LIVING IN THE ENVIRONMENT, 18e

G. TYLER MILLER • SCOTT E. SPOOLMAN

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Environmental Problems, Their Causes, and Sustainability

Core Case Study: A Vision of a More Sustainable World in 2065

- A transition in human attitudes toward the environment, and a shift in behavior, can lead to a much better future for the planet in 2065
- Sustainability
  - The capacity of the earth's natural systems and human cultural systems to survive, flourish, and adapt into the very long-term future

1-1: What Are Some Principles of Sustainability?

- Nature has sustained itself for billions of years by using solar energy, biodiversity, and nutrient cycling
- Our lives and economies depend on energy from the sun and on natural resources and natural services (natural capital) provided by the earth

1-1: What Are Some Principles of Sustainability? (cont'd.)

- Shift toward living more sustainably by:
  - Applying full-cost pricing, searching for win-win solutions
  - Committing to preserving the earth's life-support system for future generations

Environmental Science Is a Study of Connections in Nature

- Environment: everything around us
- Environmental science: interdisciplinary science connecting information and ideas from:
  - Natural sciences: ecology, biology, geology, chemistry
  - Social sciences: geography, politics, economics
  - Humanities: ethics, philosophy

Three Scientific Principles of Sustainability

- Dependence on solar energy
  - The sun provides warmth and fuels photosynthesis
- Biodiversity
  - Astounding variety and adaptability of natural systems and species
- Chemical cycling
  - From the environment to organisms and then back to the environment

Three Principles of Sustainability

Solar Energy

Chemical Cycling

Biodiversity

Fig. 1-3, p. 8

Sustainability Has Certain Key Components

- Natural capital: keep species alive
  - Natural resources: useful materials and energy in nature
  - Natural services: important nature processes such as renewal of air, water, and soil
- Ecosystem services
  - Processes provided by healthy ecosystems

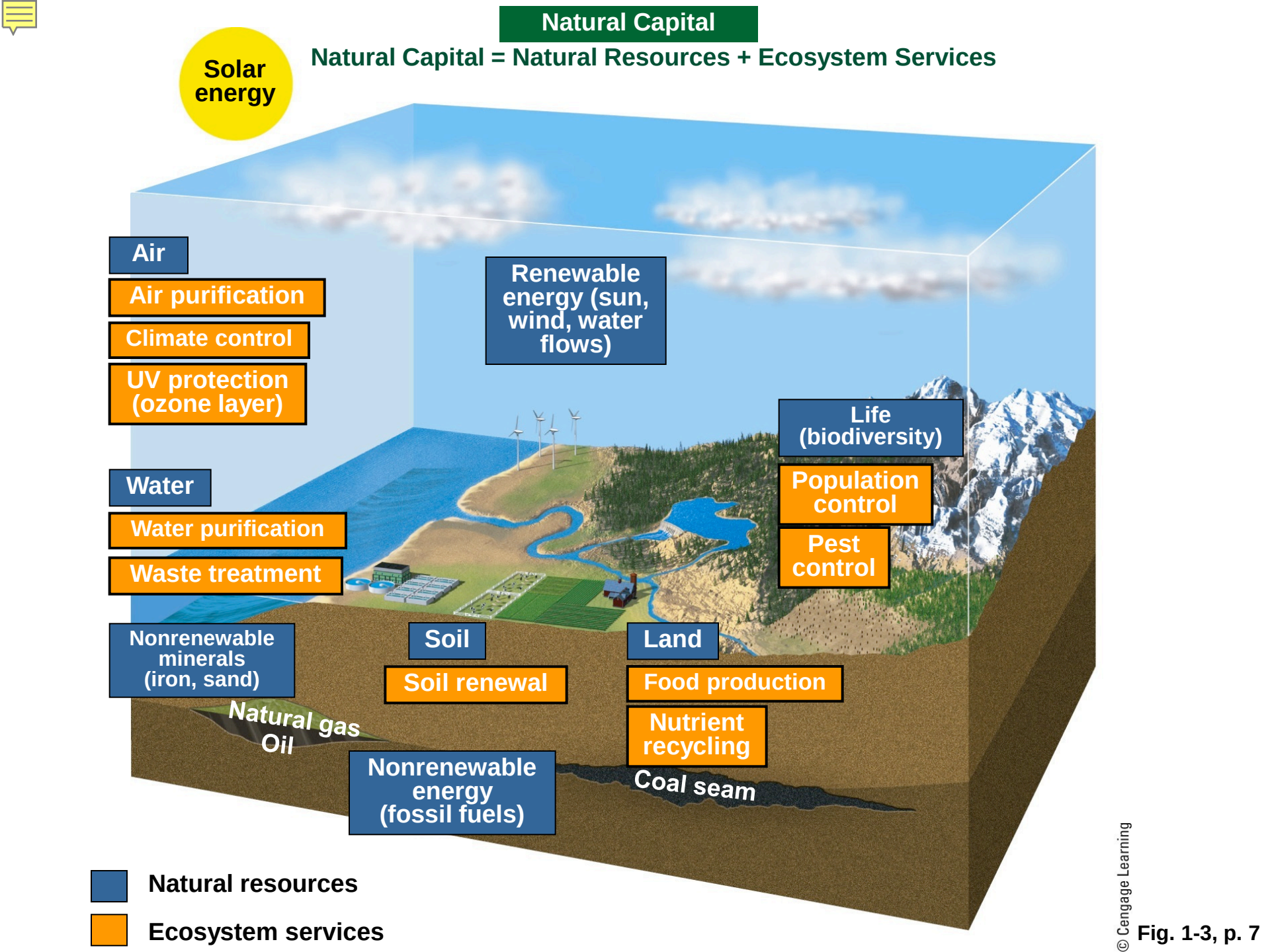

Fig. 1-3, p. 7

Other Principles of Sustainability Come from the Social Sciences

- Full-cost pricing
  - Include harmful health and environmental costs of goods and services
- Win-win solutions
  - Benefit people and the environment
- A responsibility to future generations

Some Resources Are Renewable and Some Are Not

- Resources
  - Anything we obtain from the environment to meet our needs
  - Some directly available for use: sunlight
  - Some not directly available for use: petroleum
- An inexhaustible resource
  - Solar energy

Some Resources Are Renewable and Some Are Not (cont'd.)

- Renewable resource
  - Several days to several hundred years to renew
  - Examples: forests, grasslands, and fertile soil
- Sustainable yield
  - Highest rate at which we can use a renewable resource without reducing available supply

Some Resources Are Renewable and Some Are Not (cont'd.)

- Nonrenewable resources
  - Finite stock on earth
  - Energy resources
  - Metallic mineral resources
  - Nonmetallic mineral resources

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Fig. 1-5, p. 9

Countries Differ in their Resource Use and Environmental Impact

- More-developed countries
  - Industrialized nations with high average income
  - 17% of the world's population
- Less-developed countries
  - 83% of the world's population

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

- As our ecological footprints grow, we are depleting and degrading more of the earth's natural capital

We Are Living Unsustainably

- Environmental degradation: wasting, depleting, and degrading the earth's natural capital
  - Happening at an accelerating rate

Natural Capital Degradation

Degradation of Normally Renewable Natural Resources

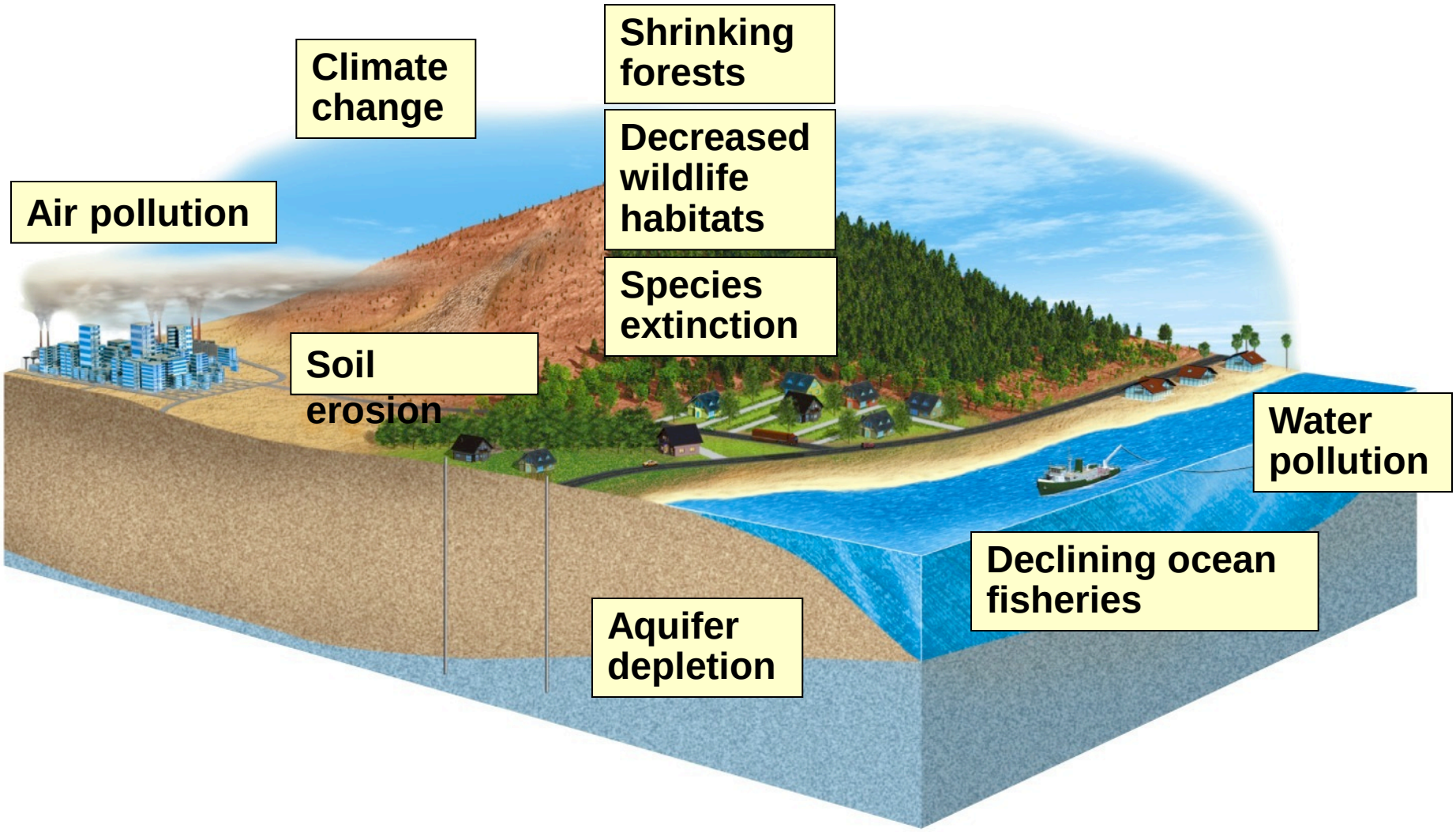

Fig. 1-7, p. 11

Pollution Comes from a Number of Sources

- Sources of pollution
  - Point sources
    - Single, identifiable source
  - Nonpoint sources
    - Disbursed and difficult to identify
- What are some strategies for pollution cleanup and prevention?

Point-Source Air Pollution

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Fig. 1-8, p. 11

Nonpoint Source Water Pollution

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Fig. 1-9, p. 11

The Tragedy of the Commons: Degrading Commonly Shared Renewable Resources

- Types of resources
  - Open access renewable resources
  - Shared resources
- Tragedy of the commons
  - Common property and open-access renewable resources are degraded from overuse
  - What are some solutions?

Ecological Footprints: A Model of Unsustainable Use of Resources

- Ecological footprint
  - Amount of biologically productive land and water needed to provide a person or area with renewable resources, and to recycle wastes and pollution
- Per capita ecological footprint
- Ecological deficit
  - Footprint is larger than biological capacity for replenishment

Natural Capital Use and Degradation

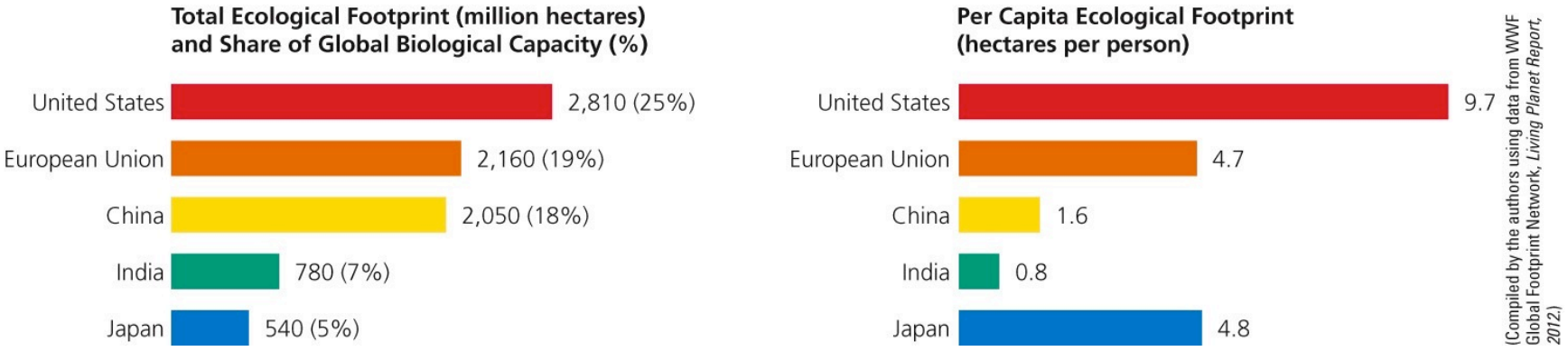

Fig. 1-11, p. 13

IPAT is Another Environmental Impact Model

- I = P x A x T
  - I = Environmental impact
  - P = Population
  - A = Affluence
  - T = Technology

IPAT

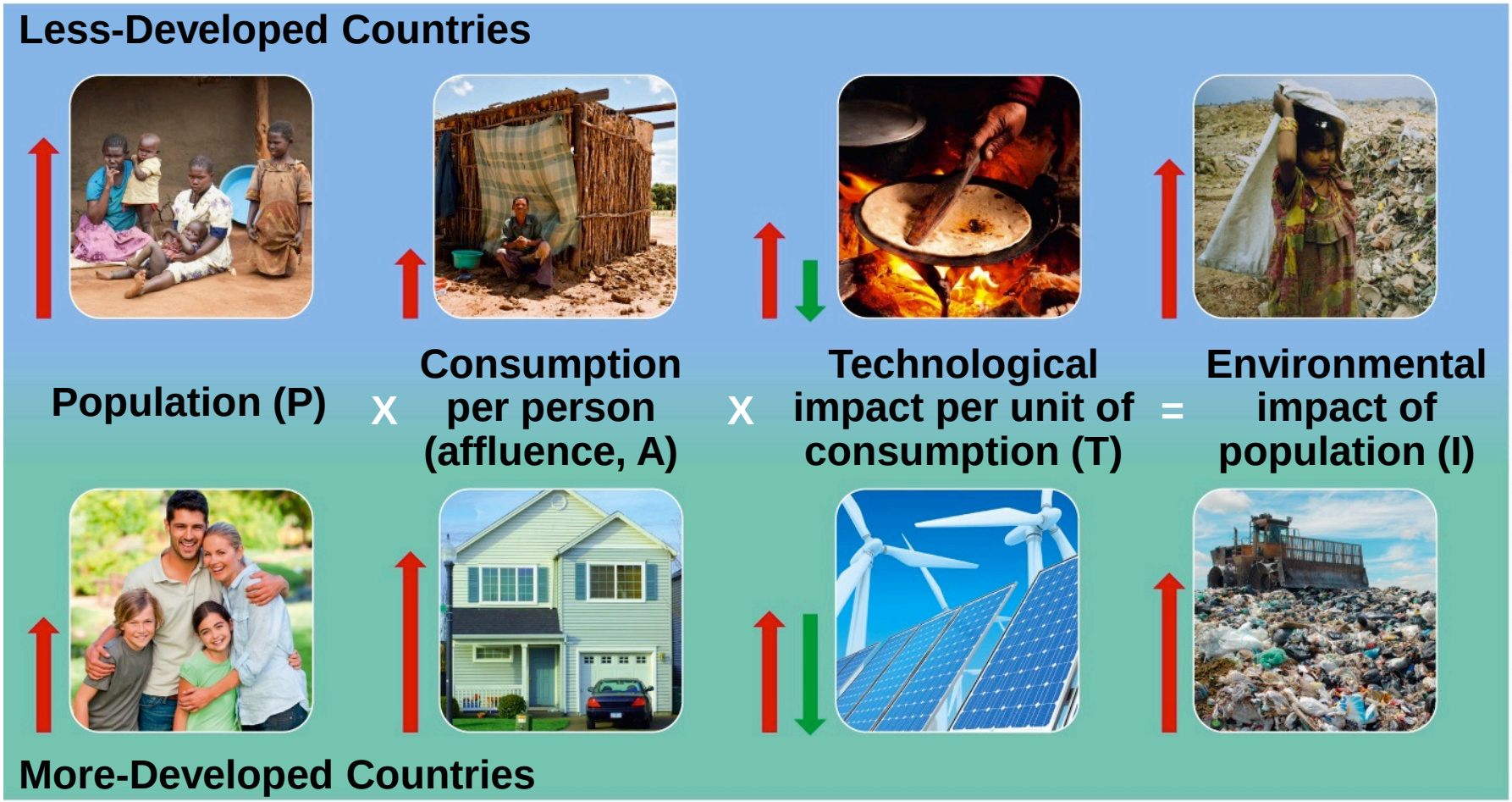

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Fig. 1-14, p. 17

Case Study: China's Growing Number of Affluent Consumers

- World's largest population
- Second largest economy
- Two-thirds of the most polluted cities are in China
- Projections for next decade
  - Largest consumer and producer of cars

Cultural Changes Can Grow or Shrink Our Ecological Footprints

- Humans were hunters and gatherers 12,000 years ago
- Three major cultural events
  - Agricultural revolution
  - Industrial-medical revolution
  - Information-globalization revolution
- Current need for a sustainability revolution

1-3: Why Do We Have Environmental Problems?

- Major causes of environmental problems
  - Population growth, unsustainable resource use, poverty, avoidance of full-cost pricing, and increasing isolation from nature
- Our environmental worldviews play a key role in determining whether we live unsustainably or more sustainably

Experts Have Identified Several Causes of Environmental Problems

- Population growth
- Wasteful and unsustainable resource use
- Poverty
- Failure to include the harmful environmental costs of goods and services in market prices
- Increasing isolation from nature

Causes of Environmental Problems

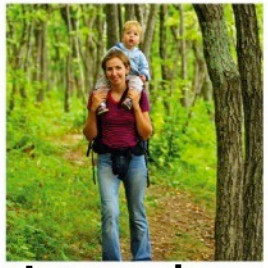
Causes of Environmental Problems

Population growth

Unsustainable resource use

Poverty

Excluding environmental costs from market prices



Increasing isolation from nature

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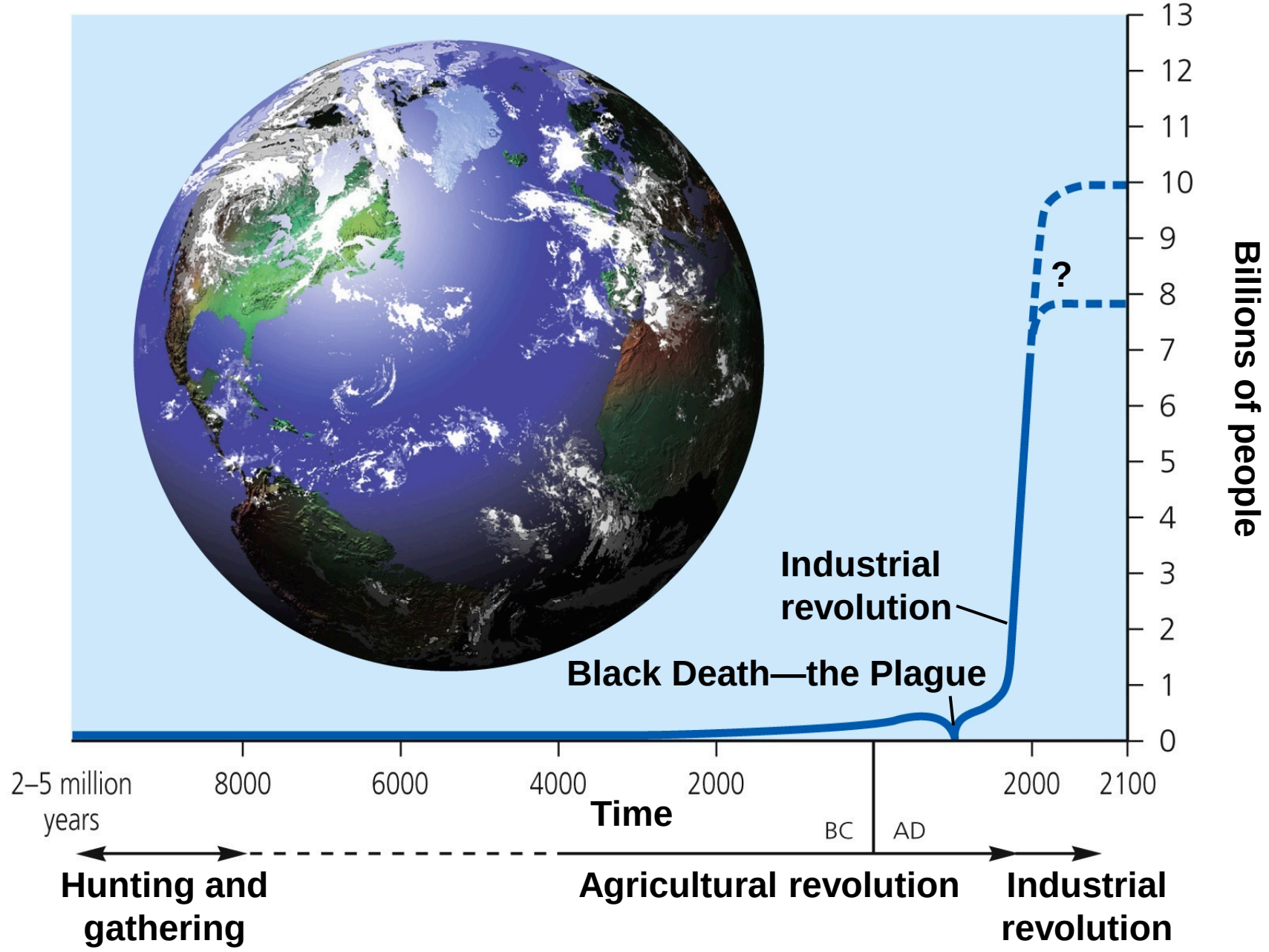
Fig. 1-15, p. 16

The Human Population is Growing at a Rapid Rate

- Exponential growth
  - Population increases at a fixed percentage per unit time
- No one knows how many people the earth can support indefinitely

Exponential Growth of Human Population



(Compiled by the authors using data from the World Bank, United Nations, and Population Reference Bureau.)

Fig. 1-16, p. 17

Affluence Has Harmful and Beneficial Environmental Effects

- Harmful environmental impact due to:
  - High levels of consumption
  - High levels of pollution
  - Unnecessary waste of resources
- Affluence can provide funding for developing technologies to reduce:
  - Pollution
  - Environmental degradation
  - Resource waste

Poverty Has Harmful Environmental and Health Effects

- Unable to fulfill basic needs
  - Adequate food, water, shelter, health care, and education
- Working to survive

Prices of Goods and Services Do Not Include the Harmful Environmental Costs

- Companies do not pay the environmental cost of resource use
- Goods and services do not include the harmful environmental costs
- Companies receive tax breaks and subsidies

We are Increasingly Isolated from Nature

- Increasing populations in urban areas
- Nature deficit disorder
  - Not having enough contact with nature

People Have Different Views on Environmental Problems/Solutions

- Environmental ethics: What is right and wrong with how we treat the environment?
  - Planetary management worldview
    - We are separate from and in charge of nature
  - Stewardship worldview
    - Manage earth for our benefit with ethical responsibility to be stewards
  - Environmental wisdom worldview
    - We are part of nature and must engage in sustainable use

1-4: What Is an Environmentally Sustainable Society?

- Living sustainably
  - Live off the earth's natural income without depleting or degrading the natural capital that supplies it

Environmentally Sustainable Societies

- Environmentally sustainable society
  - Meets current needs in a just and equitable manner without compromising future generations' ability to meet their needs
- Natural income
  - Renewable resources

A More Sustainable Future is Possible

- Overall attitude that combines environmental wisdom with compassion for all life
- Social scientists suggest it only takes 5-10% of the population to bring about major social change
- Significant social change can occur more quickly than we often think

Three Big Ideas

- A more sustainable future will require that we:
  - Rely more on energy from the sun and other renewable energy sources
  - Protect biodiversity through the preservation of natural capital
  - Avoid disrupting the earth's vitally important chemical cycles

Three Big Ideas (cont'd.)

- A major goal for becoming more sustainable is full-cost pricing—the inclusion of harmful environmental and health costs in the market prices of goods and services

Three Big Ideas (cont'd.)

- We will benefit ourselves and future generations if we commit ourselves to:
  - Finding win-win-win solutions to our problems
  - Leaving the planet's life-support system in at least as good a shape as what we now enjoy

Tying It All Together

- The key to environmental solutions
  - Apply the principles of sustainability to the design of our economic and social systems, and individual lifestyles
- The 21st century's transition generation will decide the path which humanity takes