

# **Human and Environment course**

**Dr. Hossein Moradi**

**SS 1391-2**

# The main subjects:

- The Human Population and Its Impact
- Water Resources
- Geology and Nonrenewable Mineral Resources
- Nonrenewable Energy, Energy Efficiency and Renewable Energy
- Environmental Hazards and Human Health
- Air Pollution
- Water Pollution
- Solid and Hazardous Waste
- Cities and Sustainability
- Economics, Environment, and Sustainability
- Environmental Worldviews, Ethics, and Sustainability

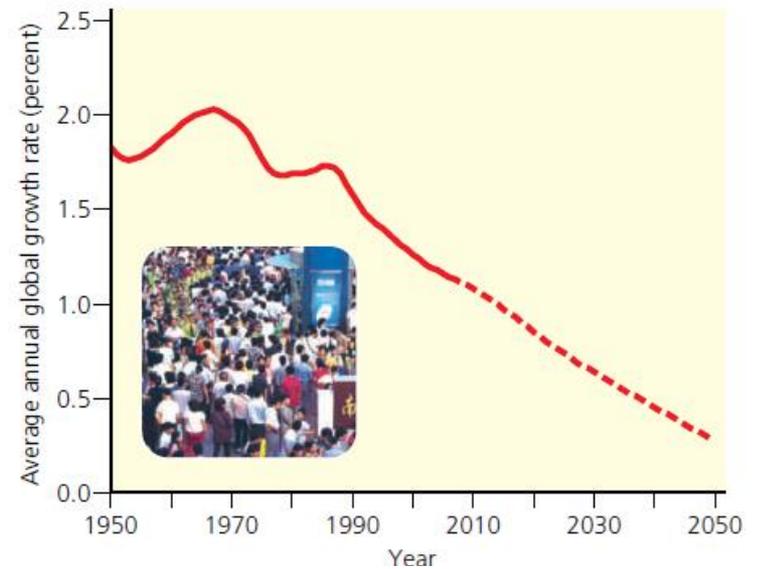
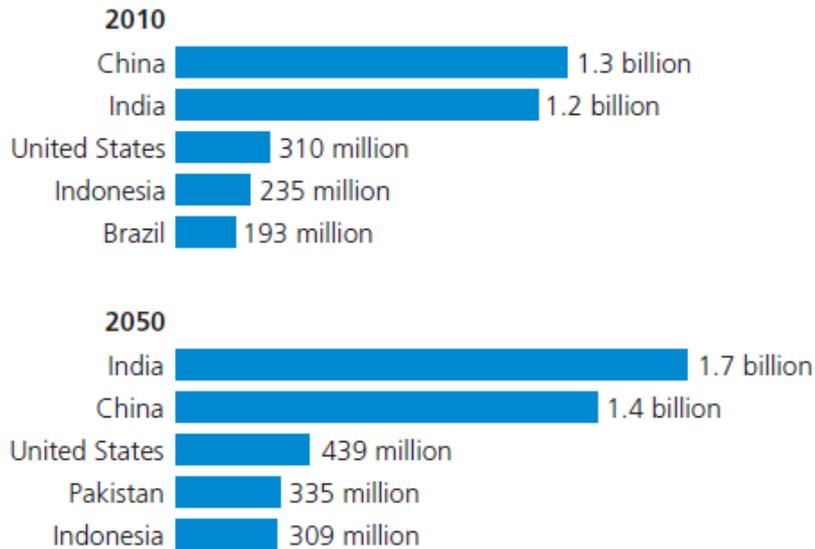
**Figure 3** This is a population time line for the period 10,000 BC–2042 AD.

**Data and Graph Analysis**

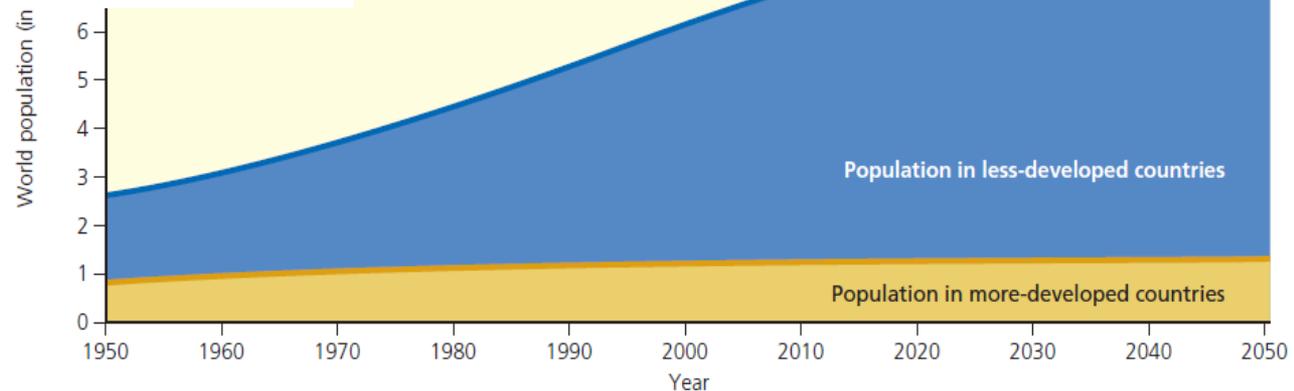
1. About how many years did it take the human population to reach 1 billion? How long after that did it reach 2 billion?
2. In about what year was the population half of what it is projected to be in 2011?

Year	Event	Human population (approximate)
50,000 BC	Hunter-gatherer societies	1.2 million
10,000 BC	End of last Ice Age	4 million
8,000 BC	Agricultural Revolution	5 million
500 BC		100 million
1,000 AD		250 million
1347–1351	Black Death (Plague); 75 million people die	
1500		450 million
1750	Industrial Revolution begins in Europe	791 million
1800	Industrial Revolution begins in the United States	
1804		1 billion
1845–1849	Irish potato famine: 1 million people die	
1927		2 billion
1943	Penicillin used against infection helps decrease death rates	
1957	Great famine in China; 20 million die	
1961		3 billion
1974		4 billion
1984		5 billion
1987		6 billion
2011	Projected human population:	7 billion
2024	Projected human population:	8 billion
2042	Projected human population:	9 billion

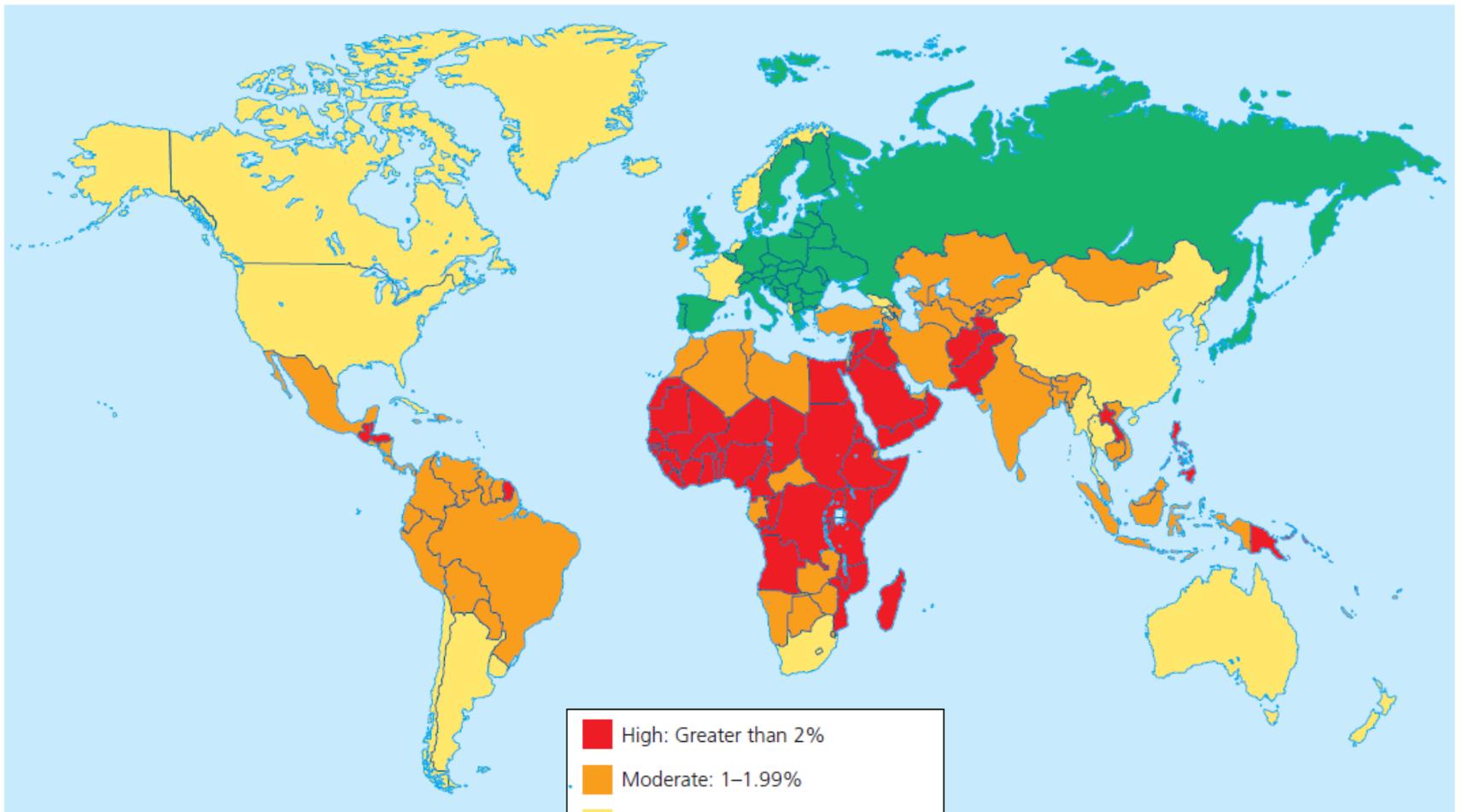
# Human Population Growth Continues but Is Unevenly



**Figure 6-4** This chart shows the populations of the world's five most populous countries in 2010 and 2050 (projected). In 2010, more than one of every three persons on the earth lived in China (with 19% of the world's population) or India (with 17%). (Data from United Nations Population Division)



**Figure 6-3** Most of the world's population growth between 1950 and 2010 took place in the world's less-developed countries. This gap is projected to increase between 2010 and 2050. (Data from United Nations Population Division, *The 2008 Revision* and Population Reference Bureau, *2010 World Population Data Sheet*)



**Figure 11** The rate of population increase (%) throughout the world in 2010 is shown here. (Data from Population Reference Bureau and United Nations Population Division)

# What factors influence the size of the human population?

- ▶ **CONCEPT 6-2A** Population size increases through births and immigration, and decreases through deaths and emigration.
- ▶ **CONCEPT 6-2B** The average number of children born to women in a population (*total fertility rate*) is the key factor that determines population size.

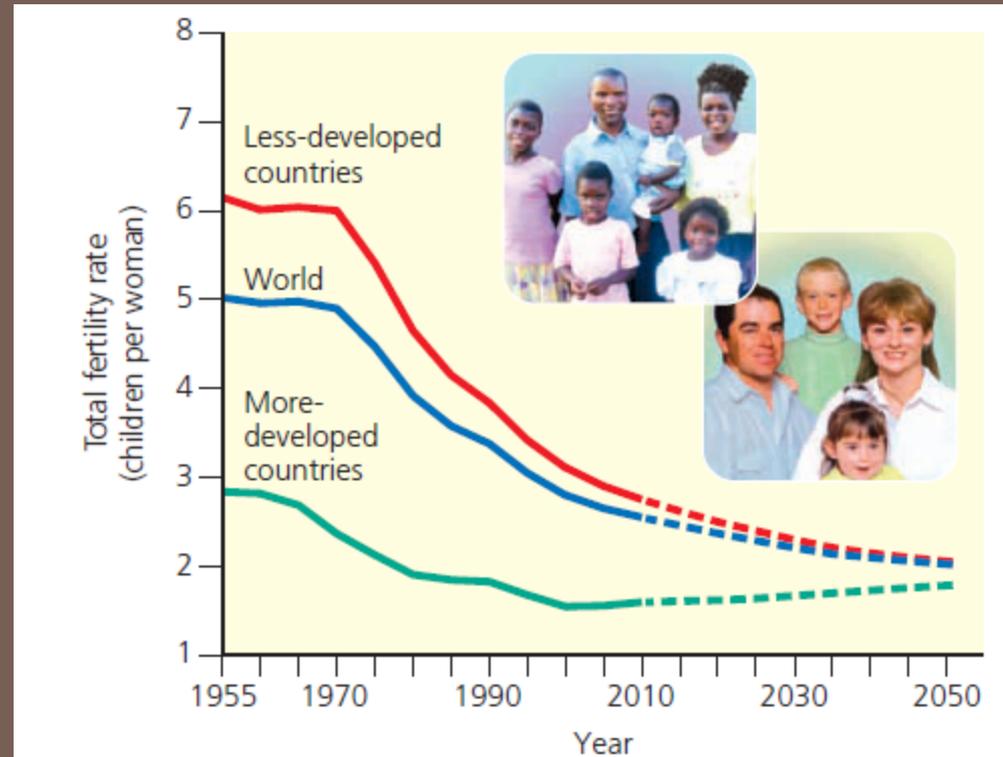
$$\text{Population change} = (\text{Births} + \text{Immigration}) - (\text{Deaths} + \text{Emigration})$$

Another measurement used in population studies is the **fertility rate**, the number of children born to a woman during her lifetime. Two types of fertility rates affect a country's population size and growth rate.

The first type, called the **replacement-level fertility rate**, is the average number of children that couples in a population must bear to replace themselves. It is slightly higher than two children per couple (2.1 in more developed countries and as high as 2.5 in some less developed countries), mostly because some children die before reaching their reproductive years.

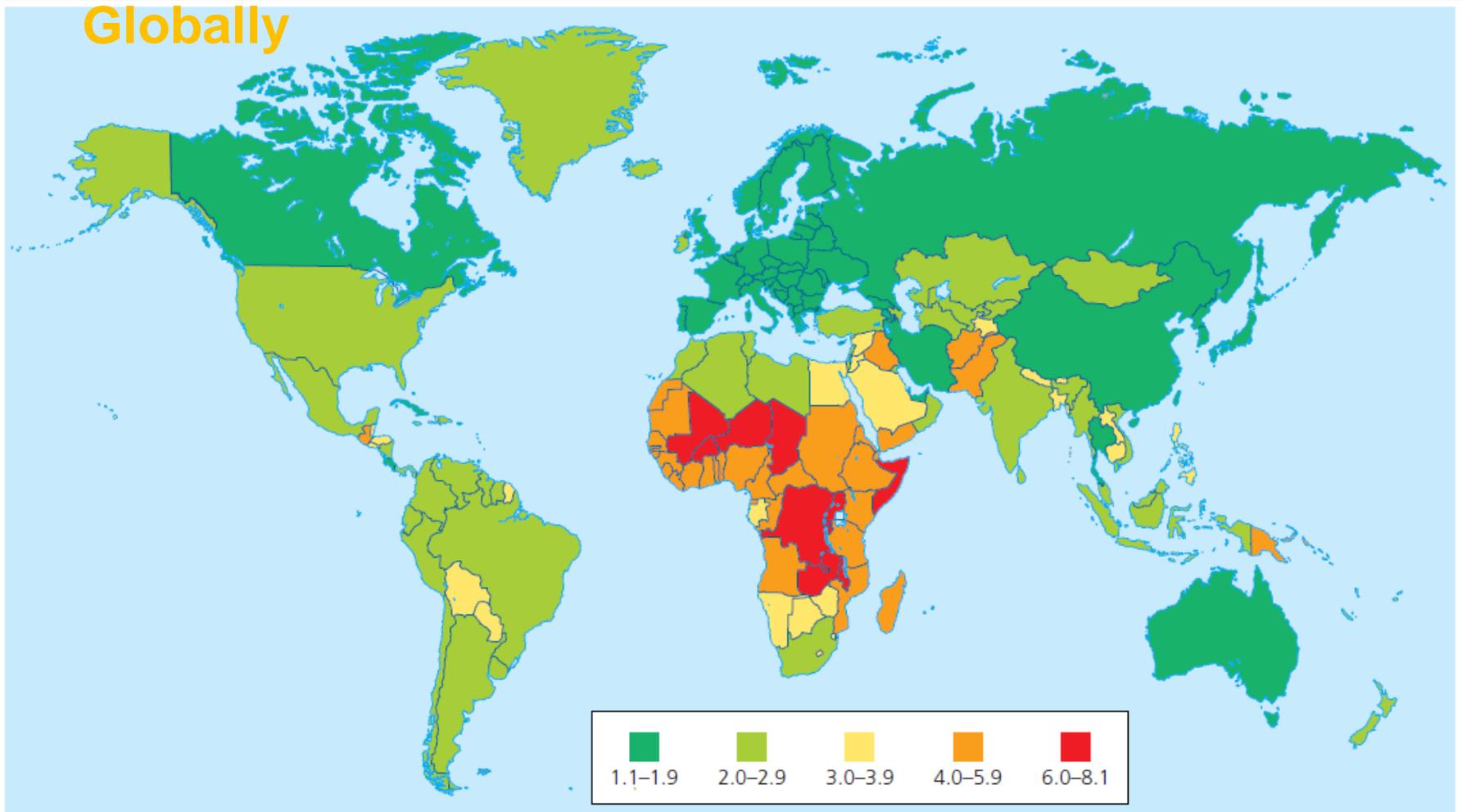
The second type of fertility rate, the **total fertility rate (TFR)**, is the **average number of children born to women in a population during their reproductive years.**

This factor plays a key role in determining population size (**Concept 6-2B**). **Between 1955 and 2010, the average TFR dropped from 2.8 to 1.7 children per woman in more-developed countries and from 6.2 to 2.7 in less-developed countries.**



**Figure 6-5** This graph tracks the total fertility rate for both the more-developed and less-developed regions of the world, 1955–2010, with projections to 2050 (based on medium population projections). Although the world's average TFR has dropped to 2.5, it will have to drop to around 2.1 to eventually halt the world's population growth. (Data from United Nations Population Division)

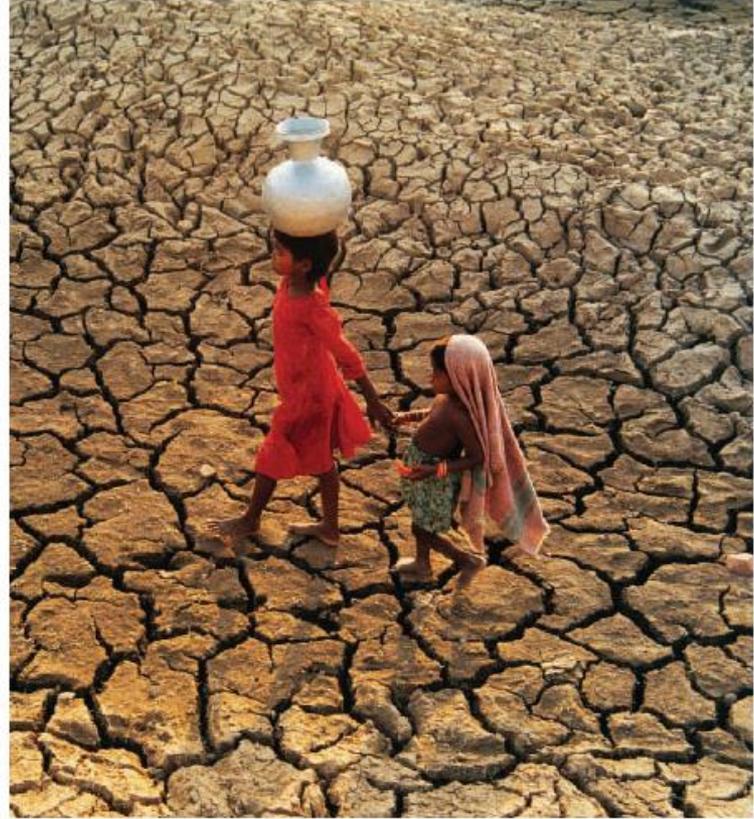
# Total Fertility Rate – Globally



**Figure 12** This map represents the total fertility rate (TFR), or average number of children born to the world's women throughout their lifetimes, as measured in 2010. (Data from Population Reference Bureau and United Nations Population Division)

# Several Factors Affect Birth Rates and Fertility Rates

1- One is the *importance of children as a part of the labor force*, especially in less-developed countries. This is a major reason for why it makes sense for many poor couples in those countries to have a large number of children. They need help with hauling daily drinking water (Figure 6-8), gathering wood for heating and cooking, and tending crops and livestock.



**Figure 6-8** This girl is carrying well water across parched earth that has dried out and cracked during a severe drought in India.

A. Ishakon-UNEP/Peter Arnold, Inc.

2- Another economic factor is the **cost of raising and educating children**. *Birth and fertility rates tend to be lower* in more-developed countries, where raising children is much more costly because they do not enter the labor force until they are in their late teens or twenties.



Mark Edwards/Dotcom, Inc.

3- The ***availability of, or lack of, private and public pension systems*** can influence the decision of some couples on how many children to have, especially the poor in less developed countries. *Pensions reduce a couple's need to have many children to help support them in old age.*

4- There are more *infant deaths in poorer countries*, so having several children might insure survival of at least a few—somewhat like having an insurance policy.

5- *Urbanization* plays a role. People living in urban areas usually have better access to family planning services and tend to have fewer children than do those living in rural areas. This is especially true in less-developed countries where children are often needed to help raise crops and carry daily water and fuel wood supplies.

6- Another important factor is the ***educational and employment opportunities available for women***. *Total fertility* rates tend to be low when women have access to education and paid employment outside the home. In less developed countries, a woman with little or no formal education typically has two more children than does a woman with a high school education. In nearly all societies, better-educated women tend to marry later and have fewer children.

7- ***Average age at marriage*** (or, more precisely, the average age at which a woman has her first child) also plays a role. Women normally have fewer children when their average age at marriage is 25 or older.

8- Birth rates and TFRs are also affected by **the availability of legal abortions**. Also, the **availability of reliable birth control methods** allows women to control the number and spacing of the children they have.

9- **Religious beliefs, traditions, and cultural norms** also play a role

## Several Factors Affect Death Rates

The rapid growth of the world's population over the past 100 years is not primarily the result of a rise in the birth rate. Instead, it has been caused largely by a decline in death rates, especially in less-developed countries.

More people in these countries started living longer and fewer infants died. This happened because of increased food supplies and distribution, better nutrition, medical advances such as immunizations and antibiotics, improved sanitation, and safer water supplies (which curtailed the spread of many infectious diseases).

-Two useful indicators of the overall health of people in a country or region are:

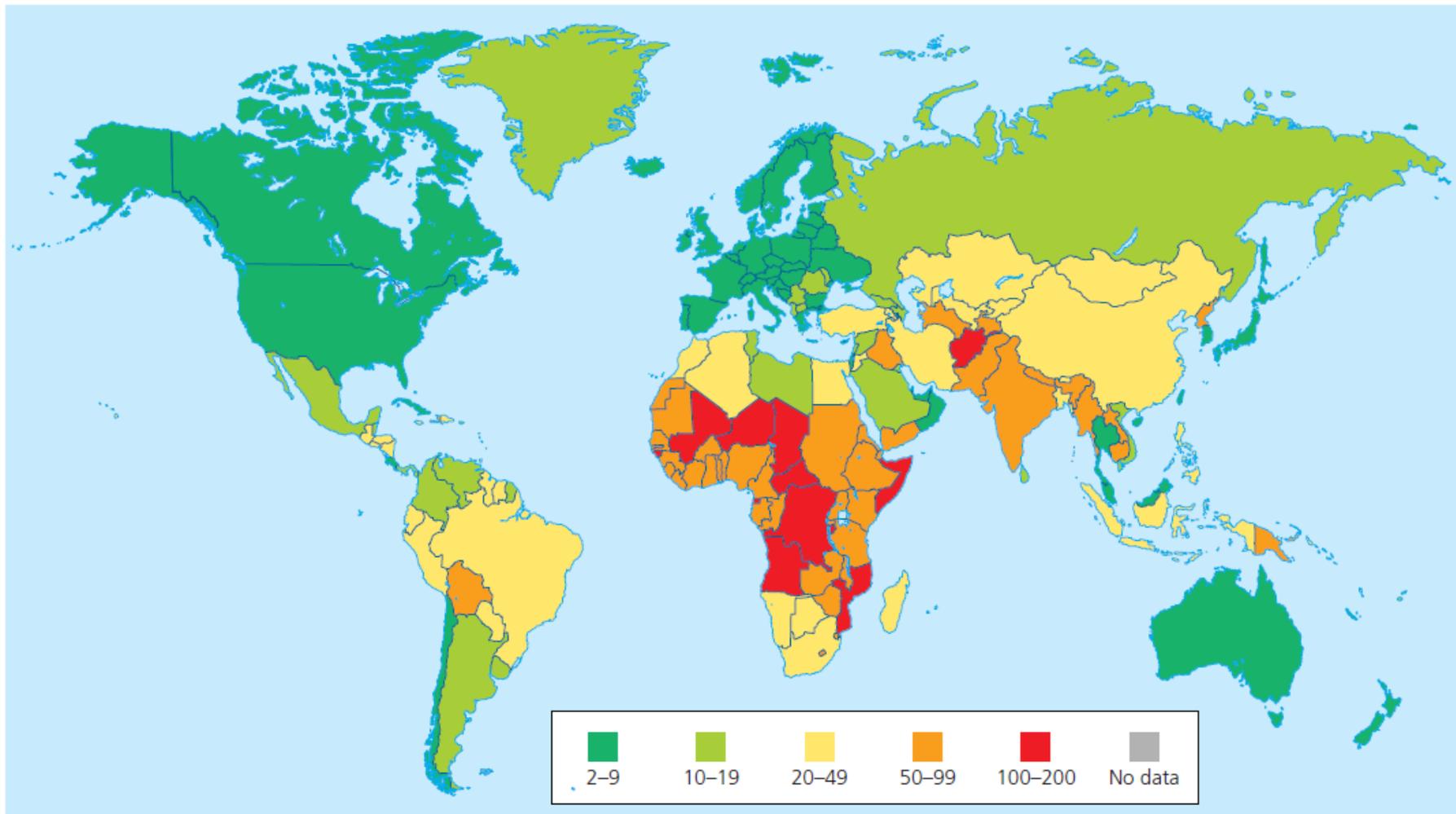
-life expectancy: **the average number of years a newborn infant can be expected to live**

- the infant mortality rate: **the number of babies out of every 1,000 born who die before their first birthday**

Between 1955 and 2010, the global life expectancy increased from 48 years to 69 years (77 years in more-developed countries and 67 years in less-developed countries) and is projected to reach 74 by 2050. In 2010, Japan had the world's longest life expectancy of 83 years.

Between 1900 and 2009, life expectancy in the United States increased from 47 to 78 years and, by 2050, is projected to reach 83 years.

In the world's poorest countries, however, life expectancy is 57 years or less and may fall further in some countries because of more deaths from AIDS and internal strife.

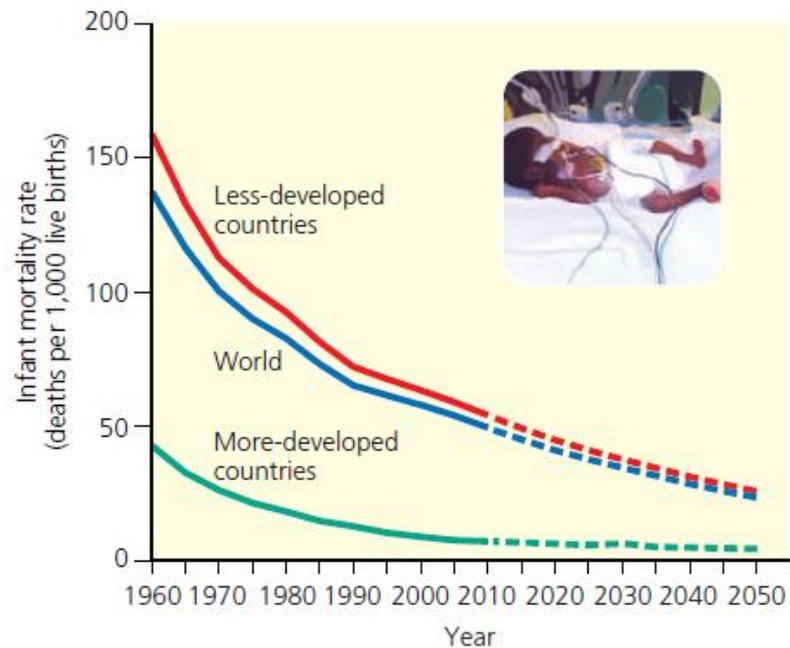


**Figure 13** Infant mortality rates in 2010 are shown here. (Data from Population Reference Bureau and United Nations Population Division)

Infant mortality is viewed as one of the best measures of a society's quality of life because it reflects a country's general level of nutrition and health care.

A high infant mortality rate usually indicates insufficient food (under nutrition), poor nutrition (malnutrition), and a high incidence of infectious disease (usually from drinking contaminated water and having weakened disease resistance due to under nutrition and malnutrition).

Infant mortality also affects the TFR. In areas with low infant mortality rates, women tend to have fewer children because fewer children die at an early age.



**Figure 6-10** This graph tracks the infant mortality rates for the world's more-developed countries and less-developed countries, 1950–2010, with projections to 2050 based on medium population projections. (Data from United Nations Population Division)

Infant mortality rates in more-developed and less developed countries have declined dramatically since 1965, as shown in Figure 6-10. But despite this sharp drop, more than 4 million infants (most in less-developed countries) die each year of preventable causes during their first year of life—an average of nearly 11,000 mostly unnecessary infant deaths per day.

This is equivalent to 55 jet airliners, each loaded with 200 infants younger than age 1, crashing *every day with no survivors!*

## The third factor in population change is migration:

the movement of people into (*immigration*) and out of (*emigration*) specific geographic areas. In 2009, more than 190 million people migrated from one country to another—more than 60 million of them from less developed countries to more-developed countries.

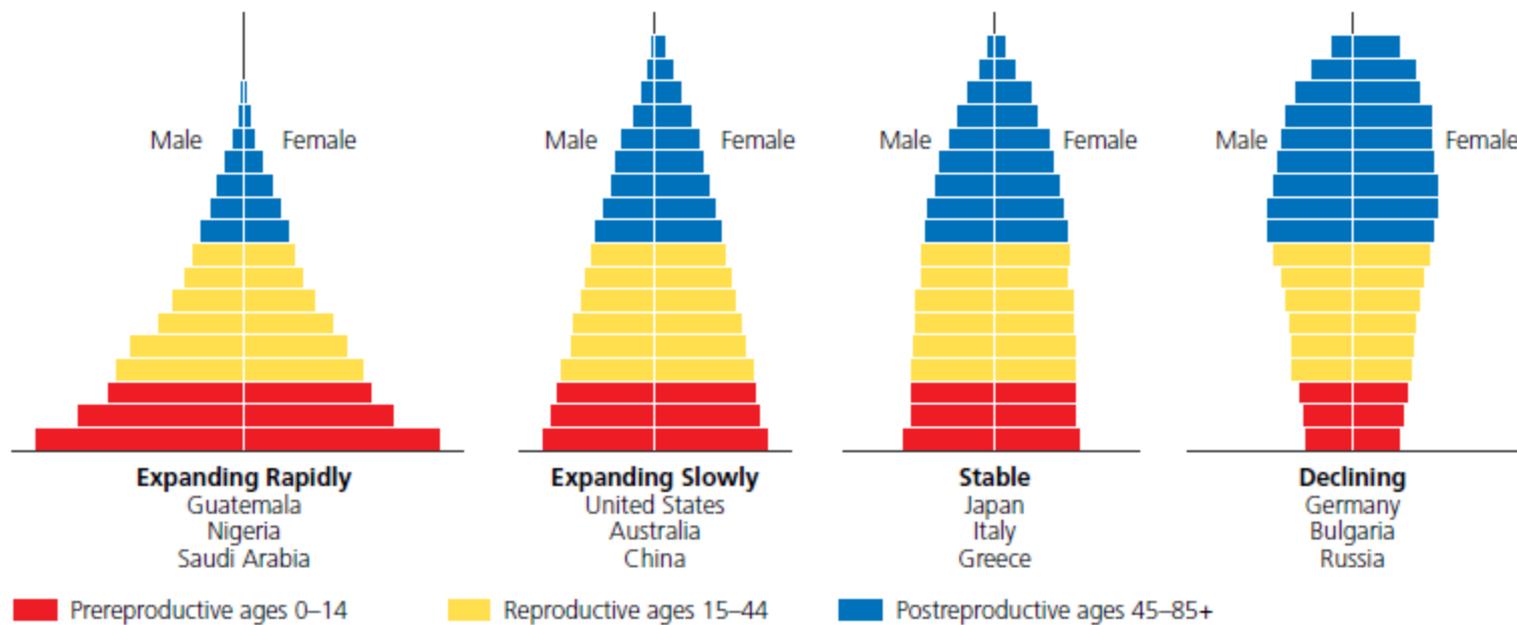
## CONNECTIONS

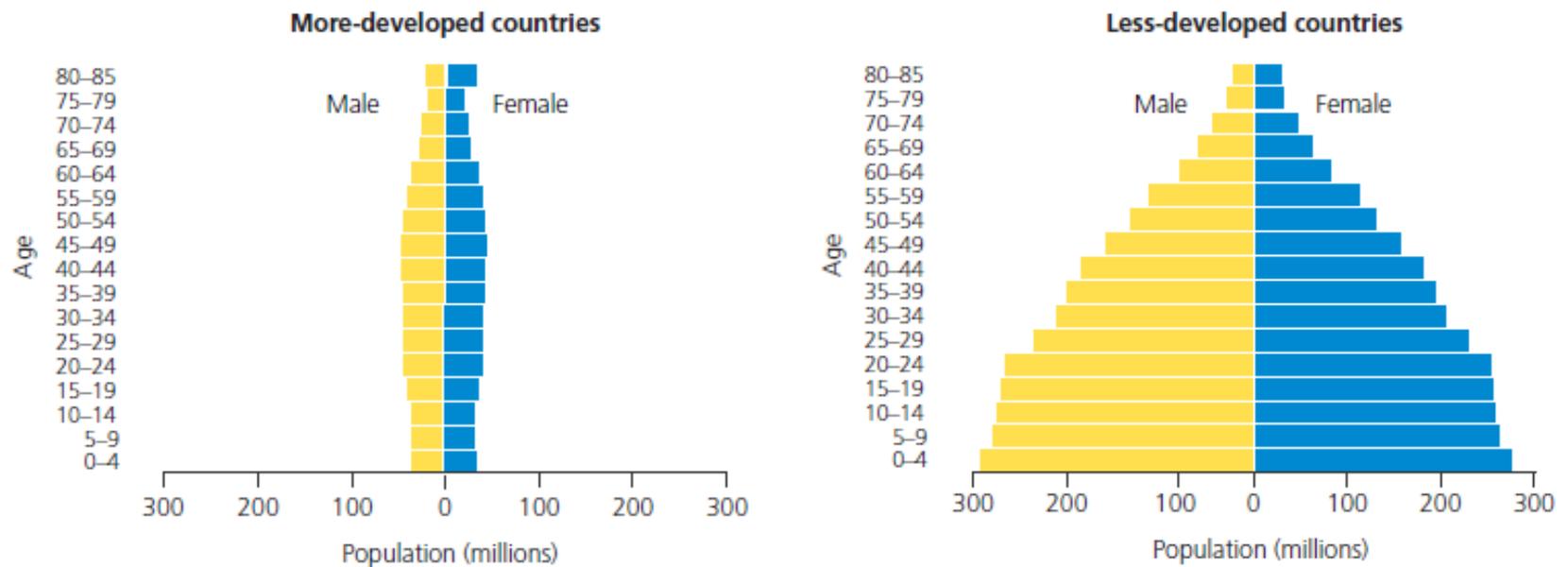
### **Climate Change and Environmental Refugees**

Environmental scientist Norman Myers warns that, as the world experiences climate change in this century as projected by most climate scientists, conditions that create environmental crises such as drought and flooding will worsen. With more such crises, the number of environmental refugees could soar to 250 million or more before the end of this century. (See more on this in the Guest Essay by Norman Myers at CengageNOW.)

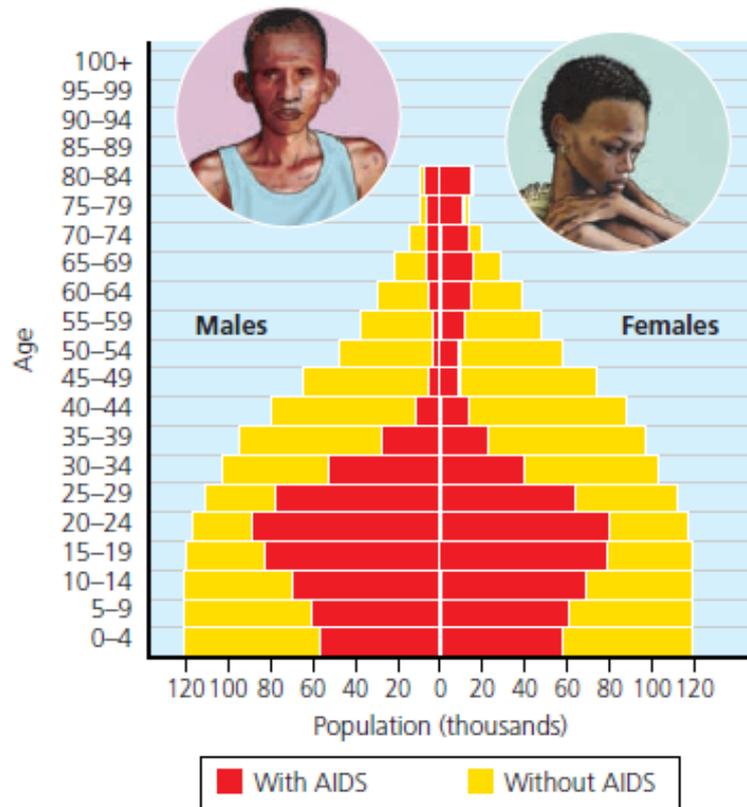
As mentioned earlier, even if the global replacement level fertility rate of 2.1 children per woman were magically achieved tomorrow, the world's population would keep growing for at least another 50 years (assuming no large increase in the death rate).

This continued growth results mostly from a population's **age structure**: the numbers or percentages of males and females in young, middle, and older age groups in that population





**Figure 6-13** *Global outlook:* These charts illustrate population structure by age and sex in less-developed countries and more-developed countries for 2010. **Question:** If all girls under 15 were to have only one child during their lifetimes, how do you think these structures would change over time? (Data from United Nations Population Division and Population Reference Bureau)

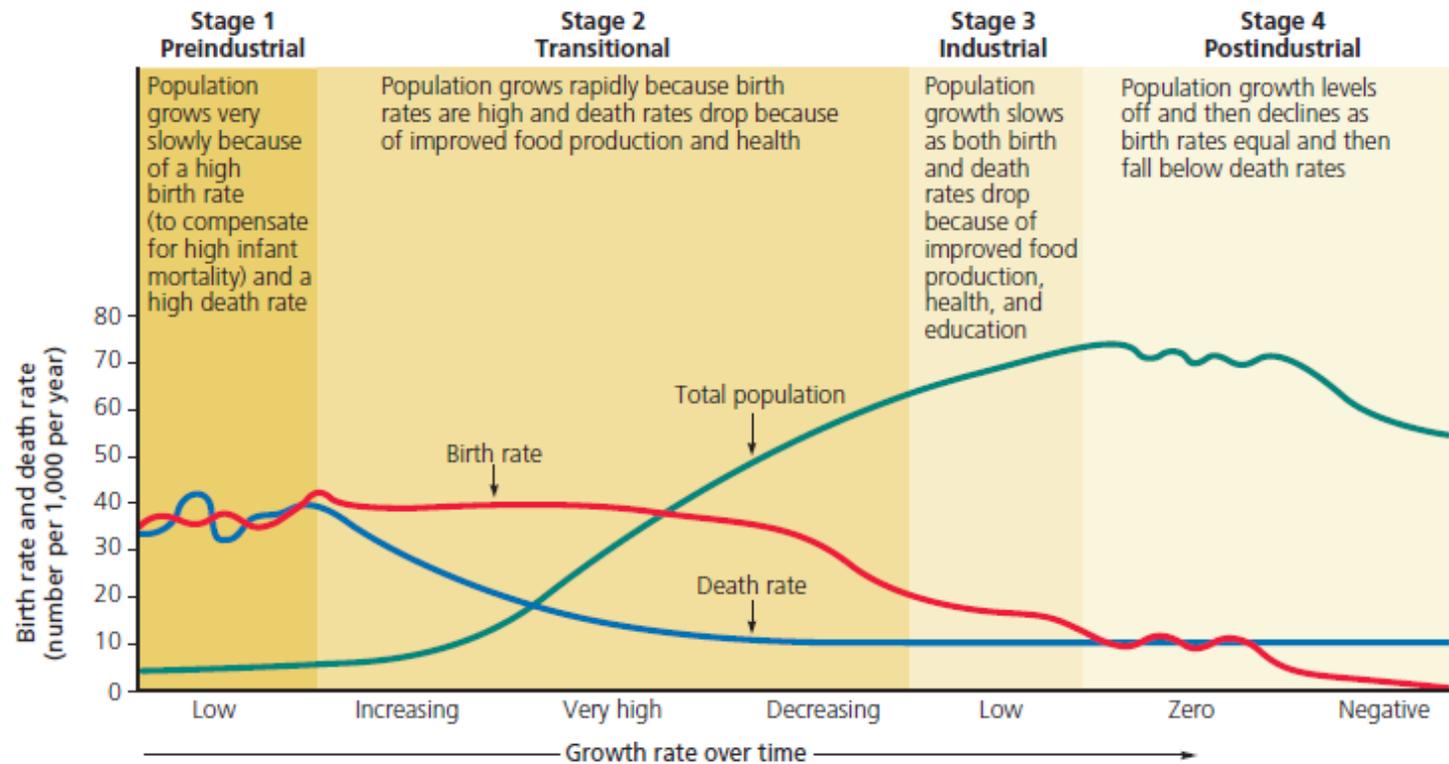


**Figure 6-16** *Global outlook:* Worldwide, AIDS is the leading cause of death for people ages 15–49. This loss of productive working adults can affect the age structure of a population. In Botswana, more than 24% of this age group was infected with HIV in 2008 and about 148,000 people died. This figure shows two projected age structures for Botswana’s population in 2020—one including the possible effects of the AIDS epidemic (red bars), and the other not including those effects (yellow bars). See the Data Analysis Exercise at the end of this chapter for further analysis of this problem. (Data from the U.S. Census Bureau) **Question:** How might this affect Botswana’s economic development?

# How can we slow human population growth?

Demographers, examining birth and death rates of western European countries that became industrialized during the 19th century, developed a hypothesis of population change known as the **demographic transition**:

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CENGAGENOW® **Active Figure 6-17** The *demographic transition*, which a country can experience as it becomes industrialized and more economically developed, can take place in four stages. See an animation based on this figure at CengageNOW. **Question:** At what stage is the country where you live?

# How can we slow human population growth?

**The First Step: Is to Promote Economic Development**

## **Second step: Empowering Women Helps to Slow Population Growth**

A number of studies show that women tend to have fewer children if they are educated, have the ability to control their own fertility, earn an income of their own, and live in societies that do not suppress their rights.

## **Third step: Promote Family Planning**

Family planning provides educational and clinical services that help couples choose how many children to have and when to have them.

# An overview of Environmental Challenges

## Air pollution

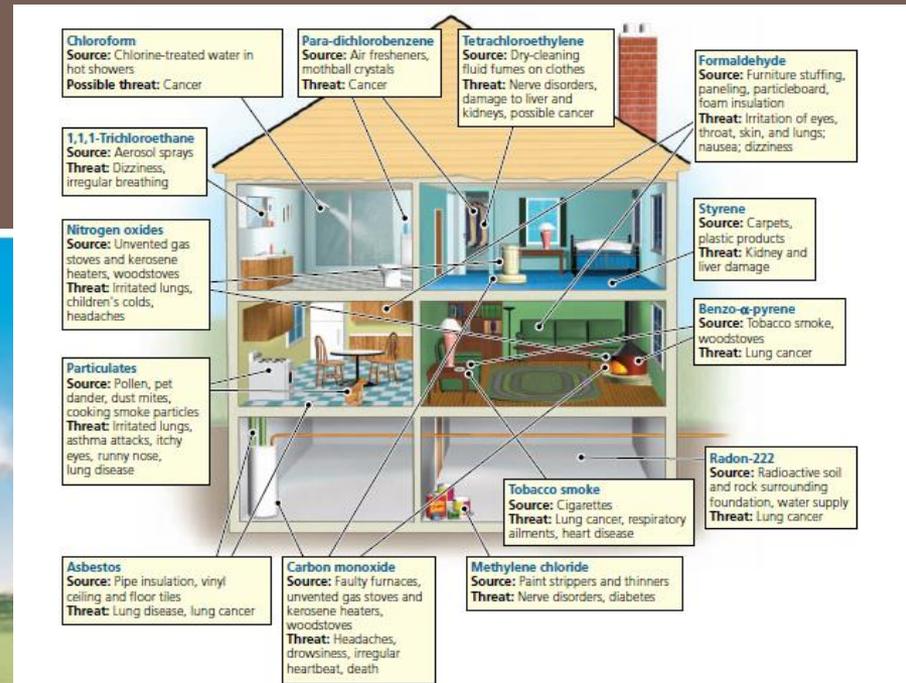
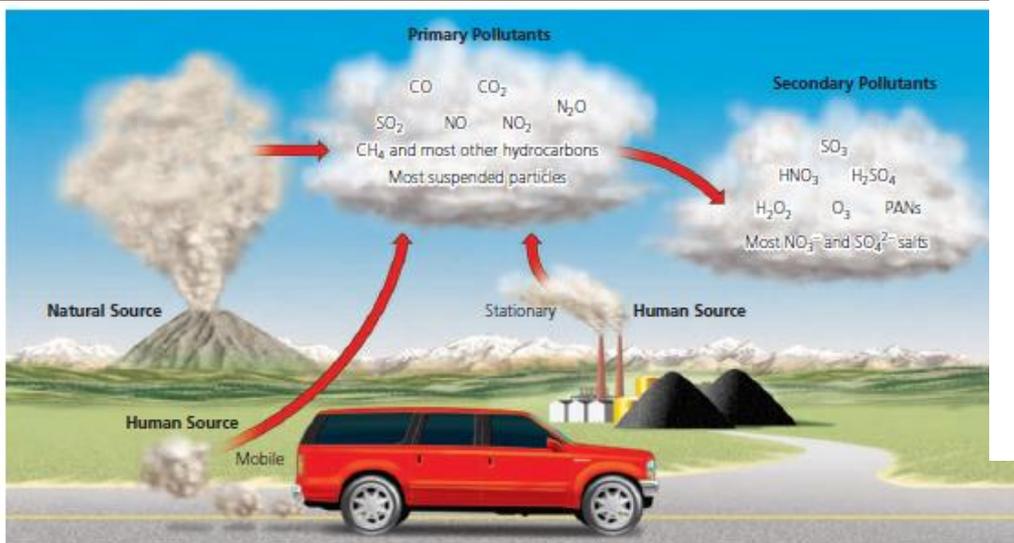


Figure 18-10 Industrial smog hangs over a factory in an Indian city.

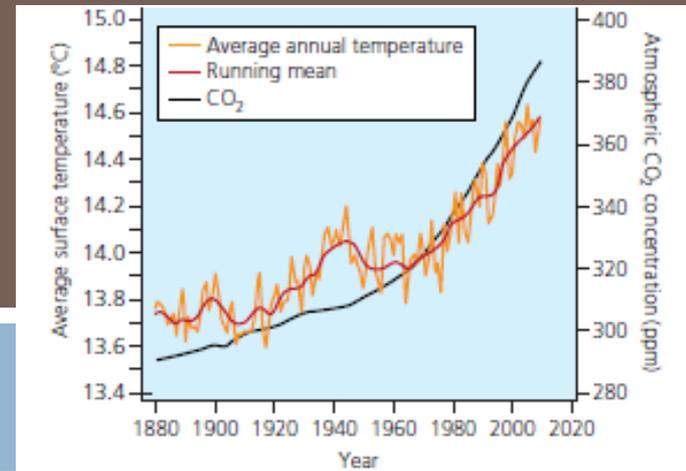
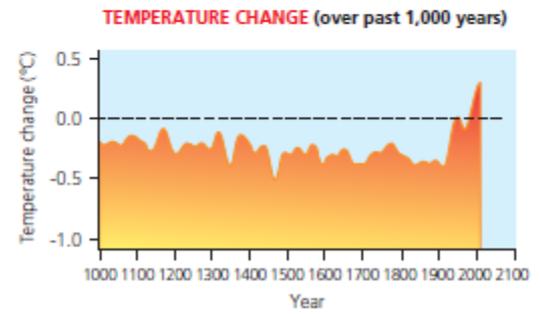
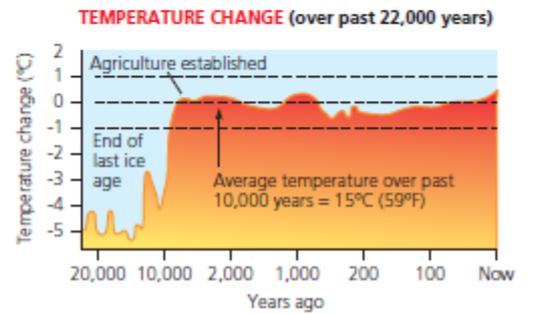
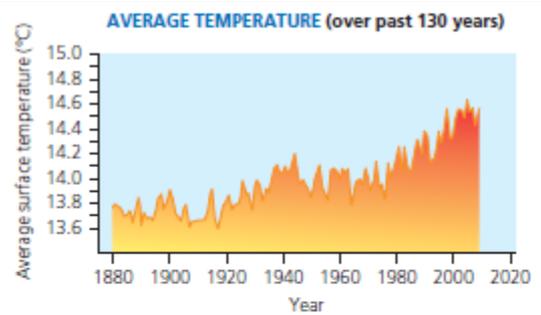
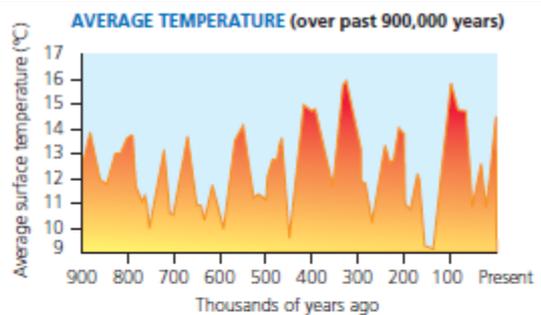
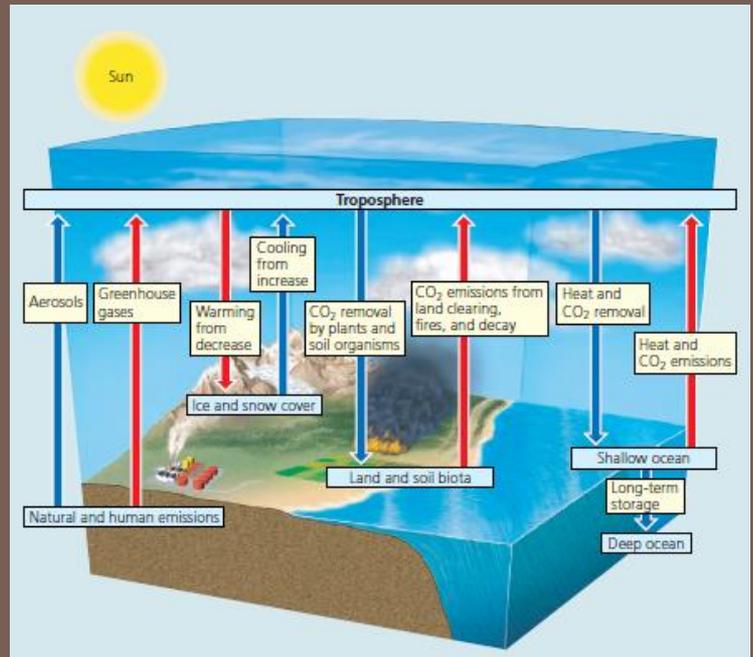
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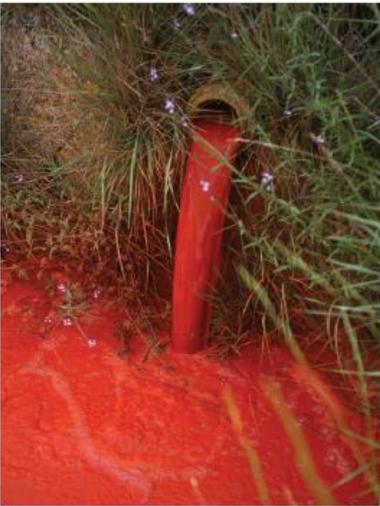
Michael Lasky/Getty Images/Alamy



# Climate disruption and ozone depletion



# Water pollution



**Figure 20-3** This point-source water pollution flows uncontrolled into a stream near Gargas, France.

AP Photo/Chris Wedel



AP Photo/Chris Wedel

This lake is polluted with mining wastes.



**Figure 20-6** Plastics and other forms of waste pollute this mountain lake as well as many bodies of water around the world, and can release harmful chemicals into the water.



©Paul Dwyer/Universal

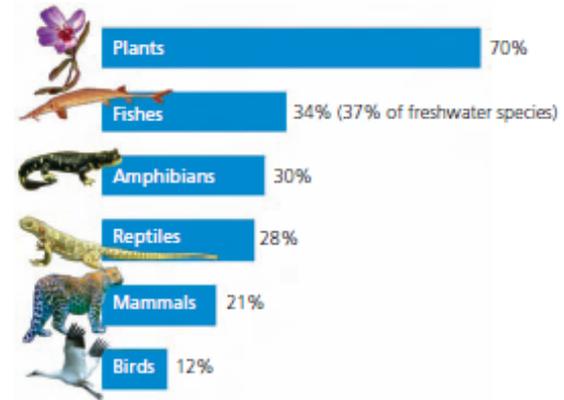
**Figure 20-9** Global outlook: This garbage truck is dumping trash into a river in Peru.



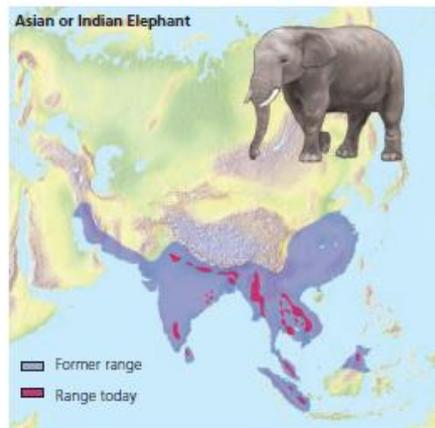
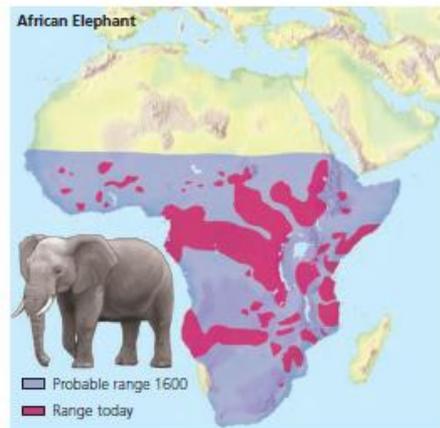
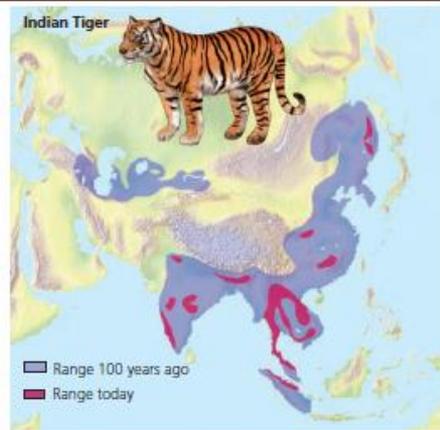
©Peter Arnold, Inc.

Global outlook: Severe cultural eutrophication has covered this lake near the Chinese city of Haozhou

# Species Extinction

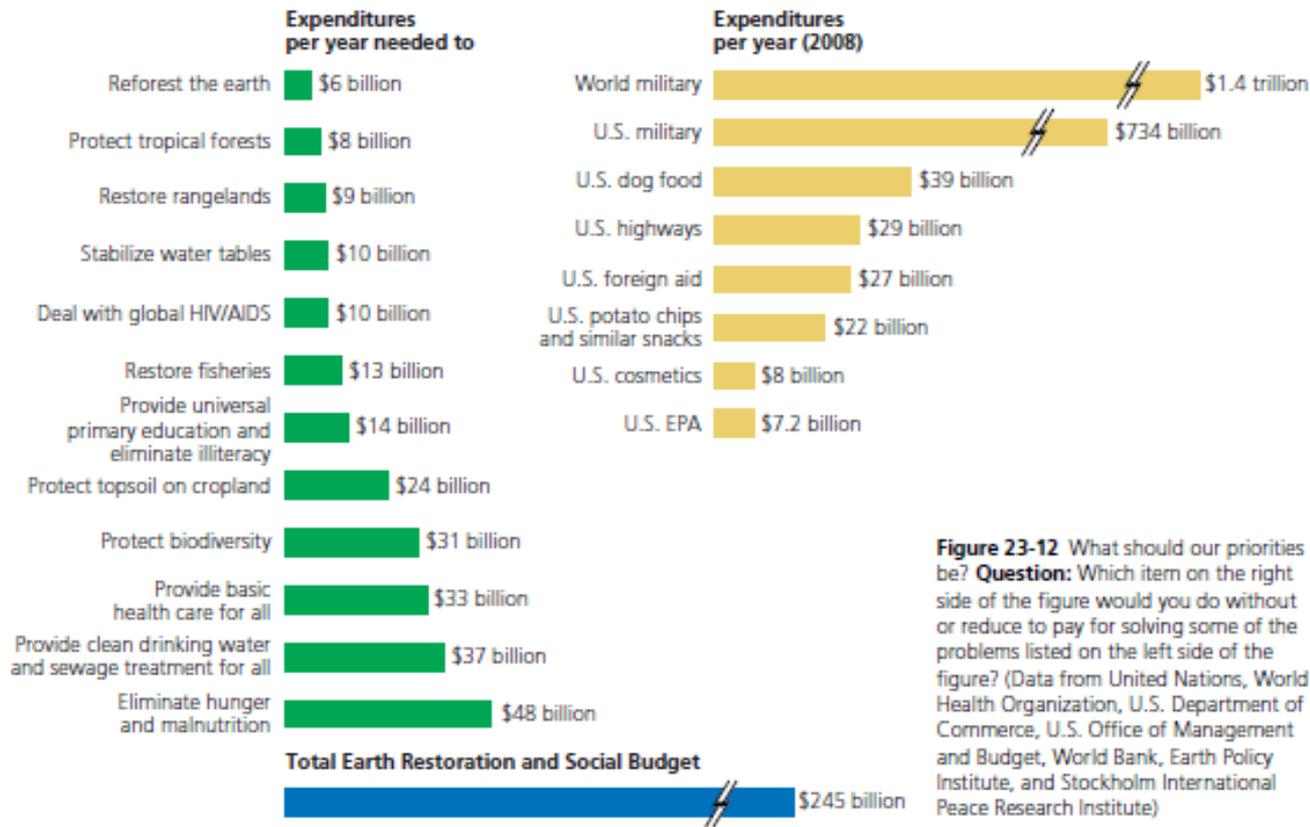


**Figure 9-4 Endangered natural capital:** This graph shows the estimated percentages of various types of known species that are threatened with extinction because of human activities (**Concept 9-1**). **Question:** Why do you think plants (see Photo 4 in the Detailed Contents) and fish species top this list? (Data from International Union for Conservation of Nature, Conservation 2009)



**Figure 9-17** This white rhinoceros was killed by a poacher in South Africa solely for its horns. **Question:** What would you say if you could talk to the person who killed this animal?

**CENGAGENOW™ Active Figure 9-10 Natural capital degradation:** These maps reveal the reductions in the ranges of four wildlife species, mostly as the result of severe habitat loss and fragmentation and illegal hunting for some of their valuable body parts. What will happen to these and millions of other species during the next few decades when the human population grows by at least 2 billion—the equivalent of more than 6 times the current U.S. population and almost twice the current population of China—as is projected by scientists? See an animation

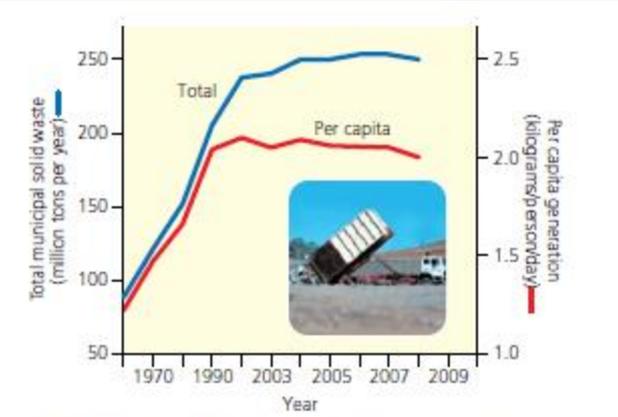


**Figure 23-12** What should our priorities be? **Question:** Which item on the right side of the figure would you do without or reduce to pay for solving some of the problems listed on the left side of the figure? (Data from United Nations, World Health Organization, U.S. Department of Commerce, U.S. Office of Management and Budget, World Bank, Earth Policy Institute, and Stockholm International Peace Research Institute)

# Solid and hazardous wastes



Photostock, Inc.



**Figure 21-4** This graph shows the total and per capita production of municipal solid waste in the United States, 1960–2008. (Data from the U.S. Environmental Protection Agency)



Jim Wink/Photo Arndt, Inc.



Lincoln Fische/Peter Arnold, Inc.