# HUMANS AND SUSTAINABILITY: AN OVERVIEW

# 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 about 1.2% per year, which adds about 77 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 is an environmentally sustainable society?**

**CORE CASE STUDY**. The human population is growing exponentially, consuming vast amounts of resources. It is uncertain how many people the earth can sustain, particularly in light of the pollution they create.

A. Environmental science studies how the earth works, our interaction with the earth, and the methods/procedures we use to deal with environmental problems.

B. Environmental science considers everything that affects a living organism.

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 five subthemes that are addressed throughout the text:

1. Natural capital—natural resources and services that keep us and other species alive.

2. Natural capital degradation—when human activities use renewable resources unsustainably.

3. Solutions—are sought to degradation of natural resources.

4. Trade-offs—or compromises are made to resolve conflicts.

5. Individuals matter—to search for solutions to environmental problems.

F. Life and economies depend on solar capital (energy from the sun) and natural capital.

**1-2 How can environmentally sustainable societies grow economically?**

A. Economic growth provides people with the goods and services needed.

1. Gross domestic product (GDP) is the market value for goods and services produced within the country.

2. Standard of living is the GDP divided by total population at midyear.

B. Economic development is improving living standards through growth. Most developed countries have high industrialization and high per capita income. Developing countries have moderate to low income.

1. Economic developments reflect good and bad economic news.

a. Poverty produces harmful environmental effects.

2. Developed countries enjoy a higher standard of living.

a. Longer life expectancy.

b. Decrease in infant mortality.

3. Environmentally sustainable development rewards sustainable activities and discourages harmful activities.

**1-3 How are our ecological footprints affecting the earth?**

A. Natural capital/natural resources are those in the environment or those obtained from the environment: food, water, air, shelter petroleum, etc.

B. Material resources we get from the environment are classified as perpetual, renewable, or nonrenewable.

1. A perpetual resource is renewed continuously, like solar energy.

2. Sustainable yield is the highest rate of use on an indefinite scale without degradation or depletion.

3. Environmental degradation occurs when use of resources exceeds rate of replacement.

C. The Tragedy of the Commons describes the overuse or degradation of freely available resources such as ocean pollution, abuse of national parks, air pollution, etc. No one individual owns these free-access resources.

D. What is our ecological footprint, our impact on the environment?

1. The per capita ecological footprint is the biologically productive land and water needed to supply renewable resources and absorb waste for each individual.

2. Humanity’s ecological footprint exceeds by about 39% the earth’s ecological capacity (or biocapacity) to replenish its renewable resources and absorb the resulting waste products and pollution.

E. What are nonrenewable resources?

1. Nonrenewable resources are those that exist in fixed quantity or stock in the earth’s crust. The resource is economically depleted when it costs too much to obtain what is left.

2. These resources include energy resources (oil, coal, natural gas), metallic mineral resources (copper, iron, aluminum, etc.), and nonmetallic minerals like salt, clay, sand, and phosphates.

3. There are solutions for an economically depleted resource.

a. Try to find more of the resource.

b. Recycle the resource.

c. Waste less.

d. Use less.

e. Try to develop a substitute for the resource.

**CASE STUDY**: The number of affluent consumers will soon double, 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.

**1-4 What is pollution and what can we do about it?**

A. Pollutants are chemicals at high enough levels in the environment to harm people or other living organisms.

1. Pollutants may enter the environment naturally (e.g., volcanic eruptions) or through human activities.

2. Point sources of pollutants are single, identifiable sources.

3. Non-point sources are dispersed.

4. Three unwanted effects of pollutants are:

a. They can disrupt or degrade life-support systems of any organism.

b. They damage human health, wildlife, and property

c. They can produce nuisances in the form of noise, smells, tastes, and sights.

B. Solutions: What can we do about pollution?

1. We use two basic approaches to deal with pollution.

a. Pollution prevention/input pollution control reduces or eliminates production of pollutants.

b. Pollution cleanup/output pollution control cleans up or dilutes pollutants after they have been produced.

c. Problems with pollution clean up include:

1) Temporary bandage without long-term pollution control technology, like the catalytic converter.

2) Pollutant is removed but causes pollution in another place: burning garbage/burying it.

3) Expensive to reduce pollution to an acceptable level. Prevention is less expensive.

**1-5 Why do we have environmental problems?**

A. Five major causes of environmental problems are:

1. Population growth.

2. Wasteful Resource use.

3. Poverty.

4. Poor environmental accounting.

5. Ecological ignorance.

B. Affluence is the addiction to over-consumption of material goods.

1. Symptoms: high debt level, declining health, increased stress, more bankruptcies.

2. Solutions: admit the problem, shop less, avoid malls and other shopping addicts.

3. Toynbee’s law of progressive simplification: transfer energy and attention to the nonmaterial side of life.

C. Affluence of developed countries can lead to environmental improvements.

1. Money is available for technological improvements.

2. Since 1970, air and water are cleaner than previously.

3. Money was spent on environmental improvements.

D. 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.

a. The planetary management worldview holds that nature exists to meet our needs.

b. The stewardship worldview holds that we mange 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.

**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.

**1-6 What are four scientific principles of sustainability?**

A. There are four major components of earth’s natural sustainability

1. Reliance on solar energy.

2. Reserve biodiversity.

3. Population control.

4. Nutrient recycling.

### Key Terms

**developed countries** (p. 10)

**developing countries** (p. 11)

**ecological footprint** (p. 14)

**ecology** (p. 7)

**economic development** (p. 10)

**environment** (p. 6)

**environmental degradation** (p. 12)

**environmental ethics** (p. 20)

**environmental science** (p. 6)

**environmental wisdom worldview** (p. 20)

**environmental worldview** (p. 20)

**environmentalism** (p. 8)

**environmentally sustainable economic development** (p. 11)

**environmentally sustainable society** (p. 9)

**exponential growth** (p. 5)

**gross domestic product (GDP)** (p. 10)

**input pollution control** (p. 17)

**natural capital** (p. 9)

**nonpoint sources** (p. 16)

**nonrenewable resources** (p. 13)

**output pollution control** (p. 17)

**per capita ecological footprint**   
(p. 14)

**per capita GDP** (p. 10)

**perpetual resource** (p. 12)

**planetary management worldview** (p. 20)

**point sources** (p. 16)

**pollution** (p. 16)

**pollution cleanup** (p. 17)

**pollution prevention** (p. 17)

**poverty** (p. 18)

**recycling** (p. 13)

**renewable resource** (p. 12)

**resource** (p. 12)

**reuse** (p. 13)

**social capital** (p. 20)

**solar capital** (p. 9)

**stewardship worldview** (p. 20)

**sustainability (durability)**   
(p. 8)

**sustainable yield** (p. 12)