



Chapter 7

The Human Population

Scientists Disagree on Earth's Carrying Capacity

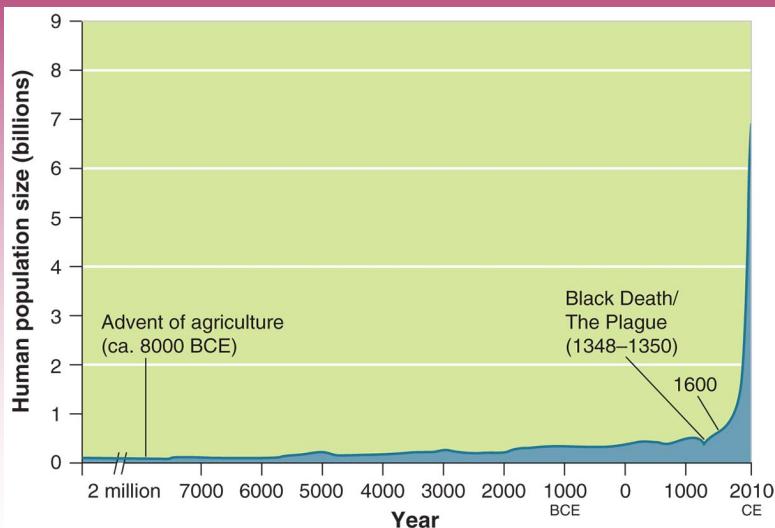
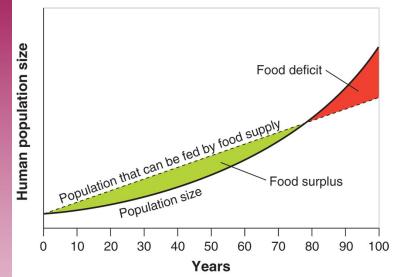


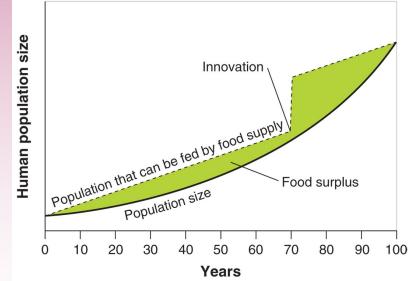
Figure 7.1
Environmental Science for AP®
© 2012 W.H. Freeman and Company

Scientists Disagree on Earth's Carrying Capacity

- The following graphs show theoretical models of food supply and population size.



(a) No significant improvement in agricultural technology



(b) Significant improvement in agricultural technology

Figure 7.2
Environmental Science for AP[®]
© 2012 W.H. Freeman and Company

Factors that Drive Human Population Growth

- Demography- the study of human populations and population trends.
 - Changes in Population Size
 - Fertility
 - Life Expectancy
 - Age Structure
 - Migration

Changes in Population Size

- **Immigration**- the movement of people into a country
- **Emigration**- the movement of people out of a country.
- **Net migration rate**- the difference between immigration and emigration in a give year per 1,000 people in the country.

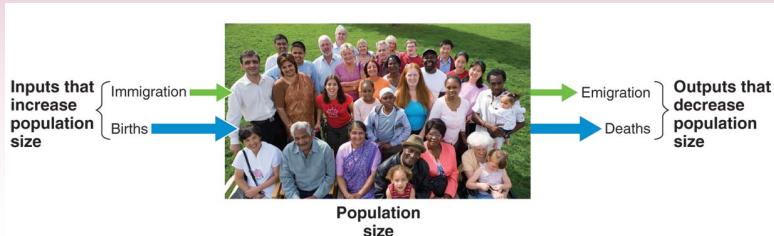


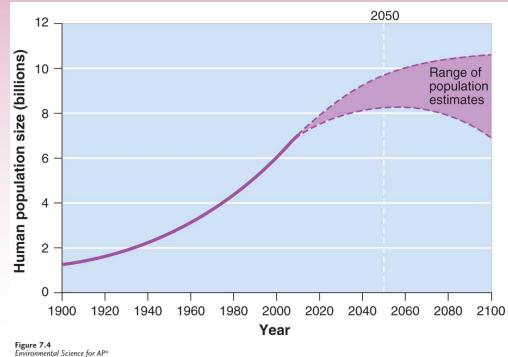
Figure 7.3
Environmental Science for AP®
John Birdsall/The Image Works

Changes in Population Size

- Crude birth rate (CBR)= the number of births per 1,000 individuals per year.
- Crude death rate (CDR)= the number of deaths per 1,000 individuals per year.
 - Global population growth rate =
 - $(CBR - CDR) / 10$
 - National population growth rate =
 - $(CBR + \text{immigration}) - (CDR + \text{emigration}) / 10$
 - Doubling time (in years)- $70 / \text{growth rate}$

Fertility

- Total fertility rate- an estimate of the average number of children that each woman in a population will bear.
- Replacement level fertility- the total fertility rate required to offset the average number of deaths in a population and for the current population size to remain stable.



Fertility

- Developed countries- countries with relatively high levels of industrialization and income.
- Developing countries- countries with relatively low levels of industrialization and income of less than \$3 per person per day.

Life Expectancy

- Life expectancy- the average number of years that an infant born in a particular year in a particular country can be expected to live, given the current average life span and death rate of that country.

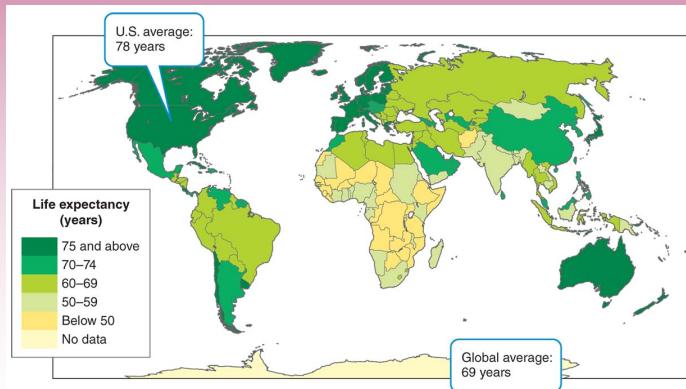


Figure 7.5
Environmental Science for AP®
© 2012 W.H. Freeman and Company

Life Expectancy

- Infant mortality rate- the number of deaths of children under 1 year of age per 1,000 live births.
- Child mortality rate- the number of deaths of children under age 5 per 1,000 live births.

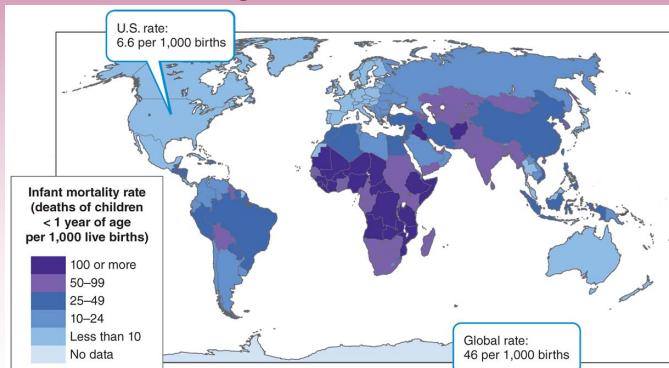
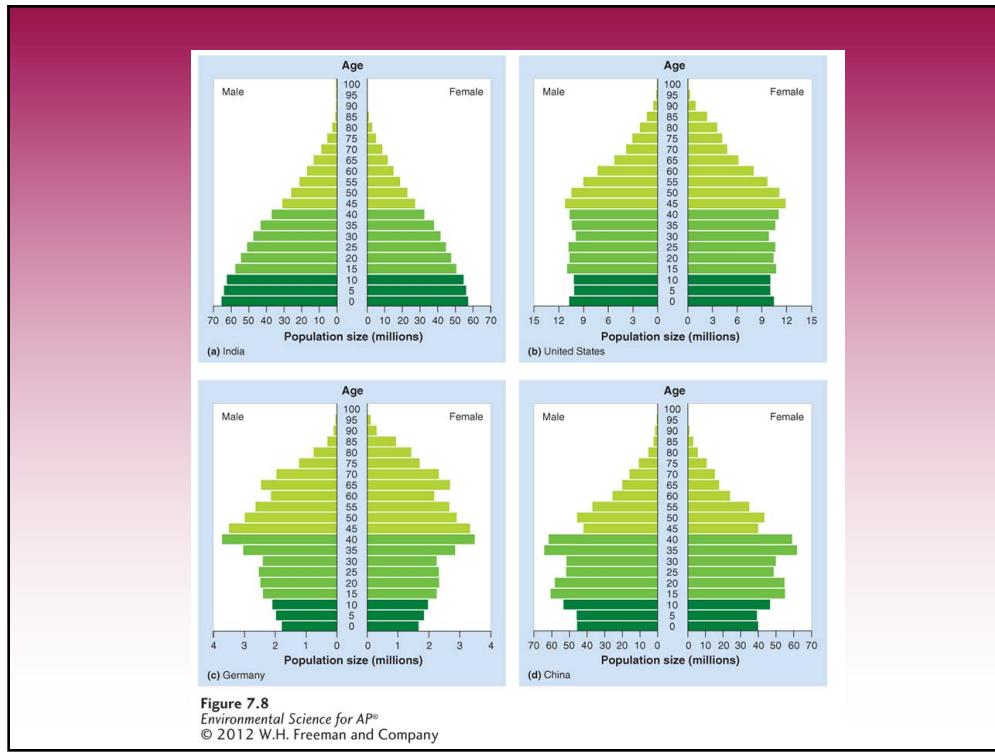


Figure 7.6
Environmental Science for AP®
© 2012 W.H. Freeman and Company

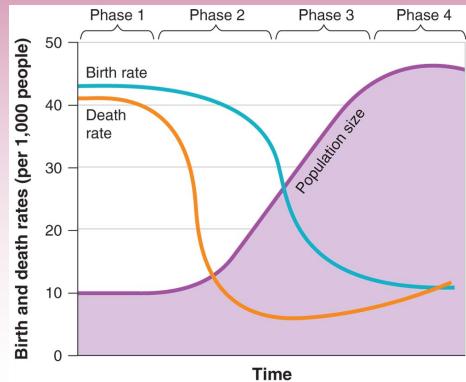
Age Structure

- Age structure diagrams (population pyramids)- visual representations of age structure within a country for males and females.
- As shown in figure 7.8



The Demographic Transition

- The theory of the demographic transition is the theory that as a country moves from a subsistence economy to industrialization and increased affluence, it undergoes a predictable shift in population growth.



The Stages of the Demographic Transition

- Phase 1: Slow population growth because there are high birth rates and high death rates which offset each other.
- Phase 2: Rapid population growth because birth rates remain high but death rates decline due to better sanitation, clean drinking water, increased access to food and goods, and access to health care.
- Phase 3: Stable population growth as the economy and educational system improves and people have fewer children.
- Phase 4: Declining population growth because the relatively high level of affluence and economic development encourage women to delay having children.

Family Planning

- Family planning- the regulation of the number or spacing of offspring through the use of birth control.

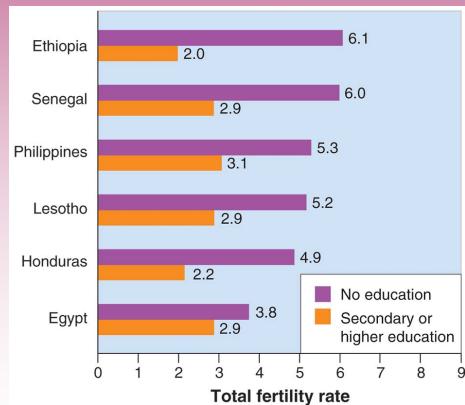


Figure 7.12
Environmental Science for AP®
© 2012 W.H. Freeman and Company

The 12 Most Populous Countries in the World

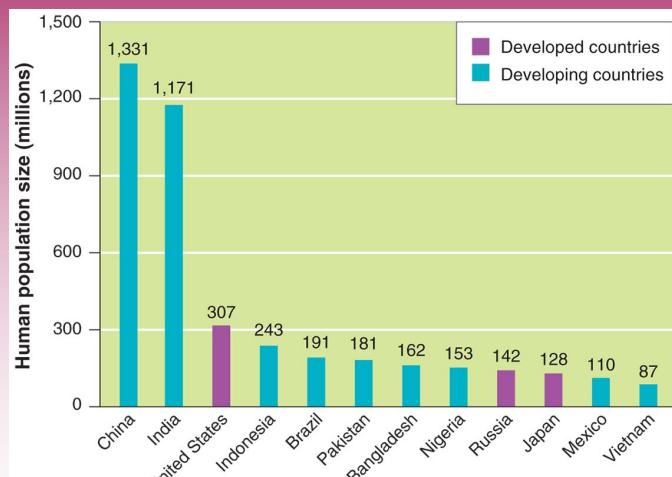


Figure 7.13
Environmental Science for AP®
© 2012 W.H. Freeman and Company

The relationship between economic development and population growth rate for developing nations.

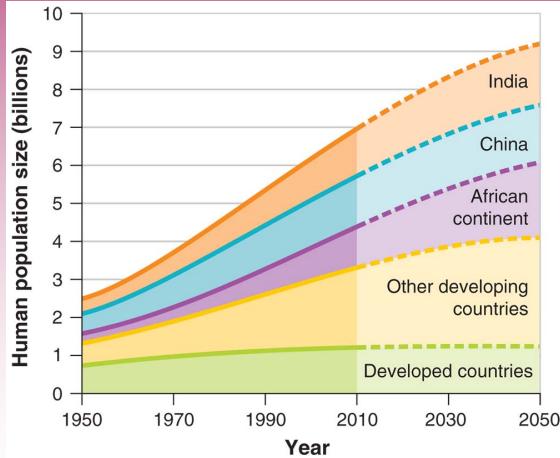


Figure 7.14
Environmental Science for AP®
© 2012 W.H. Freeman and Company

Ecological Footprints

- **Affluence** - having a lot of wealth such as money, goods, or property.



Figure 7.15
Environmental Science for AP®
© 2012 W.H. Freeman and Company

The IPAT Equation

- To estimate the impact of human lifestyles on Earth we can use the IPAT equation:
- Impact= Population × Affluence × Technology



(a)

Figure 7.16
Environmental Science for AP®
© Peter Menzel/menzelphoto.com



(b)

Figure 7.16
Environmental Science for AP®
© Peter Menzel/menzelphoto.com

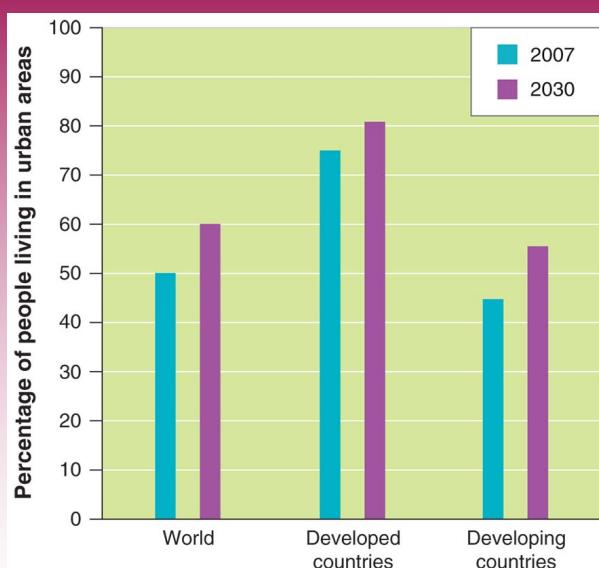


Figure 7.18
Environmental Science for AP®
© 2012 W.H. Freeman and Company

TABLE 7.1 The 20 largest urban areas in the world

Rank	City, country	Population (millions)
1	Tokyo, Japan	35.7
2	New York–Newark, United States	19.0
3	Mexico City, Mexico	19.0
4	Mumbai, India	19.0
5	São Paulo, Brazil	18.9
6	Delhi, India	16.0
7	Shanghai, China	15.0
8	Kolkata, India	14.8
9	Dacca, Bangladesh	13.5
10	Buenos Aires, Argentina	12.8
11	Los Angeles–Long Beach–Santa Ana, United States	12.5
12	Karachi, Pakistan	12.1
13	Cairo, Egypt	11.9
14	Rio de Janeiro, Brazil	11.8
15	Osaka–Kobe, Japan	11.3
16	Beijing, China	11.1
17	Manila, Philippines	11.1
18	Moscow, Russia	10.4
19	Istanbul, Turkey	10.0
20	Paris, France	9.90

Table 7.1
Environmental Science for AP®
© 2012 W.H. Freeman and Company

The Impact of Affluence

- Gross domestic product (GDP)- the value of all products and services produced in a year in that country.
- GDP is made up of consumer spending, investments, government spending, and exports minus imports.
- A country's GDP often correlates with its pollution levels.