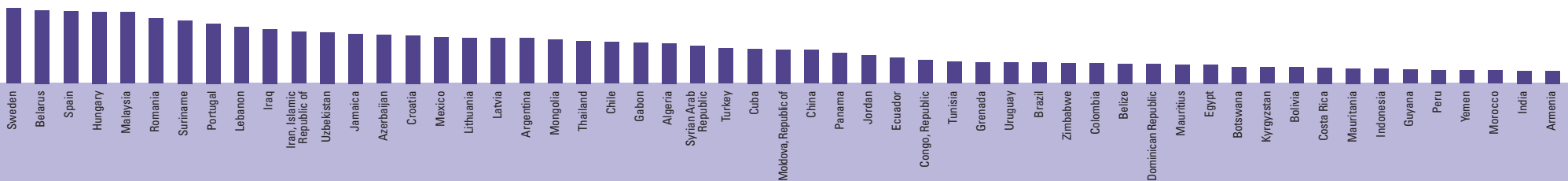
When we consider what will be needed to combine reasonably equitable

consumption patterns worldwide with climate stability, the role of population becomes apparent. The average global per capita carbon emission that would be needed to stabilize carbon dioxide concentrations in the atmosphere at roughly current levels would be less than half a metric ton (assuming roughly equivalent reductions in the carbon dioxide contributed by deforestation). That's less than one-tenth the 1996 U.S. per capita emission and equivalent to

the 1996 per capita emission of a Colombia or Zimbabwe. If world population doubles in the next century, the sustainable per capita emission would drop to about 225 kilograms of carbon, equivalent to the 1996 emission of a Nigeria or Samoa.

Changing the technology of energy production could help reduce per capita emissions, but over the long term a population that grows indefi-

nately cannot expect to stabilize the global atmosphere or reduce human influence on climate. Both industrialized and developing countries have a huge stake in stabilizing per capita greenhouse-gas emissions at low levels and for shrinking the stark inequities of these emissions. A stable world population is essential to reconciling both of these ambitious goals. ■■■



# PEOPLE and BIOLOGICAL DIVERSITY



As the millennium turns, plant and animal species are disappearing at rates 1,000 times higher than occurred in the pre-human past. From projected losses of habitat alone, biologists believe that half of the roughly 10 million species on the earth today may go extinct during the next few centuries. More could disappear as a result of invasions of exotic species, pollution,

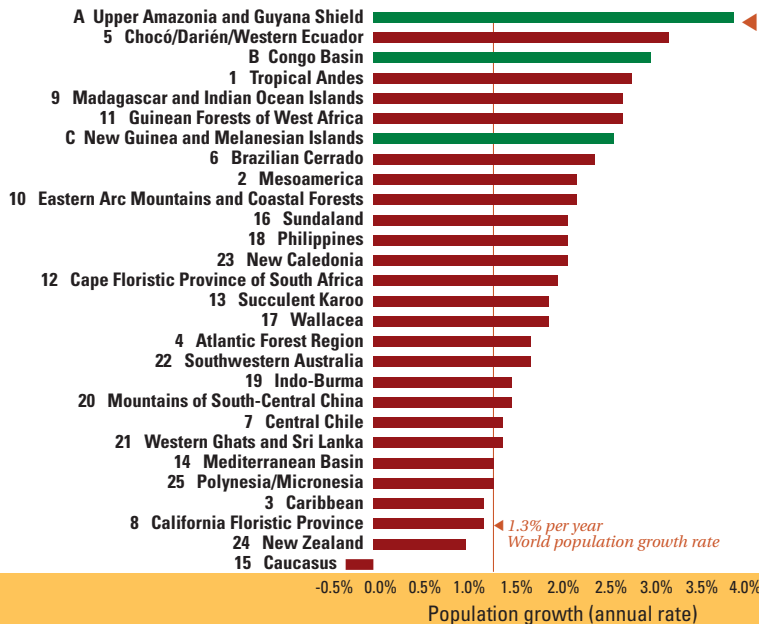
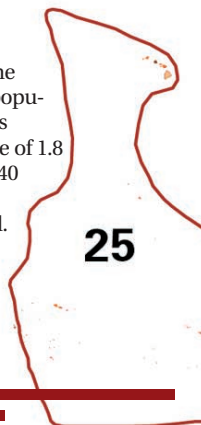
over-harvesting and human-induced global warming. The underlying driver of this unprecedented loss is the expansion of human activities across the landscape, and among the key factors in that expansion is the growth of human population. The pace of this growth in the new century will be critical to the future of biological diversity (called *biodiversity*), as will new approaches to natural-resource con-

servation that treat the non-human world as the precious asset it is.

In 1995, more than 1.1 billion people, about a fifth of world population, lived in the world's *biodiversity hotspots*. These are 25 areas with rich concentrations of unique species combined with a high threat from human activities. Population density was much greater than in the world as a whole, and in 19

of the hotspots population was growing significantly faster than the worldwide average. The population in all the hotspots is growing at a collective rate of 1.8 percent annually, almost 40 percent faster than the world's population overall.

In addition to the hotspots, there are three *major tropical wilderness areas*, biodi-

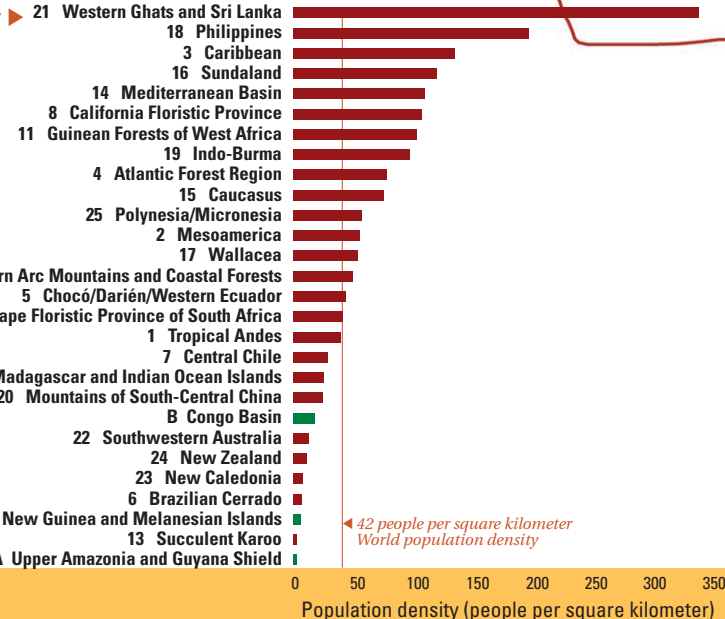


### Population Growth in the Biodiversity Hotspots

Human population is still growing in all but one of the 25 hotspots. Populations in the hotspots are growing, on average, at 1.8 percent annually, a rate substantially higher than the average world rate (1.3 percent), and even higher than that of the developing countries (1.6 percent). In the three remaining major tropical wilderness areas, population is growing, on average, at roughly two and a half times the population growth rate of the world as a whole.

### Population Density in the Biodiversity Hotspots

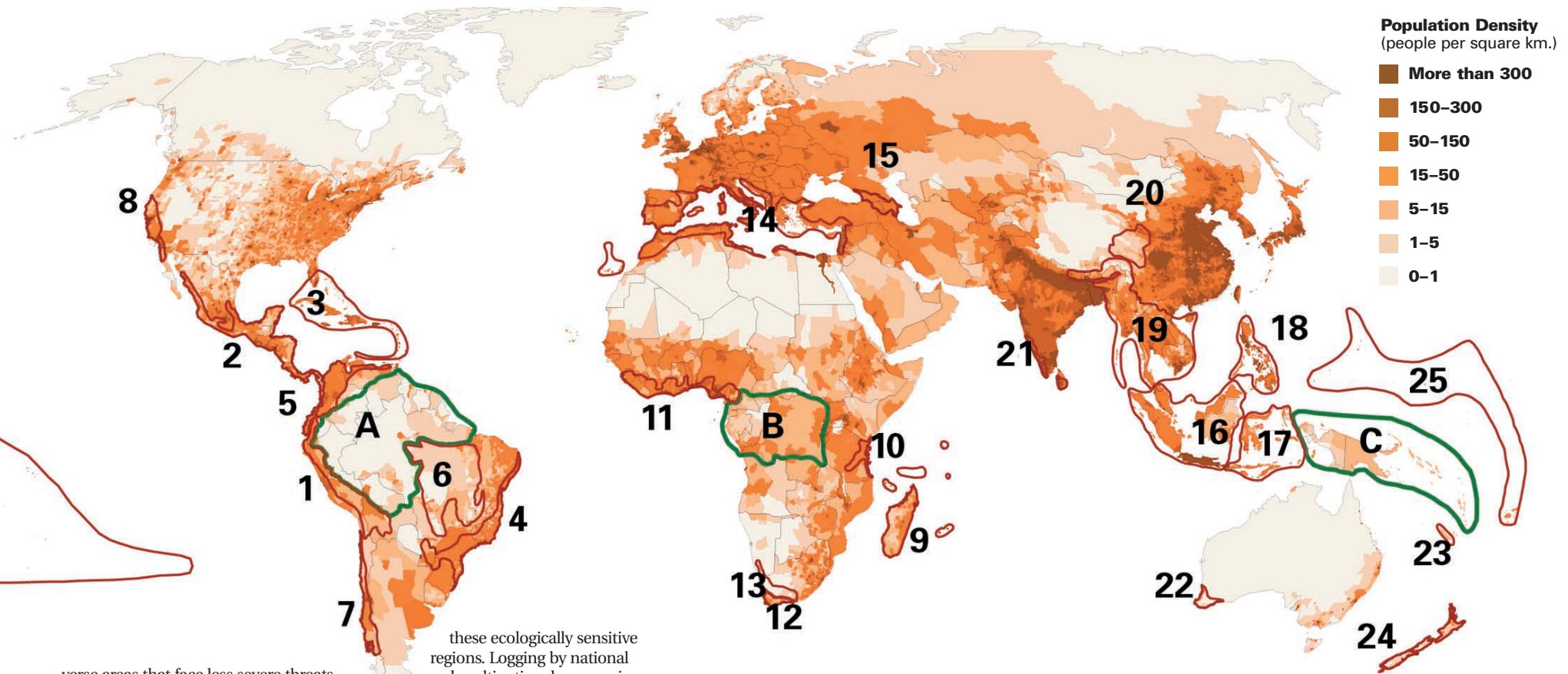
Population density in the hotspots is greater than the population density of the world as a whole. In 16 of the 25 hotspots, population density is equal to or greater than the world average. In the major tropical wilderness areas, population densities are relatively low, but increasing rapidly.



■ Biodiversity hotspots ■ Major tropical wilderness areas

◀ 1.3% per year  
World population growth rate

◀ 42 people per square kilometer  
World population density



verse areas that face less severe threats than the hotspots, but where population density is relatively low now but is increasing rapidly. The annual growth rate of this population is 3.1 percent, more than twice that of the world. About 1.3 percent of the world's population, or 75 million people, lives in these tropical rainforests. Many are recent migrants drawn by government settlement policies, urban poverty, rural landlessness, and natural growth of populations inside and outside

these ecologically sensitive regions. Logging by national and multinational companies contributes powerfully to the loss of forests in these areas, in part by opening up remote areas that landless farmers then convert to agriculture. If present deforestation rates continue, the major tropical wilderness areas could be reduced to a few isolated outposts of natural tropical woodland in the coming decades, like the hemmed-in forest parks of such cities as Rio de Janeiro and Singapore. The loss of species would have no parallel in the last 65 million years of earth history and

would leave humanity poorer for as long as our own species survives. Slowing the rate of local and global biodiversity loss presents one of the most formidable environmental challenges for humanity in the 21st century. The ongoing slowdown in population growth is one trend that offers hope that we may yet save most of the plant and animal species with which we share the earth. ■■■

**▲ Population Density and the Biodiversity Hotspots and Tropical Wilderness Areas, 1995**

The map depicts the estimated distribution of human population (1995 data) and the locations of the **biodiversity hotspots** (1-25) and **major tropical wilderness areas** (A, B & C). The boundaries of these biologically rich regions were mapped by ecologists Norman Myers, Russell Mittermeier, Cristina Mittermeier, Gustavo da Fonseca and Jennifer Kent. The hotspots are the most threatened of the species-rich terrestrial areas of the world. The major tropical wilderness areas are, by contrast, the least disturbed among species-rich terrestrial regions. They encompass the last remaining extensive tracts of intact tropical forest.

■ Biodiversity hotspots    ■ Major tropical wilderness areas

# APPENDICES

Country	POPULATION						WATER					
	1975 (thousands)	1996 <sup>5</sup> (thousands)	2000 (thousands)	2025 low projection (thousands)	2025 medium projection (thousands)	2025 high projection (thousands)	Annual internal renewable water resources (cubic kilometers)	Renewable water per capita 1975 (cubic meters)	Renewable water per capita 2000 (cubic meters)	Renewable water per capita 2025 (low population projection) (cubic meters)	Renewable water per capita 2025 (medium population projection) (cubic meters)	Renewable water per capita 2025 (high population projection) (cubic meters)
<b>Afghanistan</b>	15,378	20,368	22,720	41,464	44,934	47,960	65	4,227	2,861	1,568	1,447	1,355
<b>Albania</b>	2,424	3,151	3,113	3,488	3,820	4,173	56	23,020	17,922	15,998	14,608	13,371
<b>Algeria</b>	16,018	28,719	31,471	42,893	46,611	49,888	14	893	454	333	307	287
<b>Angola</b>	6,123	11,342	12,878	23,708	25,107	26,784	184	30,051	14,288	7,761	7,329	6,870
<b>Argentina</b>	26,049	35,219	37,032	43,284	47,160	51,023	994	38,158	26,842	43,284	21,077	19,482
<b>Armenia</b>	2,826	3,564	3,520	3,720	3,946	4,218	11	3,715	2,983	2,822	2,661	2,489
<b>Australia<sup>1</sup></b>	13,900	18,141	18,886	21,209	23,098	25,081	343	24,675	18,162	16,172	14,850	13,676
<b>Austria</b>	7,579	8,053	8,211	7,854	8,186	8,521	90	11,915	10,998	11,497	11,031	10,597
<b>Azerbaijan</b>	5,689	7,609	7,734	8,676	9,403	10,200	30	5,326	3,918	3,492	3,223	2,971
<b>Bahrain</b>	272	570	617	789	858	926	-	-	-	-	-	-
<b>Bangladesh</b>	76,582	120,594	129,155	163,172	178,751	194,737	1,211	15,808	9,373	7,419	6,773	6,217
<b>Belarus</b>	9,367	10,379	10,236	9,027	9,496	9,886	58	6,192	5,666	6,425	6,108	5,867
<b>Belgium<sup>6</sup></b>	9,796	10,109	10,161	9,573	9,918	10,305	13	1,276	1,230	1,306	1,260	1,213
<b>Belize</b>	134	219	241	335	370	402	16	119,644	66,470	47,692	43,239	39,813
<b>Benin</b>	3,046	5,480	6,097	10,450	11,109	11,652	26	8,470	4,232	2,469	2,322	2,214
<b>Bhutan</b>	1,178	1,893	2,124	3,633	3,904	4,190	95	80,668	44,728	26,147	24,335	22,671
<b>Bolivia</b>	4,759	7,593	8,329	11,998	13,131	14,002	300	63,040	36,020	25,003	22,846	21,426
<b>Bosnia and Herzegovina</b>	3,747	3,422	3,972	4,039	4,324	4,657	-	-	-	-	-	-
<b>Botswana</b>	759	1,509	1,622	2,050	2,242	2,457	15	19,368	9,062	7,170	6,557	5,984
<b>Brazil</b>	108,167	161,533	170,115	198,352	217,930	238,550	6,950	64,252	40,855	35,039	31,891	29,134
<b>Brunei Darussalam</b>	161	301	328	422	459	496	9	52,861	25,908	20,142	18,520	17,143
<b>Bulgaria</b>	8,722	8,448	8,225	6,813	7,023	7,823	205	23,504	24,924	30,088	29,190	26,203
<b>Burkina Faso</b>	6,108	10,704	11,937	22,432	23,321	24,365	18	2,865	1,466	780	750	718
<b>Burundi</b>	3,680	6,265	6,695	10,952	11,569	12,387	4	978	538	329	311	291
<b>Cambodia</b>	7,098	10,234	11,168	15,126	16,526	17,671	476	67,077	42,632	31,476	28,808	26,942
<b>Cameroon</b>	7,527	13,549	15,085	24,100	26,484	27,835	268	35,605	17,766	11,120	10,119	9,628
<b>Canada</b>	23,209	29,947	31,147	35,311	37,896	41,204	2,901	124,995	93,140	82,156	76,551	70,405
<b>Cape Verde</b>	278	389	428	622	671	718	-	-	-	-	-	-
<b>Central African Republic</b>	2,057	3,354	3,615	5,316	5,704	6,036	141	68,546	39,001	26,525	24,720	23,358
<b>Chad</b>	4,030	6,899	7,651	13,123	13,908	15,052	43	10,670	5,620	3,277	3,092	2,857
<b>Chile</b>	10,337	14,421	15,211	18,025	19,548	20,864	468	45,276	30,767	25,964	23,941	22,431
<b>China<sup>2</sup></b>	927,808	1,232,456	1,277,558	1,394,280	1,480,412	1,545,015	2,830	3,050	2,215	2,029	1,911	1,831
<b>Colombia</b>	25,381	39,288	42,321	55,947	59,758	64,446	1,070	42,158	25,283	19,125	17,906	16,603
<b>Congo, Dem. Republic of the</b>	23,251	46,772	51,654	98,990	104,788	112,840	832	574,966	282,660	154,355	146,244	137,185
<b>Congo, Republic</b>	1,447	2,634	2,943	5,390	5,689	6,065	1,019	43,826	19,727	10,294	9,724	9,030
<b>Costa Rica</b>	1,968	3,652	4,023	5,526	5,929	6,319	95	48,268	23,612	17,192	16,024	15,033
<b>Cote d'Ivoire</b>	6,755	13,816	14,786	21,638	23,345	25,065	78	11,503	5,255	3,591	3,328	3,100
<b>Croatia</b>	4,263	4,488	4,473	3,981	4,193	4,378	61	14,402	13,728	15,422	14,642	14,024
<b>Cuba</b>	9,306	11,018	11,201	11,402	11,798	12,559	35	3,707	3,080	3,026	2,924	2,747
<b>Czech Republic</b>	9,997	10,316	10,244	9,332	9,512	10,525	58	5,822	5,682	6,237	6,119	5,530
<b>Denmark<sup>3</sup></b>	5,060	5,241	5,293	4,950	5,238	5,461	13	2,569	2,456	2,626	2,482	2,380

See page 28 for endnotes.



ARABLE LAND							FOREST				CARBON DIOXIDE		Country
Arable land 1975 (thousands of hectares)	Arable land per capita 1975 (hectares)	Arable land 1997 (thousands of hectares)	Arable land per capita 2000 (hectares)	Arable land per capita 2025 (low population projection) (hectares)	Arable land per capita 2025 (medium population projection) (hectares)	Arable land per capita 2025 (high population projection) (hectares)	Forest cover 2000 (thousands of hectares)	Forest cover per capita 2000 (hectares)	Forest cover 2025 (thousands of hectares)	Forest cover per capita 2025 (hectares)	CO <sub>2</sub> emissions 1996 (thousands of metric tons of carbon)	CO <sub>2</sub> emissions per capita 1996 (metric tons of carbon)	
8,048	0.52	8,054	0.35	0.19	0.18	0.17	982	0.04	168	0.00	321	0.02	<b>Afghanistan</b>
662	0.27	702	0.23	0.20	0.18	0.17	1,046	0.34	1,046	0.27	530	0.17	<b>Albania</b>
7,495	0.47	8,040	0.26	0.19	0.17	0.16	1,751	0.06	1,291	0.03	25,736	0.90	<b>Algeria</b>
3,400	0.56	3,500	0.27	0.15	0.14	0.13	21,075	1.64	16,250	0.65	1,394	0.12	<b>Angola</b>
26,850	1.03	27,200	0.73	0.63	0.58	0.53	33,501	0.90	31,379	0.67	35,440	1.01	<b>Argentina</b>
-	-	559	0.16	0.15	0.14	0.13	382	0.11	748	0.19	1,009	0.28	<b>Armenia</b>
42,387	3.05	53,100	2.81	2.50	2.30	2.12	40,993	2.17	41,422	1.79	83,688	4.61	<b>Australia<sup>1</sup></b>
1,609	0.21	1,479	0.18	0.19	0.18	0.17	3,877	0.47	3,877	0.47	16,185	2.01	<b>Austria</b>
-	-	1,935	0.25	0.22	0.21	0.19	990	0.13	990	0.11	8,193	1.08	<b>Azerbaijan</b>
4	0.01	5	0.01	0.01	0.01	0.01	-	-	-	-	2,887	5.06	<b>Bahrain</b>
9,129	0.12	8,241	0.06	0.05	0.05	0.04	968	0.01	782	0.00	6,266	0.05	<b>Bangladesh</b>
-	-	6,319	0.62	0.70	0.67	0.64	7,733	0.76	9,820	1.03	16,851	1.62	<b>Belarus</b>
999	0.10	785	0.07	0.08	0.08	0.07	709	0.07	709	0.07	28,939	2.86	<b>Belgium<sup>6</sup></b>
48	0.36	89	0.37	0.27	0.24	0.22	1,930	8.02	1,775	4.80	97	0.44	<b>Belize</b>
1,415	0.46	1,595	0.26	0.15	0.14	0.14	4,345	0.71	3,180	0.29	179	0.03	<b>Benin</b>
112	0.10	160	0.08	0.04	0.04	0.04	2,710	1.28	2,490	0.64	71	0.04	<b>Bhutan</b>
1,880	0.40	2,100	0.25	0.18	0.16	0.15	45,568	5.47	34,023	2.59	2,757	0.36	<b>Bolivia</b>
-	-	650	0.16	0.16	0.15	0.14	2,710	0.68	2,710	0.63	849	0.25	<b>Bosnia and Herzegovina</b>
402	0.53	346	0.21	0.17	0.15	0.14	13,572	8.37	11,970	5.34	561	0.37	<b>Botswana</b>
40,001	0.37	65,300	0.38	0.33	0.30	0.27	538,656	3.17	480,358	2.20	74,610	0.46	<b>Brazil</b>
12	0.07	7	0.02	0.02	0.02	0.01	-	-	-	-	1,384	4.59	<b>Brunei Darussalam</b>
4,343	0.50	4,511	0.55	0.66	0.64	0.58	3,243	0.39	3,258	0.46	15,085	1.79	<b>Bulgaria</b>
2,536	0.42	3,440	0.29	0.15	0.15	0.14	4,117	0.34	3,425	0.15	264	0.02	<b>Burkina Faso</b>
1,180	0.32	1,100	0.16	0.10	0.10	0.09	310	0.05	278	0.02	60	0.01	<b>Burundi</b>
1,920	0.27	3,807	0.34	0.25	0.23	0.22	9,074	0.81	6,082	0.37	136	0.01	<b>Cambodia</b>
6,395	0.85	7,160	0.47	0.30	0.27	0.26	18,973	1.26	16,133	0.61	960	0.07	<b>Cameroon</b>
44,100	1.90	45,700	1.47	1.29	1.21	1.11	245,447	7.88	249,875	6.59	111,723	3.73	<b>Canada</b>
40	0.14	41	0.10	0.07	0.06	0.06	-	-	-	-	33	0.08	<b>Cape Verde</b>
1,890	0.92	2,020	0.56	0.38	0.35	0.33	29,302	8.11	26,357	4.62	64	0.02	<b>Central African Republic</b>
3,000	0.74	3,256	0.43	0.25	0.23	0.22	10,573	1.38	8,578	0.62	27	0.00	<b>Chad</b>
4,350	0.42	2,297	0.15	0.13	0.12	0.11	7,749	0.51	7,070	0.36	13,313	0.92	<b>Chile</b>
100,627	0.11	135,365	0.11	0.10	0.09	0.09	132,891	0.10	130,754	0.09	917,997	0.74	<b>China<sup>2</sup></b>
5,118	0.20	4,430	0.10	0.08	0.07	0.07	51,709	1.22	45,761	0.77	17,824	0.45	<b>Colombia</b>
7,450	0.32	7,880	0.15	0.08	0.08	0.07	105,665	2.05	89,451	0.85	626	0.01	<b>Congo, Dem. Republic of the</b>
162	0.11	185	0.06	0.03	0.03	0.03	19,331	6.57	18,334	3.22	1,354	0.51	<b>Congo, Republic</b>
492	0.25	505	0.13	0.09	0.09	0.08	1,070	0.27	497	0.08	1,278	0.35	<b>Costa Rica</b>
3,715	0.55	7,350	0.50	0.34	0.31	0.29	5,319	0.36	4,630	0.20	3,566	0.26	<b>Cote d'Ivoire</b>
-	-	1,442	0.32	0.36	0.34	0.33	1,825	0.41	1,825	0.44	4,788	1.07	<b>Croatia</b>
3,170	0.34	4,450	0.40	0.39	0.38	0.35	1,731	0.15	1,269	0.11	8,507	0.77	<b>Cuba</b>
-	-	3,331	0.33	0.36	0.35	0.32	2,631	0.26	2,636	0.28	34,580	3.35	<b>Czech Republic</b>
2,660	0.53	2,373	0.45	0.48	0.45	0.43	417	0.08	417	0.08	15,437	2.95	<b>Denmark<sup>3</sup></b>

Country	POPULATION						WATER					
	1975 <i>(thousands)</i>	1996 <sup>5</sup> <i>(thousands)</i>	2000 <i>(thousands)</i>	2025 low projection <i>(thousands)</i>	2025 medium projection <i>(thousands)</i>	2025 high projection <i>(thousands)</i>	Annual internal renewable water resources <i>(cubic kilometers)</i>	Renewable water per capita 1975 <i>(cubic meters)</i>	Renewable water per capita 2000 <i>(cubic meters)</i>	Renewable water per capita 2025 (low population projection) <i>(cubic meters)</i>	Renewable water per capita 2025 (medium population projection) <i>(cubic meters)</i>	Renewable water per capita 2025 (high population projection) <i>(cubic meters)</i>
<b>Dominican Republic</b>	5,048	7,961	8,495	10,383	11,164	12,127	20	3,962	2,354	1,926	1,791	1,649
<b>Ecuador</b>	6,907	11,699	12,646	16,490	17,796	19,341	314	45,460	24,830	19,042	17,644	16,235
<b>Egypt</b>	38,841	63,497	68,470	87,043	95,615	104,242	58	1,501	851	670	610	559
<b>El Salvador</b>	4,120	5,789	6,276	8,393	9,062	9,826	19	4,600	3,019	2,258	2,091	1,929
<b>Equatorial Guinea</b>	225	410	453	749	795	845	30	133,297	66,275	40,072	37,749	35,520
<b>Eritrea</b>	2,089	-	3,850	6,299	6,681	7,003	9	4,213	2,285	1,397	1,317	1,257
<b>Estonia</b>	1,432	1,466	1,396	1,112	1,131	1,230	13	8,939	9,168	11,512	11,315	10,405
<b>Ethiopia</b>	32,221	56,789	62,565	108,310	115,382	120,254	110	3,414	1,758	1,016	953	915
<b>Fiji</b>	576	777	817	1,012	1,104	1,195	29	49,566	34,949	28,219	25,857	23,882
<b>Finland</b>	4,711	5,126	5,176	5,057	5,254	5,473	113	23,984	21,833	22,346	21,508	20,647
<b>France</b>	52,699	58,283	59,080	58,647	61,662	63,909	198	3,757	3,351	3,376	3,211	3,098
<b>Gabon</b>	593	1,107	1,226	1,858	1,981	2,108	164	276,354	133,754	88,285	82,777	77,817
<b>Gambia</b>	548	1,150	1,305	2,044	2,151	2,260	8	14,609	6,129	3,915	3,719	3,541
<b>Georgia</b>	4,908	5,187	4,968	4,887	5,178	5,464	63	12,897	12,743	12,952	12,225	11,585
<b>Germany</b>	78,679	81,909	82,220	77,193	80,238	83,955	171	2,173	2,080	2,215	2,131	2,037
<b>Ghana</b>	9,829	18,154	20,212	34,245	36,876	39,682	53	5,412	2,632	1,553	1,443	1,341
<b>Greece</b>	9,047	10,532	10,645	9,713	9,863	10,354	59	6,483	5,510	6,038	5,947	5,664
<b>Grenada</b>	92	92	94	102	105	108	-	-	-	-	-	-
<b>Guatemala</b>	6,018	10,244	11,385	18,392	19,816	21,278	116	19,276	10,189	6,307	5,854	5,452
<b>Guinea</b>	4,149	7,275	7,430	12,020	12,497	12,982	226	54,476	30,416	18,803	18,084	17,409
<b>Guinea-Bissau</b>	627	1,111	1,213	1,822	1,946	2,079	27	43,041	22,257	14,817	13,874	12,987
<b>Guyana</b>	734	837	861	932	1,045	1,165	241	328,391	279,799	258,642	230,695	206,852
<b>Haiti</b>	4,920	7,689	8,222	11,177	11,988	12,805	11	2,236	1,338	984	918	859
<b>Honduras</b>	3,017	5,816	6,485	9,843	10,656	11,809	63	21,022	9,778	6,443	5,951	5,370
<b>Hungary</b>	10,532	10,193	10,036	8,581	8,900	9,800	120	11,394	11,957	13,984	13,483	12,245
<b>Iceland</b>	218	271	281	311	328	346	168	770,533	597,931	540,290	511,640	485,399
<b>India</b>	620,701	949,997	1,013,662	1,215,672	1,330,449	1,446,848	1,908	3,074	1,882	1,569	1,434	1,319
<b>Indonesia</b>	135,666	200,415	212,107	246,964	273,442	299,848	2,838	20,919	13,380	11,492	10,379	9,465
<b>Iran, Islamic Republic of</b>	33,344	63,469	67,702	85,613	94,463	103,564	138	4,124	2,031	1,606	1,456	1,328
<b>Iraq</b>	11,020	20,608	23,115	38,588	41,014	43,483	75	6,844	3,263	1,954	1,839	1,734
<b>Ireland</b>	3,177	3,634	3,730	4,175	4,404	4,630	50	15,737	13,404	11,976	11,354	10,799
<b>Israel</b>	3,455	5,722	6,217	7,345	8,277	9,312	2	622	346	293	260	231
<b>Italy</b>	55,441	57,392	57,298	49,841	51,270	53,306	167	3,012	2,915	3,351	3,257	3,133
<b>Jamaica</b>	2,013	2,495	2,583	2,948	3,245	3,530	8	4,124	3,214	2,815	2,558	2,351
<b>Japan</b>	111,524	125,769	126,714	116,290	121,150	124,832	430	3,856	3,393	3,698	3,549	3,445
<b>Jordan</b>	2,600	5,938	6,669	11,068	12,063	12,982	1	338	132	80	73	68
<b>Kazakhstan</b>	14,136	16,436	16,223	15,786	17,698	19,714	110	7,753	6,756	6,943	6,193	5,560
<b>Kenya</b>	13,741	27,851	30,080	38,041	41,756	45,468	30	2,198	1,004	794	723	664
<b>Korea, Dem. People's Rep. of</b>	16,304	22,610	24,039	27,813	29,388	31,297	77	4,729	3,207	2,772	2,624	2,463
<b>Korea, Republic of</b>	35,281	45,345	46,844	49,704	52,533	54,620	70	1,976	1,488	1,402	1,327	1,276
<b>Kuwait</b>	1,007	1,686	1,972	2,721	2,974	3,221	0	20	10	7	7	6
<b>Kyrgyzstan</b>	3,299	4,596	4,699	5,583	6,096	6,622	21	6,244	4,384	3,690	3,379	3,111
<b>Lao People's Dem. Republic</b>	3,024	4,902	5,433	9,235	9,653	10,515	332	109,645	61,034	35,908	34,354	31,536

ARABLE LAND							FOREST				CARBON DIOXIDE		Country
Arable land 1975 (thousands of hectares)	Arable land per capita 1975 (hectares)	Arable land 1997 (thousands of hectares)	Arable land per capita 2000 (hectares)	Arable land per capita 2025 (low population projection) (hectares)	Arable land per capita 2025 (medium population projection) (hectares)	Arable land per capita 2025 (high population projection) (hectares)	Forest cover 2000 (thousands of hectares)	Forest cover per capita 2000 (hectares)	Forest cover 2025 (thousands of hectares)	Forest cover per capita 2025 (hectares)	CO <sub>2</sub> emissions 1996 (thousands of metric tons of carbon)	CO <sub>2</sub> emissions per capita 1996 (metric tons of carbon)	
1,255	0.25	1,500	0.18	0.14	0.13	0.12	1,460	0.17	978	0.09	3,518	0.44	Dominican Republic
2,585	0.37	3,001	0.24	0.18	0.17	0.16	10,266	0.81	6,832	0.38	6,683	0.57	Ecuador
2,825	0.07	3,300	0.05	0.04	0.03	0.03	34	0.00	34	0.00	26,712	0.42	Egypt
698	0.17	816	0.13	0.10	0.09	0.08	89	0.01	39	0.00	1,104	0.19	El Salvador
230	1.02	230	0.51	0.31	0.29	0.27	1,734	3.83	1,518	1.91	39	0.10	Equatorial Guinea
-	-	393	0.10	0.06	0.06	0.06	282	0.07	282	0.04	-	-	Eritrea
-	-	1,143	0.82	1.03	1.01	0.93	2,114	1.51	2,714	2.40	4,473	3.05	Estonia
-	-	10,500	0.17	0.10	0.09	0.09	13,274	0.21	11,849	0.10	919	0.02	Ethiopia
155	0.27	285	0.35	0.28	0.26	0.24	817	1.00	735	0.67	208	0.27	Fiji
2,453	0.52	2,129	0.41	0.42	0.41	0.39	19,946	3.85	19,538	3.72	16,150	3.15	Finland
18,954	0.36	19,468	0.33	0.33	0.32	0.30	15,883	0.27	20,907	0.34	98,750	1.69	France
369	0.62	495	0.40	0.27	0.25	0.23	17,415	14.20	15,357	7.75	1,007	0.91	Gabon
164	0.30	200	0.15	0.10	0.09	0.09	87	0.07	70	0.03	59	0.05	Gambia
-	-	1,066	0.21	0.22	0.21	0.20	2,988	0.60	2,988	0.58	810	0.16	Georgia
12,510	0.16	12,060	0.15	0.16	0.15	0.14	10,740	0.13	10,740	0.13	235,050	2.87	Germany
3,400	0.35	4,550	0.23	0.13	0.12	0.11	8,472	0.42	6,185	0.17	1,104	0.06	Ghana
3,867	0.43	3,915	0.37	0.40	0.40	0.38	7,302	0.69	12,938	1.31	22,002	2.09	Greece
18	0.20	11	0.12	0.11	0.11	0.10	-	-	-	-	44	0.48	Grenada
1,638	0.27	1,905	0.17	0.10	0.10	0.09	3,469	0.30	2,084	0.11	1,849	0.18	Guatemala
1,115	0.27	1,485	0.20	0.12	0.12	0.11	6,014	0.81	4,521	0.36	298	0.04	Guinea
285	0.45	350	0.29	0.19	0.18	0.17	2,258	1.86	2,020	1.04	63	0.06	Guinea-Bissau
379	0.52	496	0.58	0.53	0.47	0.43	18,534	21.52	18,321	17.54	260	0.31	Guyana
860	0.17	910	0.11	0.08	0.08	0.07	18	0.00	7	0.00	292	0.04	Haiti
1,635	0.54	2,045	0.32	0.21	0.19	0.17	3,660	0.56	2,039	0.19	1,099	0.19	Honduras
5,495	0.52	5,047	0.50	0.59	0.57	0.52	1,764	0.18	2,008	0.23	16,231	1.59	Hungary
8	0.04	6	0.02	0.02	0.02	0.02	11	0.04	11	0.03	599	2.21	Iceland
168,010	0.27	169,850	0.17	0.14	0.13	0.12	65,041	0.06	65,221	0.05	272,212	0.29	India
26,000	0.19	30,987	0.15	0.13	0.11	0.10	104,624	0.49	82,216	0.30	66,882	0.33	Indonesia
16,440	0.49	19,400	0.29	0.23	0.21	0.19	1,414	0.02	911	0.01	72,779	1.15	Iran, Islamic Republic of
5,285	0.48	5,540	0.24	0.14	0.14	0.13	83	0.00	83	0.00	24,942	1.21	Iraq
1,236	0.39	1,346	0.36	0.32	0.31	0.29	650	0.17	1,251	0.28	9,527	2.62	Ireland
422	0.12	437	0.07	0.06	0.05	0.05	102	0.02	102	0.01	14,282	2.50	Israel
12,313	0.22	10,927	0.19	0.22	0.21	0.20	6,525	0.11	6,673	0.13	110,052	1.92	Italy
250	0.12	274	0.11	0.09	0.08	0.08	121	0.05	19	0.01	2,743	1.10	Jamaica
5,088	0.05	4,295	0.03	0.04	0.04	0.03	25,080	0.20	24,754	0.20	318,686	2.53	Japan
325	0.13	390	0.06	0.04	0.03	0.03	40	0.01	21	0.00	3,748	0.63	Jordan
-	-	30,135	1.86	1.91	1.70	1.53	11,565	0.71	18,715	1.06	47,447	2.89	Kazakhstan
4,272	0.31	4,520	0.15	0.12	0.11	0.10	1,275	0.04	1,195	0.03	1,849	0.07	Kenya
1,845	0.11	2,000	0.08	0.07	0.07	0.06	6,170	0.26	6,170	0.21	69,412	3.07	Korea, Dem. People's Rep. of
2,240	0.06	1,924	0.04	0.04	0.04	0.04	7,562	0.16	7,247	0.14	111,370	2.46	Korea, Republic of
1	0.00	7	0.00	0.00	0.00	0.00	5	0.00	5	0.00	11,624	6.89	Kuwait
-	-	1,425	0.30	0.26	0.23	0.22	730	0.16	730	0.12	1,674	0.36	Kyrgyzstan
670	0.22	852	0.16	0.09	0.09	0.08	11,735	2.16	8,783	0.91	92	0.02	Lao People's Dem. Republic

Country	POPULATION						WATER					
	1975 <i>(thousands)</i>	1996 <sup>5</sup> <i>(thousands)</i>	2000 <i>(thousands)</i>	2025 low projection <i>(thousands)</i>	2025 medium projection <i>(thousands)</i>	2025 high projection <i>(thousands)</i>	Annual internal renewable water resources <i>(cubic kilometers)</i>	Renewable water per capita 1975 <i>(cubic meters)</i>	Renewable water per capita 2000 <i>(cubic meters)</i>	Renewable water per capita 2025 (low population projection) <i>(cubic meters)</i>	Renewable water per capita 2025 (medium population projection) <i>(cubic meters)</i>	Renewable water per capita 2025 (high population projection) <i>(cubic meters)</i>
Latvia	2,474	2,499	2,357	1,870	1,936	2,087	35	14,312	15,022	18,928	18,285	16,965
Lebanon	2,767	3,083	3,282	3,986	4,400	4,814	5	1,735	1,463	1,204	1,091	997
Lesotho	1,187	-	2,153	3,238	3,506	3,690	5	4,405	2,430	1,615	1,492	1,417
Liberia	1,609	2,198	3,154	6,218	6,618	7,337	232	144,179	73,557	37,312	35,058	31,620
Libya	2,446	5,086	5,605	7,887	8,647	9,298	1	245	107	76	69	65
Lithuania	3,308	3,715	3,670	3,289	3,399	3,680	25	7,527	6,784	7,572	7,326	6,767
Luxembourg <sup>6</sup>	362	412	431	439	463	485	-	-	-	-	-	-
Macedonia	1,676	-	2,024	2,103	2,258	2,401	-	-	-	-	-	-
Madagascar	7,819	14,183	15,942	27,403	28,964	30,884	337	43,098	21,139	12,298	11,635	10,912
Malawi	5,244	9,835	10,925	18,204	19,958	21,446	19	3,562	1,710	1,026	936	871
Malaysia	12,258	20,549	22,244	28,404	30,968	33,531	580	47,317	26,074	20,419	18,729	17,297
Mali	6,169	10,186	11,234	19,740	21,295	23,349	100	16,211	8,902	5,066	4,696	4,283
Mauritania	1,371	1,124	2,670	4,520	4,766	5,070	11	8,314	4,270	2,522	2,392	2,248
Mauritius <sup>4</sup>	892	2,394	1,158	1,281	1,379	1,471	2	2,477	1,908	1,725	1,602	1,502
Mexico	59,099	92,718	98,881	120,389	130,196	141,966	357	6,047	3,614	2,969	2,745	2,518
Moldova, Republic of	3,839	4,376	4,380	4,231	4,547	4,786	12	3,048	2,671	2,765	2,573	2,445
Mongolia	1,447	2,495	2,662	3,340	3,709	4,076	35	24,043	13,073	10,420	9,383	8,538
Morocco	17,305	26,417	28,351	35,195	38,670	42,059	30	1,734	1,058	852	776	713
Mozambique	10,498	17,950	19,680	29,103	30,612	32,684	216	20,575	10,975	7,422	7,056	6,609
Myanmar	30,441	43,393	45,611	52,906	58,120	63,210	1,046	34,348	22,924	19,763	17,990	16,542
Namibia	900	-	1,726	2,107	2,338	2,497	46	50,538	26,364	21,595	19,464	18,220
Nepal	12,797	21,791	23,930	35,393	38,010	40,674	210	16,426	8,784	5,939	5,530	5,168
Netherlands	13,653	15,541	15,786	15,441	15,782	16,544	90	6,592	5,701	5,829	5,703	5,440
New Zealand	3,083	3,720	3,862	4,418	4,695	5,004	327	106,062	84,673	74,020	69,649	65,345
Nicaragua	2,498	4,552	5,074	8,035	8,696	9,368	175	70,053	34,488	21,780	20,124	18,680
Niger	4,771	9,454	10,730	20,797	21,495	22,184	33	6,813	3,029	1,563	1,512	1,465
Nigeria	57,004	101,413	111,506	174,368	183,041	196,872	280	4,912	2,511	1,606	1,530	1,422
Norway	4,007	4,372	4,465	4,569	4,817	5,029	392	97,821	87,800	85,794	81,383	77,945
Oman	880	2,230	2,542	5,019	5,352	5,738	1	880	388	196	184	172
Pakistan	74,734	140,055	156,483	245,920	263,000	280,225	418	5,597	2,673	1,701	1,590	1,493
Panama	1,723	2,677	2,856	3,483	3,779	4,126	144	83,567	50,426	41,340	38,104	34,904
Papua New Guinea	2,729	4,399	4,807	6,765	7,460	7,962	801	293,559	166,644	118,400	107,374	100,597
Paraguay	2,659	4,957	5,496	8,711	9,355	9,806	314	118,096	57,128	36,045	33,564	32,022
Peru	15,161	23,944	25,662	32,505	35,518	38,550	40	2,638	1,559	1,231	1,126	1,038
Philippines	43,010	69,902	75,967	100,153	108,251	117,066	479	11,137	6,305	4,783	4,425	4,092
Poland	34,022	38,659	38,765	38,143	39,069	41,321	56	1,652	1,450	1,473	1,438	1,360
Portugal	9,093	9,859	9,875	9,165	9,348	10,025	70	7,654	7,048	7,594	7,445	6,943
Qatar	171	558	599	728	779	824	-	-	-	-	-	-
Romania	21,245	22,633	22,327	19,607	19,945	22,510	208	9,790	9,316	10,608	10,428	9,240
Russia	134,233	147,876	146,934	131,063	137,933	150,380	4,498	33,511	30,614	34,321	32,612	29,912
Rwanda	4,384	5,475	7,733	11,580	12,427	13,058	6	1,437	815	544	507	482
Samoa	151	170	180	255	271	293	-	-	-	-	-	-
Saudi Arabia	7,251	18,829	21,607	37,562	39,965	42,407	2	331	111	64	60	57

ARABLE LAND							FOREST				CARBON DIOXIDE		Country
Arable land 1975 (thousands of hectares)	Arable land per capita 1975 (hectares)	Arable land 1997 (thousands of hectares)	Arable land per capita 2000 (hectares)	Arable land per capita 2025 (low population projection) (hectares)	Arable land per capita 2025 (medium population projection) (hectares)	Arable land per capita 2025 (high population projection) (hectares)	Forest cover 2000 (thousands of hectares)	Forest cover per capita 2000 (hectares)	Forest cover 2025 (thousands of hectares)	Forest cover per capita 2025 (hectares)	CO <sub>2</sub> emissions 1996 (thousands of metric tons of carbon)	CO <sub>2</sub> emissions per capita 1996 (metric tons of carbon)	
-	-	1,830	0.78	0.98	0.95	0.88	3,013	1.28	3,760	1.94	2,533	1.01	Latvia
335	0.12	308	0.09	0.08	0.07	0.06	35	0.01	5	0.00	3,866	1.25	Lebanon
372	0.31	325	0.15	0.10	0.09	0.09	6	0.00	6	0.00	-	-	Lesotho
366	0.23	327	0.10	0.05	0.05	0.04	4,377	1.39	3,780	0.57	89	0.04	Liberia
2,055	0.84	2,115	0.38	0.27	0.24	0.23	400	0.07	400	0.05	11,075	2.18	Libya
-	-	3,006	0.82	0.91	0.88	0.82	2,034	0.55	2,348	0.69	3,780	1.02	Lithuania
999	0.10	785	0.07	0.08	0.08	0.07	-	-	-	-	2,260	5.48	Luxembourg <sup>6</sup>
-	-	658	0.33	0.31	0.29	0.27	987	0.49	982	0.43	-	-	Macedonia
2,759	0.35	3,108	0.19	0.11	0.11	0.10	14,483	0.91	11,732	0.41	327	0.02	Madagascar
1,270	0.24	1,710	0.16	0.09	0.09	0.08	3,087	0.28	2,084	0.10	200	0.02	Malawi
4,678	0.38	7,605	0.34	0.27	0.25	0.23	13,699	0.62	7,457	0.24	32,497	1.58	Malaysia
1,850	0.30	4,650	0.41	0.24	0.22	0.20	11,043	0.98	8,689	0.41	129	0.01	Mali
196	0.14	502	0.19	0.11	0.11	0.10	556	0.21	556	0.12	476	0.42	Mauritania
106	0.12	106	0.09	0.08	0.08	0.07	12	0.01	12	0.01	805	0.34	Mauritius <sup>4</sup>
23,840	0.40	27,300	0.28	0.23	0.21	0.19	52,958	0.54	42,322	0.33	95,007	1.02	Mexico
-	-	2,183	0.50	0.52	0.48	0.46	357	0.08	357	0.08	3,302	0.75	Moldova, Republic of
827	0.57	1,320	0.50	0.40	0.36	0.32	9,406	3.53	9,406	2.54	2,424	0.97	Mongolia
7,717	0.45	9,595	0.34	0.27	0.25	0.23	3,777	0.13	3,499	0.09	7,609	0.29	Morocco
3,080	0.29	3,180	0.16	0.11	0.10	0.10	16,300	0.83	13,761	0.45	272	0.02	Mozambique
9,985	0.33	10,151	0.22	0.19	0.17	0.16	25,343	0.56	17,956	0.31	1,995	0.05	Myanmar
653	0.73	820	0.48	0.39	0.35	0.33	12,168	7.05	11,186	4.79	-	-	Namibia
2,326	0.18	2,968	0.12	0.08	0.08	0.07	4,563	0.19	3,461	0.09	440	0.02	Nepal
796	0.06	935	0.06	0.06	0.06	0.06	334	0.02	334	0.02	42,348	2.72	Netherlands
3,500	1.14	3,280	0.85	0.74	0.70	0.66	8,107	2.10	9,321	1.99	8,120	2.18	New Zealand
1,230	0.49	2,746	0.54	0.34	0.32	0.29	4,896	0.96	2,592	0.30	781	0.17	Nicaragua
2,154	0.45	5,000	0.47	0.24	0.23	0.23	2,562	0.24	2,562	0.12	306	0.03	Niger
30,000	0.53	30,738	0.28	0.18	0.17	0.16	13,199	0.12	10,640	0.06	22,743	0.22	Nigeria
792	0.20	902	0.20	0.20	0.19	0.18	8,210	1.84	8,933	1.85	18,290	4.18	Norway
37	0.04	63	0.02	0.01	0.01	0.01	-	-	-	-	4,133	1.85	Oman
19,830	0.27	21,600	0.14	0.09	0.08	0.08	1,510	0.01	727	0.00	25,746	0.18	Pakistan
546	0.32	655	0.23	0.19	0.17	0.16	2,514	0.88	1,468	0.39	1,823	0.68	Panama
491	0.18	670	0.14	0.10	0.09	0.08	36,285	7.55	33,184	4.45	657	0.15	Papua New Guinea
1,154	0.43	2,285	0.42	0.26	0.24	0.23	10,097	1.84	5,206	0.56	1,009	0.20	Paraguay
3,200	0.21	4,200	0.16	0.13	0.12	0.11	66,495	2.59	61,408	1.73	7,144	0.30	Peru
7,664	0.18	9,520	0.13	0.10	0.09	0.08	5,667	0.07	2,336	0.02	17,260	0.25	Philippines
15,099	0.44	14,424	0.37	0.38	0.37	0.35	8,792	0.23	9,101	0.23	97,375	2.52	Poland
3,118	0.34	2,900	0.29	0.32	0.31	0.29	3,000	0.30	3,713	0.40	13,082	1.33	Portugal
2	0.01	17	0.03	0.02	0.02	0.02	-	-	-	-	7,948	14.24	Qatar
10,500	0.49	9,900	0.44	0.50	0.50	0.44	6,240	0.28	6,210	0.31	32,555	1.44	Romania
-	-	127,962	0.87	0.98	0.93	0.85	763,500	5.20	763,500	5.54	431,090	2.92	Russia
912	0.21	1,150	0.15	0.10	0.09	0.09	248	0.03	238	0.02	134	0.02	Rwanda
118	0.78	122	0.68	0.48	0.45	0.42	-	-	-	-	36	0.21	Samoa
1,684	0.23	3,830	0.18	0.10	0.10	0.09	213	0.01	175	0.00	73,098	3.88	Saudi Arabia

Country	POPULATION						WATER					
	1975 (thousands)	1996 <sup>5</sup> (thousands)	2000 (thousands)	2025 low projection (thousands)	2025 medium projection (thousands)	2025 high projection (thousands)	Annual internal renewable water resources (cubic kilometers)	Renewable water per capita 1975 (cubic meters)	Renewable water per capita 2000 (cubic meters)	Renewable water per capita 2025 (low population projection) (cubic meters)	Renewable water per capita 2025 (medium population projection) (cubic meters)	Renewable water per capita 2025 (high population projection) (cubic meters)
Senegal	4,806	8,548	9,481	15,803	16,743	17,639	39	8,198	4,156	2,493	2,353	2,234
Sierra Leone	2,931	4,289	4,854	7,714	8,085	8,655	160	54,597	32,960	20,742	19,789	18,486
Singapore	2,263	3,375	3,567	3,939	4,168	4,304	1	265	168	152	144	139
Slovakia	4,736	5,365	5,387	5,119	5,393	5,831	31	6,503	5,716	6,016	5,710	5,281
Slovenia	1,742	1,995	1,986	1,790	1,818	1,950	-	-	-	-	-	-
Solomon Islands	190	392	444	756	817	883	45	234,897	100,757	59,092	54,742	50,617
Somalia	4,134	8,467	10,097	19,853	21,211	22,663	14	3,266	1,337	680	636	596
South Africa	24,728	38,126	40,377	41,809	46,015	50,289	50	2,022	1,238	1,196	1,087	994
Spain	35,596	39,593	39,630	35,976	36,658	38,837	111	3,127	2,808	3,094	3,036	2,866
Sri Lanka	13,603	18,096	18,827	22,341	23,547	24,933	50	3,676	2,656	2,238	2,123	2,005
Sudan	16,012	27,160	29,490	43,675	46,264	48,735	154	9,618	5,222	3,526	3,329	3,160
Suriname	364	410	417	482	525	564	200	548,698	479,467	414,836	381,212	354,855
Swaziland	482	898	1,008	1,643	1,785	1,926	5	9,364	4,475	2,745	2,527	2,342
Sweden	8,193	8,832	8,910	8,866	9,097	9,816	180	21,971	20,202	20,302	19,787	18,338
Switzerland	6,339	7,198	7,386	7,271	7,587	7,938	50	7,888	6,770	6,877	6,590	6,299
Syrian Arab Republic	7,438	14,571	16,125	24,335	26,292	28,265	45	6,014	2,774	1,838	1,701	1,583
Tajikistan	3,442	5,836	6,188	8,089	8,857	9,645	16	4,648	2,586	1,978	1,807	1,659
Tanzania, United Republic of	15,900	30,700	33,517	52,598	57,918	62,010	89	5,597	2,655	1,692	1,537	1,435
Thailand	41,359	59,172	61,399	67,999	72,717	77,953	410	9,911	6,676	6,028	5,637	5,258
Togo	2,285	4,172	4,629	7,949	8,482	9,145	12	5,251	2,592	1,510	1,415	1,312
Trinidad and Tobago	1,012	1,270	1,295	1,415	1,493	1,587	5	5,040	3,938	3,604	3,415	3,213
Tunisia	5,668	9,081	9,586	11,775	12,843	13,927	4	727	430	350	321	296
Turkey	40,025	62,332	66,591	79,161	87,869	95,570	204	5,087	3,057	2,572	2,317	2,130
Turkmenistan	2,520	4,156	4,459	5,815	6,287	6,765	25	9,802	5,539	4,247	3,929	3,651
Uganda	11,183	19,464	21,778	39,431	44,435	47,703	66	5,902	3,031	1,674	1,485	1,384
Ukraine	49,016	51,254	50,456	44,461	45,688	48,392	140	2,848	2,767	3,140	3,056	2,885
United Arab Emirates	505	2,260	2,441	3,074	3,284	3,492	0	297	61	49	46	43
United Kingdom	56,226	58,431	58,830	56,775	59,961	63,243	71	1,263	1,207	1,251	1,184	1,123
United States of America	220,165	269,439	278,357	304,412	325,573	350,084	2,478	11,255	8,902	8,140	7,611	7,078
Uruguay	2,829	3,242	3,337	3,614	3,907	4,187	124	43,839	37,158	34,313	31,741	29,618
Uzbekistan	13,981	22,848	24,318	30,779	33,355	35,978	50	3,605	2,073	1,638	1,511	1,401
Venezuela	12,734	173	24,170	31,724	34,775	37,514	1,317	103,421	54,490	41,514	37,872	35,107
Vietnam	48,030	22,311	79,832	96,721	108,037	118,521	891	18,555	11,163	9,214	8,249	7,519
Yemen	6,991	75,159	18,112	36,000	38,985	41,764	4	586	226	114	105	98
Yugoslavia	9,085	15,674	10,640	10,151	10,844	11,671	-	-	-	-	-	-
Zambia	4,841	8,389	9,169	14,119	15,616	16,964	116	23,961	12,652	8,216	7,428	6,838
Zimbabwe	6,143	11,045	11,669	13,440	15,092	16,441	20	3,256	1,714	1,488	1,325	1,216

<sup>1</sup>Australia includes Christmas Island, Cocos (Keeling) Islands and Norfolk Island.

<sup>2</sup>For statistical purposes, the data for China do not include Hong Kong Special Administrative Region (Hong Kong SAR).

<sup>3</sup>Denmark includes Greenland.

<sup>4</sup>Mauritius includes Agalega, Rodrigues and Saint Brandon.

<sup>5</sup>1996 population data were used only for per capita carbon emissions calculations.

<sup>6</sup>Please note that all arable land data for Belgium and Luxembourg are combined figures.

- no data or not applicable

ARABLE LAND							FOREST				CARBON DIOXIDE		Country
Arable land 1975 (thousands of hectares)	Arable land per capita 1975 (hectares)	Arable land 1997 (thousands of hectares)	Arable land per capita 2000 (hectares)	Arable land per capita 2025 (low population projection) (hectares)	Arable land per capita 2025 (medium population projection) (hectares)	Arable land per capita 2025 (high population projection) (hectares)	Forest cover 2000 (thousands of hectares)	Forest cover per capita 2000 (hectares)	Forest cover 2025 (thousands of hectares)	Forest cover per capita 2025 (hectares)	CO <sub>2</sub> emissions 1996 (thousands of metric tons of carbon)	CO <sub>2</sub> emissions per capita 1996 (metric tons of carbon)	
2,350	0.49	2,266	0.24	0.14	0.14	0.13	7,141	0.75	6,053	0.36	836	0.10	Senegal
472	0.16	546	0.11	0.07	0.07	0.06	1,126	0.23	530	0.07	122	0.03	Sierra Leone
8	0.00	1	0.00	0.00	0.00	0.00	4	0.00	4	0.00	17,968	5.32	Singapore
-	-	1,605	0.30	0.31	0.30	0.28	2,001	0.37	2,063	0.38	10,820	2.02	Slovakia
-	-	285	0.14	0.16	0.16	0.15	1,077	0.54	1,077	0.59	3,559	1.78	Slovenia
50	0.26	60	0.14	0.08	0.07	0.07	-	-	-	-	44	0.11	Solomon Islands
975	0.24	1,061	0.11	0.05	0.05	0.05	748	0.07	719	0.03	4	0.00	Somalia
13,392	0.54	16,300	0.40	0.39	0.35	0.32	8,425	0.21	8,063	0.18	79,898	2.10	South Africa
20,833	0.59	19,164	0.48	0.53	0.52	0.49	8,388	0.21	8,388	0.23	63,451	1.60	Spain
1,910	0.14	1,888	0.10	0.08	0.08	0.08	1,700	0.09	1,293	0.05	1,932	0.11	Sri Lanka
12,215	0.76	16,900	0.57	0.39	0.37	0.35	39,922	1.35	32,442	0.70	948	0.03	Sudan
43	0.12	67	0.16	0.14	0.13	0.12	14,660	35.15	14,360	27.37	573	1.40	Suriname
170	0.35	180	0.18	0.11	0.10	0.09	146	0.14	146	0.08	93	0.10	Swaziland
3,006	0.37	2,799	0.31	0.32	0.31	0.29	24,413	2.74	24,353	2.68	14,776	1.67	Sweden
395	0.06	444	0.06	0.06	0.06	0.06	1,130	0.15	1,130	0.15	12,070	1.68	Switzerland
5,476	0.74	5,521	0.34	0.23	0.21	0.20	196	0.01	112	0.00	12,088	0.83	Syrian Arab Republic
-	-	890	0.14	0.11	0.10	0.09	410	0.07	410	0.05	1,595	0.27	Tajikistan
3,080	0.19	4,000	0.12	0.08	0.07	0.06	30,973	0.92	24,313	0.42	667	0.02	Tanzania, United Republic of
16,680	0.40	20,445	0.33	0.30	0.28	0.26	10,187	0.17	5,254	0.07	56,048	0.95	Thailand
2,360	1.03	2,430	0.52	0.31	0.29	0.27	1,158	0.25	808	0.10	205	0.05	Togo
115	0.11	122	0.09	0.09	0.08	0.08	149	0.12	101	0.07	6,069	4.78	Trinidad and Tobago
4,860	0.86	4,900	0.51	0.42	0.38	0.35	540	0.06	473	0.04	4,417	0.49	Tunisia
27,662	0.69	29,162	0.44	0.37	0.33	0.31	8,856	0.13	8,856	0.10	48,674	0.78	Turkey
-	-	1,695	0.38	0.29	0.27	0.25	3,754	0.84	3,754	0.60	9,346	2.25	Turkmenistan
5,407	0.48	6,810	0.31	0.17	0.15	0.14	5,822	0.27	4,594	0.10	282	0.01	Uganda
-	-	34,081	0.68	0.77	0.75	0.70	9,267	0.18	9,404	0.21	108,431	2.12	Ukraine
15	0.03	81	0.03	0.03	0.02	0.02	60	0.02	60	0.02	22,337	9.89	United Arab Emirates
6,954	0.12	6,425	0.11	0.11	0.11	0.10	2,456	0.04	2,813	0.05	152,015	2.60	United Kingdom
188,218	0.85	179,000	0.64	0.59	0.55	0.51	215,499	0.77	231,061	0.71	1,446,777	5.37	United States of America
1,437	0.51	1,307	0.39	0.36	0.33	0.31	812	0.24	802	0.21	1,540	0.48	Uruguay
-	-	4,850	0.20	0.16	0.15	0.13	10,409	0.43	20,169	0.60	25,922	1.13	Uzbekistan
3,570	0.28	3,490	0.14	0.11	0.10	0.09	41,614	1.72	31,509	0.91	17	0.10	Venezuela
6,240	0.13	7,202	0.09	0.07	0.07	0.06	8,488	0.11	5,936	0.05	39,438	1.77	Vietnam
1,460	0.21	1,555	0.09	0.04	0.04	0.04	9	0.00	9	0.00	10,274	0.14	Yemen
-	-	4,058	0.38	0.40	0.37	0.35	1,769	0.17	1,769	0.16	4,642	0.30	Yugoslavia
5,000	1.03	5,265	0.57	0.37	0.34	0.31	30,129	3.29	24,515	1.57	667	0.08	Zambia
2,565	0.42	3,210	0.28	0.24	0.21	0.20	8,467	0.73	7,350	0.49	5,025	0.45	Zimbabwe

## The 25 Global Hotspots and Major Tropical Wilderness Areas

<b>Hotspot (numbers)/Wilderness area (letters)</b>	<b>Hotspot/Wilderness Area</b> <i>(thousands of square kilometers)</i>	<b>Human population, 1995</b> <i>(thousands)</i>	<b>Population density, 1995</b> <i>(per square kilometer)</i>	<b>Population growth rate, 1995-2000</b> <i>(percent per year)</i>
<b>1 Tropical Andes</b>	1,415	57,920	40	2.8
<b>2 Mesoamerica</b>	1,099	61,060	56	2.2
<b>3 Caribbean</b>	264	38,780	136	1.2
<b>4 Atlantic Forest Region</b>	824	65,050	79	1.7
<b>5 Chocó/Darién/Western Ecuador</b>	134	5,930	44	3.2
<b>6 Brazilian Cerrado</b>	2,160	14,370	7	2.4
<b>7 Central Chile</b>	320	9,710	29	1.4
<b>8 California Floristic Province</b>	236	25,360	108	1.2
<b>9 Madagascar and Indian Ocean Islands</b>	587	15,450	26	2.7
<b>10 Eastern Arc Mountains and Coastal Forests</b>	142	7,070	50	2.2
<b>11 Guinean Forests of West Africa</b>	660	68,290	104	2.7
<b>12 Cape Floristic Province of South Africa</b>	82	3,480	42	2.0
<b>13 Succulent Karoo</b>	193	460	3	1.9
<b>14 Mediterranean Basin</b>	1,556	174,460	111	1.3
<b>15 Caucasus</b>	184	13,940	76	-0.3
<b>16 Sundaland</b>	1,500	180,490	121	2.1
<b>17 Wallacea</b>	341	18,260	54	1.9
<b>18 Philippines</b>	293	61,790	198	2.1
<b>19 Indo-Burma</b>	2,313	224,920	98	1.5
<b>20 Mountains of South-Central China</b>	469	12,830	25	1.5
<b>21 Western Ghats and Sri Lanka</b>	136	46,810	341	1.4
<b>22 Southwestern Australia</b>	107	1,440	13	1.7
<b>23 New Caledonia</b>	16	140	8	2.1
<b>24 New Zealand</b>	260	2,740	11	1.0
<b>25 Polynesia/Micronesia</b>	46	2,900	58	1.3
<b>A Upper Amazonia and Guyana Shield</b>	5,830	14,750	3	3.9
<b>B Congo Basin</b>	2,886	54,040	18	3.0
<b>C New Guinea and Melanesian Islands</b>	906	6,120	6	2.6

## Global Fishing Data

	<b>1970</b>	<b>1980</b>	<b>1990</b>
<b>Total global fish production in metric tons</b> <i>(includes both aquaculture and marine catch)</i>	65,342,942	72,256,376	98,594,817
<b>Fishers</b>	13,000,000	17,000,000	29,000,000
<b>Average tons of fish caught per fisher</b>	5.23	4.25	3.40



# METHODOLOGY and DATA SOURCES

This publication relies for population data on the national and world population estimates and projections of the United Nations Population Division from *World Population Prospects: The 1998 Revision*.<sup>1</sup> For the years from 1996 to 2000, this required the use of medium projections rather than estimates of actual population based on current demographic information. Any differences between such projections and future population estimates for these years are likely to be insignificant.

## Fresh Water

Freshwater resource data come from *World Resources*,<sup>2</sup> a biennial publication of the World Resources Institute in cooperation with the World Bank and the United Nations. For countries in Asia, except those included in the Middle East, and the former Soviet Union, water data were taken from the Food and Agriculture Organization of the United Nations' *Irrigation in the Former Soviet Union in Figures*<sup>3</sup> and the FAO's *Irrigation in Asia in Figures*.<sup>4</sup> These data were more recent than those provided by WRI. UN population data include the 2000 medium projection and the low and high projections for 2025. For further information, see Population Action International's publications *Sustaining Water: Population and the Future of Renewable Water Supplies*<sup>5</sup> and *Sustaining Water, Easing Scarcity: A Second Update*.<sup>6</sup>

## Cropland

Data for arable land are from the FAO Statistical Databases 1998, produced by and available on CD-ROM from the United Nations Food and Agriculture Organization in Rome. UN population data represent the 2000 medium projection and the low and high projections for 2025. Data for The State of World Hunger map are from FAO's *The State of Food Insecurity in the World*.<sup>7</sup> For further information about methodology, see PAI's *Conserving Land: Population and Sustainable Food Production*.<sup>8</sup>

## Forests

Data on forest cover are based on the biannual publication of the United Nations Food and Agriculture Organization, *State of the World's Forests, 1999*.<sup>9</sup> Each country's total forest area in 2000 and 2025 was calculated by applying the FAO rate of forest area change in each country for the most recent period available (1990-1995) to its total forest area in 1995. These data formed the basis for calculating per capita forest cover—the forest-to-people ratio—for the countries charted in the section on people and forests. The forest-to-people ratios are based on a country's total population (using the medium population projection) compared to its total forest area. For further information, see PAI's *Forest Futures: Population, Consumption and Wood Resources*.<sup>10</sup>

## Fisheries

Data for A World of Declining Fisheries were derived from the Fishstat Plus database, "Total production 1950-1998," which is available on CD-ROM from the FAO in Rome.<sup>11</sup> Data used for the period up to 1995 came from "Catches and Landings," in the *FAO Yearbook of Fishery Statistics*, Vol. 80.<sup>12</sup> The data for "Fish Protein as a Percentage of Total Protein Intake in 26 Countries" came from *1961-1997 Fish and Fishery Products*.<sup>13</sup> The data for "More Fishers Fishing, Fewer Fish Caught" came from *FAO Fisheries Circular No. 929 Revision 1999*.<sup>14</sup> The

data for "Real and Projected Trends in Global Per Capita Fish Production: 1950-2010" came from the FAO's Fisheries Department.<sup>15</sup>

## Carbon

The carbon dioxide emissions data are from the Carbon Dioxide Information Analysis Center (CDIAC),<sup>16</sup> a data center with the U.S. Department of Energy that monitors fossil-fuel and other climate-change-related production issues worldwide. Population data are from the UN Population Division's medium projection. For further information about methodology, see PAI's *Stabilizing the Atmosphere: Population, Consumption and Greenhouse Gases*<sup>17</sup> and *Profiles in Carbon: An Update on Population, Consumption and Carbon Dioxide Emissions*.<sup>18</sup>

## Biodiversity

Population densities for the biodiversity hotspots were estimated using the Gridded Population of the World, 1995, a geographic information systems (GIS) data layer developed at the National Center for Geographic Information Analysis, University of Santa Barbara, and the Center for International Earth Science Information Network, based at Columbia University in New York.<sup>19</sup> Hotspot boundaries were provided by Conservation International and were drawn by ecologist Norman Myers and Russell A. Mittermeier, Cristina G. Mittermeier and Gustavo A. B. da

Fonseca of Conservation International. Sub-national growth rates were estimated using several sources: local growth rate estimates, census enumeration and local projections. Where provincial data were unavailable or unnecessary, rates were obtained from national estimates published by the UN Population Division. For further information on methodology, see *Nature's Place: Human Population and the Future of Biological Diversity*.<sup>20</sup>

<sup>1</sup> United Nations Population Division, *World Population Prospects: The 1998 Revision* (New York: United Nations, 1998).

<sup>2</sup> World Resources Institute, *World Resources 1998-99* (New York: Oxford University Press, 1998).

<sup>3</sup> Food and Agriculture Organization of the United Nations, *Irrigation in the Countries of the Former Soviet Union in Figures* (Rome: FAO, 1997).

<sup>4</sup> Food and Agriculture Organization of the United Nations, *Irrigation in Asia in Figures* (Rome: FAO, 1999).

<sup>5</sup> Robert Engelman and Pamela LeRoy, *Sustaining Water: Population and the Future of Renewable Water Supplies* (Washington, DC: Population Action International, 1993).

<sup>6</sup> Tom Gardner-Outlaw and Robert Engelman, *Sustaining Water, Easing Scarcity: A Second Update* (Washington, DC: Population Action International, 1998).

<sup>7</sup> Food and Agriculture Organization of the United Nations, *Food Insecurity: When People Must Live With Hunger and Fear Starvation* (Rome: FAO, 1999).

<sup>8</sup> Robert Engelman and Pamela LeRoy, *Conserving Land: Population and Sustainable Food Production* (Washington, DC: Population Action International, 1995).

<sup>9</sup> Food and Agriculture Organization of the United Nations, *State of the World's Forests, 1999* (Rome: FAO, 1999).

<sup>10</sup> Tom Gardner-Outlaw and Robert Engelman, *Forest Futures: Population,*

*Consumption and Wood Resources* (Washington, DC: Population Action International, 1999).

<sup>11</sup> <http://www.fao.org/fi/statist/statist.asp> last accessed June 5, 2000.

<sup>12</sup> Data provided by Edmondo Laureti, FAO, personal communication.

<sup>13</sup> Edmondo Laureti, *1961-1997 Fish and Fishery Products: World Apparent Consumption Statistics Based on Food Balance Sheets* (Rome: FAO, 1999).

<sup>14</sup> Food and Agriculture Organization of the United Nations, *FAO Fisheries Circular No. 929 Revision 1999* (Rome: FAO, 1999).

<sup>15</sup> Food and Agriculture Organization of the United Nations, "Projection of World Fishery Production in 2010," available at <http://www.fao.org/fi/highlight/2010.asp>, last accessed on June 5, 2000.

<sup>16</sup> Carbon Dioxide Information Analysis Center, *Global, Regional, and National Annual CO<sub>2</sub> Emissions from Fossil-Fuel Burning, Hydraulic Cement Production, and Gas Flaring: 1751-1996*, available at <http://cdiac.esd.ornl.gov/ftp/ndp030/nation96.ems>, last accessed on June 5, 2000.

<sup>17</sup> Robert Engelman, *Stabilizing the Atmosphere: Population, Consumption and Greenhouse Gases* (Washington, DC: Population Action International, 1994).

<sup>18</sup> Robert Engelman, *Profiles in Carbon: An Update on Population, Consumption and Carbon Dioxide Emissions* (Washington, DC: Population Action International, 1998).

<sup>19</sup> For further information about this data layer, see Waldo Tobler, Uwe Deichmann, Jon Gottsegen, and Kelly Maloy, *The Global Demography Project*, National Center for Geographic Information and Analysis, University of California, Santa Barbara, at [ftp://ncgia.ucsb.edu/pub/Publications/tech\\_reports/95/95-6/95-6.txt](ftp://ncgia.ucsb.edu/pub/Publications/tech_reports/95/95-6/95-6.txt), last accessed on June 5, 2000.

<sup>20</sup> Richard P. Cincotta and Robert Engelman, *Nature's Place: Human Population and the Future of Biological Diversity* (Washington, DC: Population Action International, 2000).

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## About Population Action International

Population Action International (PAI) is an independent research and advocacy organization working to make clear the linkages between population, reproductive health, the environment, and development in order to foster support for family planning and population programs worldwide. Founded in 1965, PAI is a private, non-profit group and accepts no government funds.

At the heart of PAI's mission is its commitment to the expansion of voluntary family planning, other reproductive health services, and of educational and economic opportunities for girls and women. Together these strategies promise to improve the lives of individual women and their families while also slowing the world's population growth.

To these ends, PAI seeks to increase global political and financial support for effective population policies and programs grounded in individual rights.

PAI fosters the development of U.S. and international policy on urgent population and reproductive health issues through an integrated program of research, public education and advocacy. PAI reaches out to government leaders and opinion makers through coalitions with other development, reproductive health and environmental organizations, the dissemination of strategic, action-oriented publications, and broader efforts to inform public opinion.

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# FRESH WATER, FERTILE CROPLAND, AND A WEALTH OF SPECIES—

all needed to sustain human life—are among the critical natural resources profiled in *People in the Balance: Population and Natural Resources at the Turn of the Millennium*. Gathering the latest data on six natural resources and with an in-depth essay on human population trends, *People in the Balance* is a concise yet data-rich guide to the natural world in which we live—and to the choices we face as the new millennium opens.

The author of *People in the Balance* is Robert Engelman, vice president for research at Population Action International and founding board member of the Center for a New American Dream. Ecologist Richard P. Cincotta, Ph.D., natural resource analyst Tom Gardner-Outlaw, and research assistants Bonnie Dye and Jennifer Wisnewski, all of PAI, contributed to the research and writing.



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