Environmental Problems, Their Causes, and Sustainability

Main themes:
- What keeps us alive? What is an environmentally sustainable society?
- What is the difference between economic growth, economic development, and environmentally sustainable economic development?

Environmental Problems, Their Causes, and Sustainability (cont’d)
- What are the harmful environmental effects of poverty and affluence?
- What three major human cultural changes have taken place since humans arrived?
- What are the four scientific principles of sustainability and how can we use them and shared visions to build more environmentally sustainable and just societies during this century?
What is Environmental Science?

- The goals of environmental science are to learn:
  - how nature works.
  - how the environment affects us.
  - how we affect the environment.
  - how we can live more sustainably without degrading our life-support system.
Sustainability, is the ability of earth’s various systems to survive and adapt to environmental conditions indefinitely. The steps to sustainability must be supported by sound science.

Environmentally Sustainable Societies

... meets basic needs of its people in a just and equitable manner without degrading the natural capital that supplies these resources.

Fig. 1-4, p. 9

Fig. 1-4, p. 9
POPULATION GROWTH, ECONOMIC GROWTH, AND ECONOMIC DEVELOPMENT

- Economic growth provides people with more goods and services.
  - Measured in gross domestic product (GDP) and purchasing power parity (PPP).
- Economic development uses economic growth to improve living standards.
  - The world’s countries economic status (developed vs. developing) are based on their degree of industrialization and GDP-PPP.
- Comparison of developed and developing countries.

**Figure 1-5, p. 11**

### Percentage of World's Population

- **Population Growth**: 82%
- **Wealth and Income**: 85%
- **Resource Use**: 88%
- **Pollution and Waste**: 75%

Developed countries: Red
Developing countries: Yellow

**Figure 1-6, p. 11**

### World Economic Status

- Developed vs. Developing countries based on industrialization and GDP-PPP.
RESOURCES

- **Perpetual**: On a human time scale are continuous.
- **Renewable**: On a human time scale can be replenished rapidly (e.g. hours to several decades).
- **Nonrenewable**: On a human time scale are in fixed supply.

Nonrenewable Resources

- Exist as fixed quantity
  - Becomes economically depleted.
- Recycling and reusing extends supply
  - Recycling processes waste material into new material.
  - Reuse is using a resource over again in the same form.

Our Ecological Footprint

- Humanity’s ecological footprint has exceeded earth’s ecological capacity.
Total Footprint (million hectares) and Share of Global Ecological Capacity (%)

- United States: 2,810 (25%)
- European Union: 2,160 (19%)
- China: 2,050 (18%)
- India: 780 (7%)
- Japan: 540 (5%)

Footprint Per Person (hectares per person)

- United States: 9.7
- European Union: 4.7
- China: 1.6
- India: 0.8
- Japan: 4.8

Number of Earths Humanity's Ecological Footprint

- Year 1960: 0.3
- Year 1970: 0.6
- Year 1980: 0.9
- Year 1990: 1.2
- Year 2000: 1.5
- Year 2010: 1.5

Humanity's Ecological Capacity

- Number of Earths
Pollution

- Found at high enough levels in the environment to cause harm to organisms.
  - Point source
  - Nonpoint source

Pollutants can have three types of unwanted effects:
- Can disrupt / degrade life-support systems.
- Can damage health and property.
- Can create nuisances such as noise and unpleasant smells, tastes, and sights.

Environmental Problems: Causes and Connections

- The major causes of environmental problems are:
  - Population growth
  - Wasteful resource use
  - Poverty
  - Poor environmental accounting
  - Ecological ignorance
Natural capital degradation

The exponential increasing flow of material resources through the world’s economic systems depletes, degrades and pollutes the environment.

Solutions: Prevention vs. Cleanup

Problems with relying on cleanup:
- Temporary bandage without improvements in control technology.
- Often removes a pollutant from one part of the environment to cause problems in another.
- Pollutants at harmful levels can cost too much to reduce them to acceptable levels.

THINKING ABOUT PREVENTING POLLUTION AND EXPONENTIAL GROWTH: Explain how placing much greater emphasis on pollution prevention would help reduce the exponential growth of the human ecological footprint and your own ecological footprint.
Poverty and Environmental Problems

- 1 of 3 children under 5, suffer from severe malnutrition.

<table>
<thead>
<tr>
<th>Lack of access to</th>
<th>Number of people (% of world’s population)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adequate sanitation</td>
<td>2.4 billion (37%)</td>
</tr>
<tr>
<td>Enough fuel for heating and cooking</td>
<td>2 billion (31%)</td>
</tr>
<tr>
<td>Electricity</td>
<td>1.6 billion (25%)</td>
</tr>
<tr>
<td>Clean drinking water</td>
<td>1.1 billion (17%)</td>
</tr>
<tr>
<td>Adequate health care</td>
<td>1.1 billion (17%)</td>
</tr>
<tr>
<td>Enough food for good health</td>
<td>1.1 billion (17%)</td>
</tr>
</tbody>
</table>

Resource Consumption and Environmental Problems

- Underconsumption
- Overconsumption
  - Affluenza: unsustainable addiction to overconsumption and materialism.
Connections between Environmental Problems and Their Causes

**CULTURAL CHANGES AND THE ENVIRONMENT**

- Agricultural revolution
  - Allowed people to stay in one place.
- Industrial-medical revolution
  - Led shift from rural villages to urban society.
  - Science improved sanitation and disease control.
- Information-globalization revolution
  - Rapid access to information.

**Industrial-Medical Revolution**

<table>
<thead>
<tr>
<th>Advantage</th>
<th>Disadvantage</th>
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<tbody>
<tr>
<td>Increased oil production</td>
<td>Increased water pollution</td>
</tr>
<tr>
<td>Higher standard of living for many</td>
<td>Soil depletion and degradation</td>
</tr>
<tr>
<td>Directly increased agricultural production</td>
<td>Industrial pollution</td>
</tr>
<tr>
<td>Lower infant mortality</td>
<td>Lower rates of population growth</td>
</tr>
<tr>
<td>Longer life expectancies</td>
<td>Biodiversity exploitation</td>
</tr>
</tbody>
</table>

**Which single advantage and disadvantage are the most important?**

Figure 1.14

Figure 1.15
SUSTAINABILITY AND ENVIRONMENTAL WORLDVIEWS

- Technological optimists:
  - suggest that human ingenuity will keep the environment sustainable.
- Environmental pessimists:
  - overstate the problems where our environmental situation seems hopeless.

How Would You Vote?

- Is the society you live in on an unsustainable path?
  - a. Yes: Without readily available green products and services, converting to a sustainable society is unrealistic.
  - b. Not entirely: I’m doing what I can to improve sustainability, including recycling and using less energy.

Four Scientific Principles of Sustainability: Copy Nature

- Reliance on Solar Energy
- Biodiversity
- Population Control
- Nutrient Recycling

Figure 1.16
Aldo Leopold’s Environmental Ethics

- Individuals matter.
- ... land is to be loved and respected is an extension of ethics.
- We abuse land because we regard it as a commodity...

Implications of the Four Scientific Principles of Sustainability

- Principles of Sustainability
- Lessons for Us
- Current Emphasis
- Sustainability Emphasis

Figures 1-18, p. 25