

Chapter 1- Environmental Problems, Their Causes, and Sustainability

Summary

1. All life depends on energy from the sun, solar capital, and the resources and ecological services of the earth, natural capital, to survive. An environmentally sustainable society provides for the current needs of its people without undermining the ability of future generations to do the same.
2. The world's population is growing exponentially, adding about 80 million people per year. Economic growth increases a country's capacity to provide goods and services to its people. Economic development uses economic growth to improve standards of living. Globalization is a process of increasingly interconnecting people through social, economic, and environmental global changes.
3. The earth's main resources are perpetual resources like solar energy, renewable resources like forests and fresh water, and nonrenewable resources like oil and gas. The resources can be depleted or degraded by overuse, by waste, by pollution, and by man's increasing "ecological footprint."
4. The principle types of pollution are air, water, soil, and food pollutants. We can prevent pollution or clean up pollution. Prevention is far preferable because cleaning up pollution often causes additional pollutants in another part of the environment.
5. The basic causes of today's environmental problems are population growth, wasteful use of resources, the tragedy of the commons, poverty, poor environment accounting, and ecological ignorance. They are interconnected because of political and economic practices that are not equitable for various populations, in resource consumption and in technological applications.
6. The world's current course is not sustainable. Environmental sustainable development encourages environmentally beneficial forms of economic growth and discourages environmentally harmful growth.

Key Questions and Concepts

1-1 What are three principles of sustainability?

CORE CASE STUDY. Contemporary society faces many environmental problems. Sustainability is the capacity of natural systems and cultural systems to survive and flourish indefinitely. As we look to the future, our actions today are pivotal to our ultimate sustainability.

- A. The environment is everything around us. Environmental science is an interdisciplinary study of how humans interact with their environment.
- B. Three goals of environmental science are:
 - 1. to learn how nature works.
 - 2. to understand how we interact with the environment.
 - 3. to find ways to address environmental problems and embrace sustainability.
- C. Ecology studies relationships between living organisms and their environment.
- D. Environmentalism is a social movement dedicated to protecting life support systems for all species.
- E. A path toward sustainability includes three overarching themes:
 - 1. Reliance on solar energy.
 - 2. Biodiversity.
 - 3. Chemical or nutrient cycling.
- F. Natural capital is the natural resources (materials and energy in nature) and natural services (natural processes) that support ecosystems and economies.
- G. Resources are that which can be taken from the environment to meet our needs or wants.
 - 1. Perpetual resources are continuously available (sunlight)
 - 2. Renewable resources can be replenished in the foreseeable future (forests, fertile topsoil).
 - 3. Non-renewable resources are found in fixed quantities and are not renewable on a human time scale.
- H. Economic growth is an increase in a nation's output of goods and services, measured by gross domestic product (GDP).
 - 1. Economic development uses economic growth to improve living standards
 - a. More developed countries make up 20% of the world's population and use 88% of all resources.

1-2 How Are Our Ecological Footprints Affecting the Earth?

- A. The process of depleting resources is known as environmental degradation or natural capital degradation.
- B. Pollution is any presence in the environment that is harmful to health or survival or humans or other organisms.
 - 1. Point sources are single identifiable sources; non-point sources are dispersed.
 - 2. Biodegradable pollutants break down over time and nonbiodegradable pollutants cannot break down.
 - 3. Pollutants can have three kinds of effects:
 - a. Disrupt or degrade life-support systems for humans or other species.
 - b. Damage wildlife, human health, or property.
 - c. Create nuisances.
 - 4. There are two ways to deal with pollution:

- a. Pollution cleanup.
 - b. Pollution prevention.
- C. The Tragedy of the Commons describes the overuse or degradation of freely available resources. The cumulative effect of many users exploiting a common resource can degrade it such that no one can benefit from it.
- D. Ecological footprint
 - 1. The amount of biologically productive land and water needed to supply renewable resources and absorb waste for people in a given area.
 - 2. Humanity's ecological footprint exceeds by at least 30% the earth's biological capacity to support life.
- E. IPAT summarizes environmental impact
 - 1. $\text{Impact (I)} = \text{Population (P)} \times \text{Affluence (A)} \times \text{Technology (T)}$.
- CASE STUDY:** The number of affluent consumers is rising rapidly, as people in underdeveloped countries attain a middleclass lifestyle. China is already a leading consumer of many resources, and its economy and population are continuing to grow at a rapid rate. Thus, its ecological footprint and overall level of resource consumption are expected to continue to grow.
- F. Ecological tipping point refers to an irreversible shift in the behavior of a natural system. We currently face three potential tipping points:
 - 1. Collapse of fish populations from overfishing.
 - 2. Species extinction from overharvesting and habitat destruction.
 - 3. Climate change from burning coal and oil.
- G. Culture describes a society's knowledge, beliefs, technology and practices.
 - 1. Three major cultural changes have occurred in human history
 - a. Agricultural revolution: 10,000 – 12,000 years ago when people began growing and breeding plants.
 - b. Industrial-medical revolution: 275 years ago machines and medical advances improved lives.
 - c. Information-globalization revolution: 50 years ago new technologies allow for global communications and trade.
 - d. A fourth, called the sustainability revolution, is advocated by many environmental scientists.

1-3 Why do we have environmental problems?

- A. Four major causes of environmental problems are:
 - 1. Population growth.
 - 2. Wasteful resource use.
 - 3. Poverty.
 - 4. Poor environmental accounting.
- B. Exponential growth occurs when a population increases by a fixed percentage per unit of time.
 - 1. There are roughly 6.9 billion people on earth in 2010. There may be as many as 9.3 billion by 2050. No one knows how many people the Earth can support.
- C. Affluence results in high levels of consumption.
 - 1. Affluence can lead to an unsustainable addiction to acquiring material things.

2. Affluence can lead to better education, improved health, and more resources to address environmental issues.
- D. Poverty occurs when people are unable to fulfill their basic needs.
 1. 1/5 of the world population lives in extreme poverty.
 2. Poverty conditions in heavily populated areas can have significant environmental impacts.
 3. Pollution and environmental degradation can have severe impacts on the poor. Three significant health issues are:
 - a. malnutrition
 - b. inadequate sanitation and access to safe drinking water
 - c. respiratory disease
- E. Prices of goods do not include their harmful environmental costs.
- F. Environmental worldviews and ethics determine the way people view the seriousness of environmental problems.
 1. Your environmental worldview is your assumptions and values about the world and your role.
 2. Environmental Ethics are beliefs about what is right and wrong in our treatment of the environment.
 - a. The planetary management worldview holds that nature exists to meet our needs.
 - b. The stewardship worldview holds that we manage the earth, but we have an ethical responsibility to be stewards of the earth.
 - c. The environmental worldview holds that we are connected to nature and that nature exists for all species equally.

1-4 What is an environmentally sustainable society?

- A. An environmentally sustainable society meets the current and future basic resource needs of its people in a just and equitable manner by protecting natural capital and living off its income.
 1. The shift to sustainability involves building social capital, which involves bringing together people with different views and values and finding common ground.
- CASE STUDY:** Chattanooga, Tennessee, was once one of the most polluted cities in the United States. In the mid-1980s civic leaders gathered together community members to identify problems and brainstorm solutions. After years of encouraging zero-emission industries, implementing recycling programs, and renovating much of the city, Chattanooga is an example of what can be accomplished when cities build their social capital.
- B. Individuals matter
 1. It takes only 5-10% of a community to bring about major social change.
 2. Significant social change can occur very rapidly.