The Human Population and Its Impact

Chapter 6
Core Case Study: Are There Too Many of Us? (1)

- Estimated 2.4 billion more people by 2050
- Are there too many people already?
- Will technological advances overcome environmental resistance that populations face?
- Should populations be controlled?
Core Case Study: Are There Too Many of Us? (2)

- Will growing populations cause increased environmental stresses?
  - Infectious diseases
  - Biodiversity losses
  - Water shortages
  - Traffic congestion
  - Pollution of the seas
  - Climate change
6-1 How Many People Can the Earth Support?

- **Concept 6-1** We do not know how long we can continue increasing the earth’s carrying capacity for humans without seriously degrading the life-support system for humans and many other species.
Human Population Growth Continues but It Is Unevenly Distributed (1)

- Reasons for human population increase
  - Movement into new habitats and climate zones
  - Early and modern agriculture methods
  - Control of infectious diseases through
    - Sanitation systems
    - Antibiotics
    - Vaccines
Human Population Growth Continues but It Is Unevenly Distributed (2)

- Population growth in developing countries is increasing 15 times faster than developed countries.

- By 2050, 97% of growth will be in developing countries.

- Should the optimum sustainable population be based on cultural carrying capacity?
Science Focus: How Long Can the Human Population Keep Growing?

- Thomas Malthus and population growth: 1798
- Humans have altered 83% of the earth’s land surface
- Can the human population grow indefinitely?
# Natural Capital Degradation: Altering Nature to Meet Our Needs

## Altering Nature to Meet Our Needs

- Reduction of biodiversity
- Increasing use of the earth’s net primary productivity
- Increasing genetic resistance of pest species and disease-causing bacteria
- Elimination of many natural predators
- Introduction of potentially harmful species into communities
- Using some renewable resources faster than they can be replenished
- Interfering with the earth’s chemical cycling and energy flow processes
- Relying mostly on polluting and climate-changing fossil fuels
NATURAL CAPITAL DEGRADATION

Altering Nature to Meet Our Needs

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- Relying mostly on polluting and climate-changing fossil fuels
Animation: Current and projected population sizes by region

- Asia: 3.5 billion
- Europe: 728 million
- Africa: 732 million
- Latin America: 486 million
- North America: 295 million
- Oceania: 29 million

1997
Video: Bonus for a baby
Video: People explosion
Animation: Resources depletion and degradation
6-2 What Factors Influence the Size of the Human Population?

- **Concept 6-2A** Population size increases because of 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.
The Human Population Can Grow, Decline, or Remain Fairly Stable

- Population change
  - Births: fertility
  - Deaths: mortality
  - Migration

- Population change =
  \[(\text{births} + \text{immigration}) - (\text{deaths} + \text{emigration})\]

- Crude birth rate

- Crude death rate
Global Connections: The World’s 10 Most Populous Countries in 2008

- **China**: 1.3 billion (2008), 1.5 billion (2025)
- **India**: 1.1 billion (2008), 1.4 billion (2025)
- **USA**: 304 million (2008), 357 million (2025)
- **Indonesia**: 240 million (2008), 292 million (2025)
- **Pakistan**: 173 million (2008), 229 million (2025)
- **Brazil**: 195 million (2008), 229 million (2025)
- **Nigeria**: 148 million (2008), 205 million (2025)
- **Bangladesh**: 147 million (2008), 180 million (2025)
- **Russia**: 142 million (2008), 129 million (2025)
- **Japan**: 128 million (2008), 119 million (2025)
China
1.3 billion
1.5 billion

India
1.1 billion
1.4 billion

USA
304 million
357 million

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Women Having Fewer Babies but Not Few Enough to Stabilize the World’s Population

- Fertility rate
  - Replacement-level fertility rate
  - Total fertility rate (TFR)
Case Study: The U.S. Population Is Growing Rapidly

- Drop in TFR in U.S.
  - Rate of population growth has slowed

- Population still growing and not leveling off
  - Fourfold increase since 1900

- Changes in lifestyle in the U.S. during the 20th century
TFR Rates for the U.S. between 1917 and 2008

- Baby boom (1946–64)
- Replacement level
Fig. 6-4, p. 127

Births per woman

Baby boom (1946–64)

Replacement level

Year

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Birth Rates in the U.S. from 1910 to 2008

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Births per thousand population

- Demographic transition
- Depression
- End of World War II
- Baby boom
- Baby bust
- Echo baby boom

Year

Fig. 6-5, p. 127
Some Major Changes That Took Place in the U.S. between 1900 and 2000

- Life expectancy: 1900 - 47 years, 2000 - 77 years
- Married women working outside the home: 1900 - 8%, 2000 - 81%
- High school graduates: 1900 - 15%, 2000 - 83%
- Homes with flush toilets: 1900 - 10%, 2000 - 98%
- Homes with electricity: 1900 - 2%, 2000 - 99%
- Living in suburbs: 1900 - 10%, 2000 - 52%
- Hourly manufacturing job wage (adjusted for inflation): 1900 - $3, 2000 - $15
- Homicides per 100,000 people: 1900 - 1.2, 2000 - 5.8

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Life expectancy: 47 years (77 years)

Married women working outside the home: 8% (81%)

High school graduates: 15% (83%)

Homes with flush toilets: 10% (98%)

Homes with electricity: 2% (99%)

Living in suburbs: 10% (52%)

Hourly manufacturing job wage (adjusted for inflation): $3 (1900) to $15 (2000)

Homicides per 100,000 people: 1.2 (1900) to 5.8 (2000)

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Life expectancy
1900: 47 years
2000: 77 years

Married women working outside the home
1900: 8%
2000: 81%

High school graduates
1900: 15%
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Homes with flush toilets
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2000: 98%

Homes with electricity
1900: 2%
2000: 99%

Living in suburbs
1900: 10%
2000: 52%

Hourly manufacturing job wage (adjusted for inflation)
1900: $3
2000: $15

Homicides per 100,000 people
1900: 1.2
2000: 5.8

Stepped Art
Fig. 6-6, p. 128
Several Factors Affect Birth Rates and Fertility Rates (1)

- Children as part of the labor force
- Cost of raising and educating children
- Availability of private and public pension
- Urbanization
- Educational and employment opportunities for women
Several Factors Affect Birth Rates and Fertility Rates (2)

- Infant mortality rate
- Average age of a woman at birth of first child
- Availability of legal abortions
- Availability of reliable birth control methods
- Religious beliefs, traditions, and cultural norms
Several Factors Affect Death Rates (1)

- Life expectancy
- Infant mortality rate

Why are people living longer and fewer infants dying?
  - Increased food supply and distribution
  - Better nutrition
  - Medical advances
  - Improved sanitation
Several Factors Affect Death Rates (2)

- U.S. infant mortality rate high due to
  - Inadequate health care for poor women during pregnancy and their infants
  - Drug addiction among pregnant women
  - High birth rate among teenagers
Migration Affects an Area’s Population Size

- Economic improvement
- Religious freedom
- Political freedom
- Wars
- Environmental refugees
Case Study: The United States: A Nation of Immigrants

- Historical role of immigration in the U.S.
- Legal immigration
- Illegal immigration
Legal Immigration to the U.S. between 1820 and 2003

- 1907: New laws restrict immigration
- 1914: Great Depression

Year:
- 1820
- 1840
- 1860
- 1880
- 1900
- 1920
- 1940
- 1960
- 1980
- 2000
- 2010

Number of legal immigrants (thousands)
Number of legal immigrants (thousands)

Year

1820 1840 1860 1880 1900 1920 1940 1960 1980 2000 2010

1907
1914
New laws restrict immigration
Great Depression
6-3 How Does a Population’s Age Structure Affect Its Growth or Decline?

- **Concept 6-3** The numbers of males and females in young, middle, and older age groups determine how fast a population grows or declines.
Populations Made Up Mostly of Young People Can Grow Rapidly

- **Age structure** categories
  - Prereproductive ages
  - Reproductive ages
  - Postreproductive ages
Generalized Population Age Structure Diagrams

Expanding Rapidly
Guatemala
Nigeria
Saudi Arabia

Expanding Slowly
United States
Australia
China

Stable
Japan
Italy
Greece

Declining
Germany
Bulgaria
Russia

- Red: Preraductive ages 0–14
- Yellow: Reproductive ages 15–44
- Blue: Postreproductive ages 45–85+

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Expanding Rapidly
- Guatemala
- Nigeria
- Saudi Arabia

Expanding Slowly
- United States
- Australia
- China

Stable
- Japan
- Italy
- Greece

Declining
- Germany
- Bulgaria
- Russia

Female
Male

Prereproductive ages
- 0–14

Reproductive ages
- 15–44

Postreproductive ages
- 45–85+

Fig. 6-8, p. 131
Population Structure by Age and Sex in Developing and Developed Countries

[Diagram showing population structure in developed and developing countries by age and sex]

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Developed Countries

Age

85+
80–85
75–79
70–74
65–69
60–64
55–59
50–54
45–49
40–44
35–39
30–34
25–29
20–24
15–19
10–14
5–9
0–4

Population (millions)

0
100
200
300

Fig. 6-9a, p. 131
We Can Use Age-Structure Information to Make Population and Economic Projections

- Baby boomers
- Job market when they retire
Tracking the Baby-Boom Generation in the United States
Populations Made Up of Mostly Older People Can Decline Rapidly

- Slow decline
  - Manageable

- Rapid decline
  - Severe economic problems
  - Severe social problems
Some Problems with Rapid Population Decline

Can threaten economic growth

Labor shortages

Less government revenues with fewer workers

Less entrepreneurship and new business formation

Less likelihood for new technology development

Increasing public deficits to fund higher pension and health-care costs

Pensions may be cut and retirement age increased
Some Problems with Rapid Population Decline

Can threaten economic growth

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Populations Can Decline from a Rising Death Rate: The AIDS Tragedy

- 25 million killed by 2008

- Many young adults die: loss of most productive workers

- Sharp drop in life expectancy

- International community called upon to
  - Reduce the spread of HIV through education and health care
  - Financial assistance and volunteers
Active Figure: Examples of age structure
Active Figure: U.S. age structure
Concept 6-4  Experience indicates that the most effective ways to slow human population growth are to encourage family planning, to reduce poverty, and to elevate the status of women.
As Countries Develop, Their Populations Tend to Grow More Slowly

- **Demographic transition** stages
  - Preindustrial
  - Transitional
    - May lead to a demographic trap
  - Industrial
  - Postindustrial
Four Stages of the Demographic Transition

Stage 1: Preindustrial
- Population grows very slowly because of a high birth rate (to compensate for high infant mortality) and a high death rate.

Stage 2: Transitional
- Population grows rapidly because birth rates are high and death rates drop because of improved food production and health.

Stage 3: Industrial
- Population growth slows as both birth and death rates drop because of improved food production, health, and education.

Stage 4: Postindustrial
- Population growth levels off and then declines as birth rates equal and then fall below death rates.

Birth rate and death rate (number per 1,000 per year)

Growth rate over time
<table>
<thead>
<tr>
<th>Stage 1</th>
<th>Preindustrial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>grows very slowly because of a high birth rate (to compensate for high infant mortality) and a high death rate</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stage 2</th>
<th>Transitional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population grows rapidly because birth rates are high and death rates drop because of improved food production and health</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stage 3</th>
<th>Industrial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population growth slows as both birth and death rates drop because of improved food production, health, and education</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stage 4</th>
<th>Postindustrial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population growth levels off and then declines as birth rates equal and then fall below death rates</td>
<td></td>
</tr>
</tbody>
</table>

**Birth rate and death rate** (number per 1,000 per year)

- **Stage 1**
  - Birth rate: Low
  - Death rate: Low
- **Stage 2**
  - Birth rate: Increasing
  - Death rate: Very high
- **Stage 3**
  - Birth rate: Very high
  - Death rate: Decreasing
- **Stage 4**
  - Birth rate: Zero
  - Death rate: Negative

**Growth rate over time**

- **Low**
- **Increasing**
- **Very high**
- **Decreasing**
- **Low**
- **Zero**
- **Negative**

*Fig. 6-12, p. 134*
Planning for Babies Works

- Family Planning
  - Responsible for a 55% drop in TFRs
  - In developing countries
  - Expansion of program
    - Include teenagers, sexually active unmarried women, and men

- Slow and stabilize population growth
  - Invest in family planning
  - Reduce poverty
  - Elevate the social and economic status of women
Empowering Women Can Slow Population Growth

- Education
- Paying jobs
- Human rights without suppression
- “For poor women the only holiday is when you are asleep”
Women from a Village in Burkina Faso
Returning with Fuelwood
Case Study: Slowing Population Growth in China: the One-Child Policy

- Encourages fewer children
- Gender imbalance
- Fast-growing economy
- Face serious resource and environmental problems
Active Figure: Demographic transition model
Case Study: Slowing Population Growth in India

- Population control: gender bias
- Poverty
- Malnutrition
- Environmental problems