



Chapter 9 Opener  
Environmental Science  
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## Chapter 7

### The Human Population

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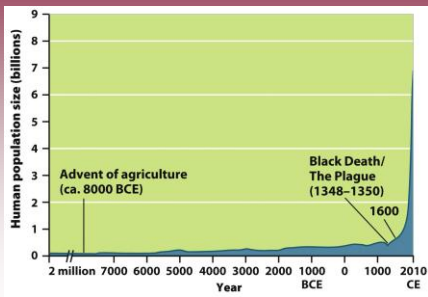
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### Scientists Disagree on Earth's Carrying Capacity




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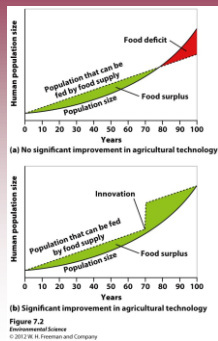
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### Scientists Disagree on Earth's Carrying Capacity

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




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## 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

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## 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.

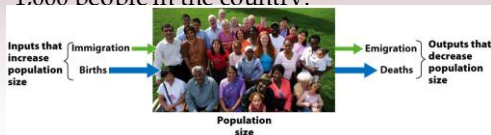


Figure 7.3  
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## Changes in Population Size

- 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 =
  - $(\text{CBR} - \text{CDR}) / 10$
  - National population growth rate =
  - $(\text{CBR} + \text{immigration}) - (\text{CDR} + \text{emigration}) / 10$
  - Doubling time (in years)-  $70 / \text{growth rate}$

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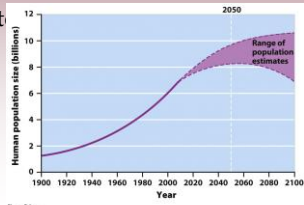
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## Fertility

- 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



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## 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.

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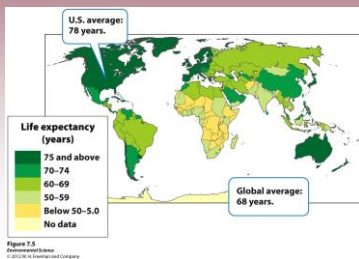
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## Life Expectancy

- 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.



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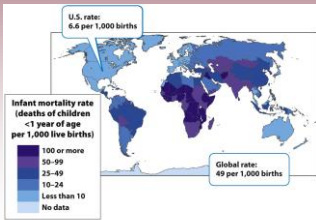
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## Life Expectancy

- 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.




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## 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

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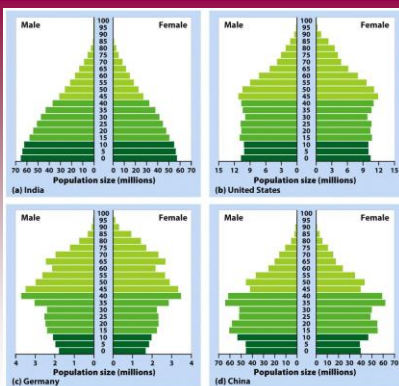
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## The Demographic Transition

- 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.

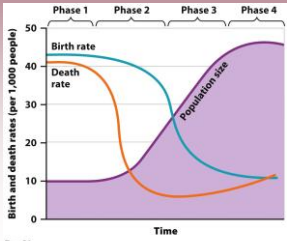


Figure 7.8  
Demographic Transition  
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## The Stages of the Demographic Transition

- 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.

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## Family Planning

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

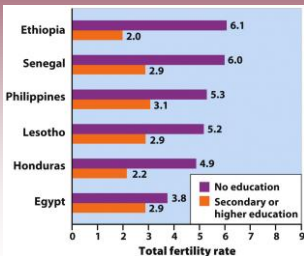


Figure 7.12  
Demographic Transition  
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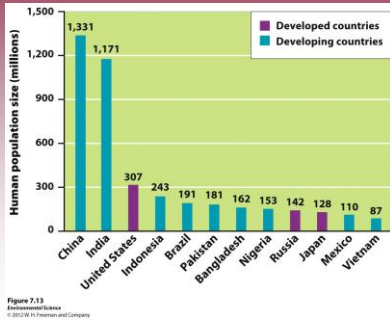
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## The 12 Most Populous Countries in the World




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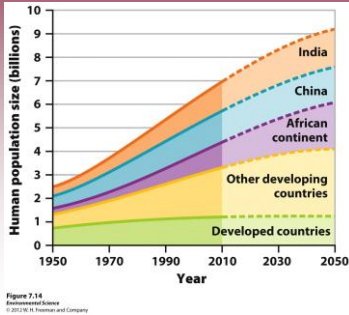
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The relationship between economic development and population growth rate for developing nations.




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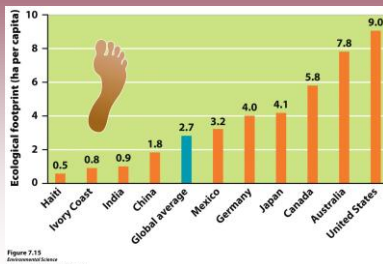
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## Ecological Footprints

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




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## The IPAT Equation

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



Figure 7.16a  
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Figure 7.16b  
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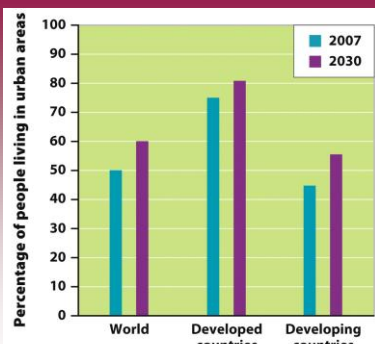


Figure 7.18  
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Rank	City, country	Population (millions)
1	Tokyo, Japan	35.7
2	New York-Newark, United States	19.0
3	Mexico City, Mexico	19.0
4	Mumbai, India	19.0
5	São Paulo, Brazil	18.9
6	Delhi, India	16.0
7	Shanghai, China	15.0
8	Kolkata, India	14.8
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

Source: United Nations Population Division.  
Note: Data are from 2007 and contain the areas defined by the United Nations as "urban agglomerations."

Table 7.1  
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## 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 countries GDP often correlates with its pollution levels.

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