ENVIRONMENTAL SCIENCE 13e

CHAPTER 17: Environmental Economics, Politics, and Worldviews

Core Case Study: Chattanooga, Tennessee

- 1960s: dirtiest air in the U.S. and polluted river
- *Vision 2000*
  - Encouraged zero-emission industries
  - Replaced diesel buses
  - Recycling
  - Improved low-income housing
  - Riverfront park
  - Aquarium

Fig. 17-1, p. 424

17-1 How Are Economic Systems Related to the Biosphere?

- ***Concept 17-1*** *Ecological economists regard human economic systems as subsystems of the biosphere.*

Resources Supporting Economic Systems (1)

- **Economics**
  - Production, distribution, and consumption of goods and services to satisfy wants and needs
  - Market-based systems interact through sellers and buyers
  - Supply and demand determines prices

Resources Supporting Economic Systems (2)

- **Natural capital**
- **Human capital/human resources**
- **Manufactured capital/manufactured resources**

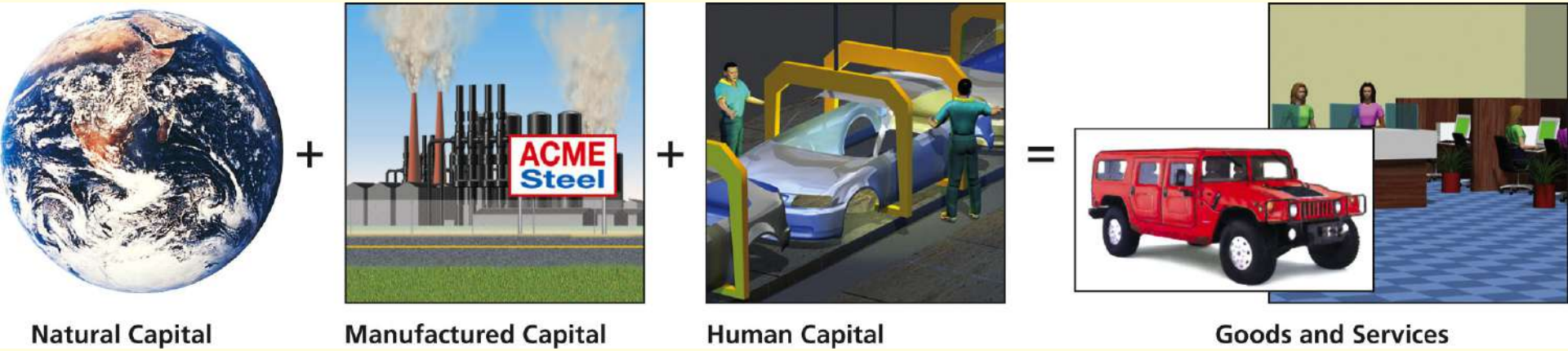

ACME
Steel
Natural Capital
Manufactured Capital
Human Capital
Goods and Services

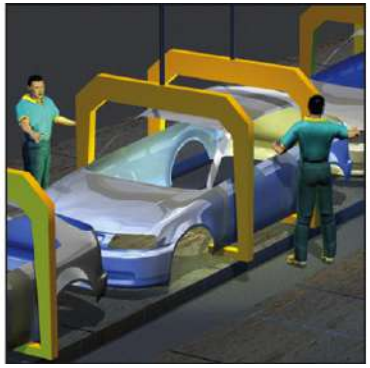
Fig. 17-2, p. 426

Natural Capital

+

Manufactured Capital

+



Human Capital

=

Goods and Services

Fig. 17-2, p. 426

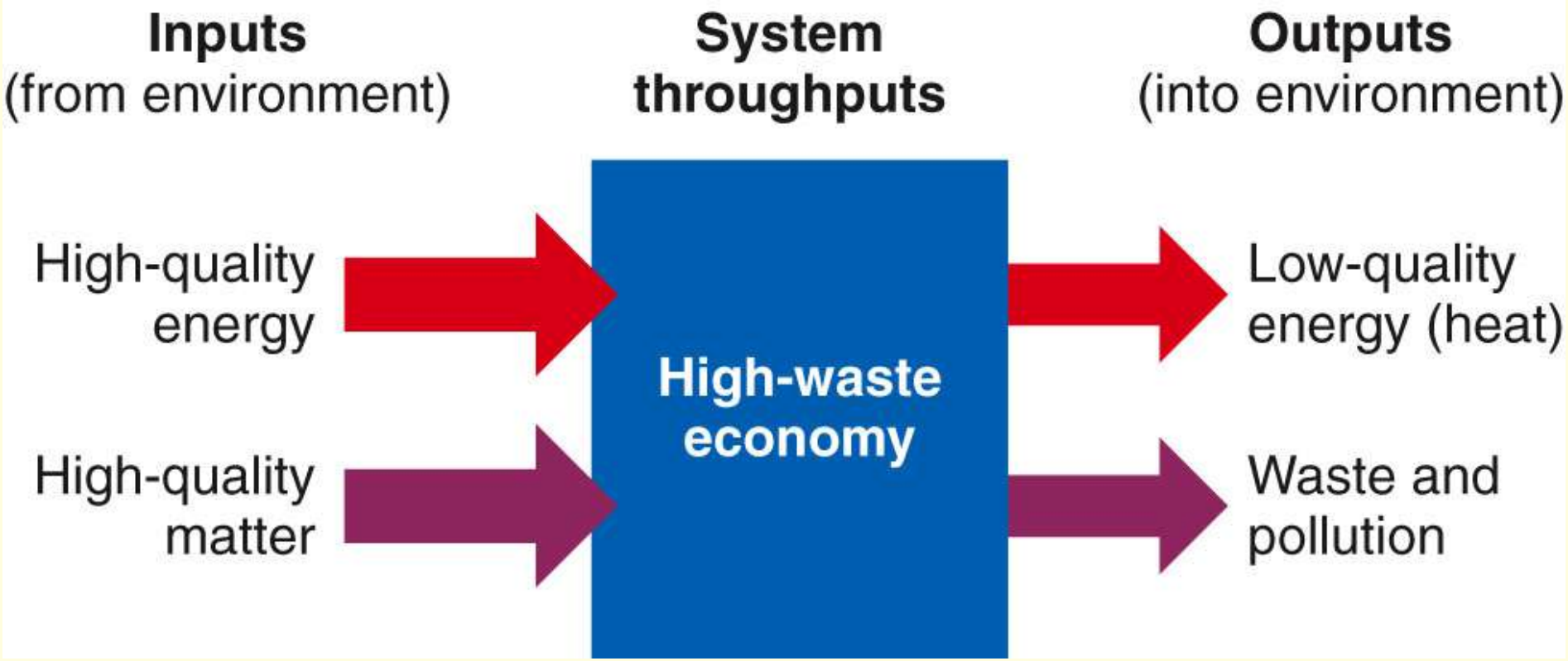

Inputs
(from environment)
System
throughputs
Outputs
(into environment)
High-quality
energy
High-quality
matter
High-waste
economy
Low-quality
energy (heat)
Waste and
pollution

Fig. 17-3, p. 426

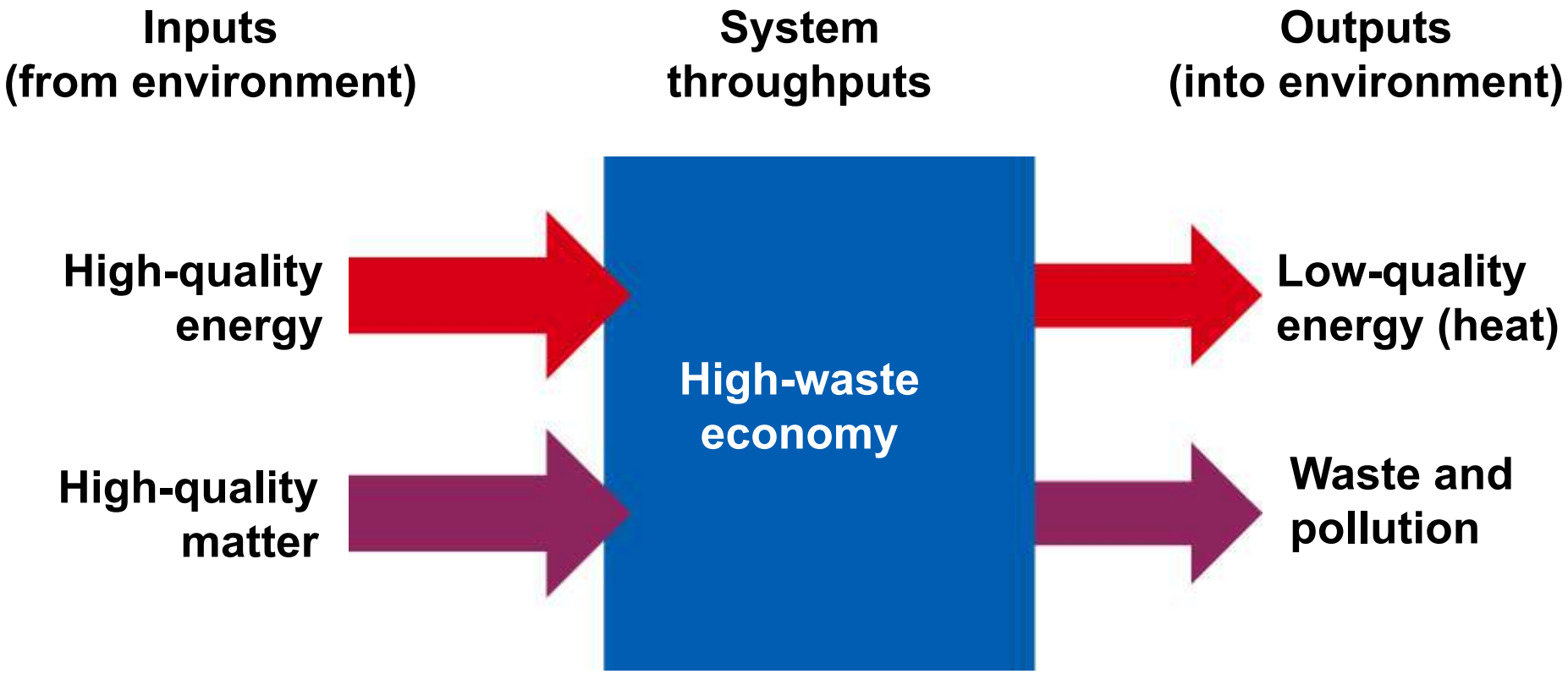

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Fig. 17-3, p. 426

Economic Importance of Natural Resources

- Neoclassical economists
- Ecological economists
- Environmental economics takes middle ground
  - Some forms of economic growth discouraged
  - Environmentally sustainable economy – eco-economy

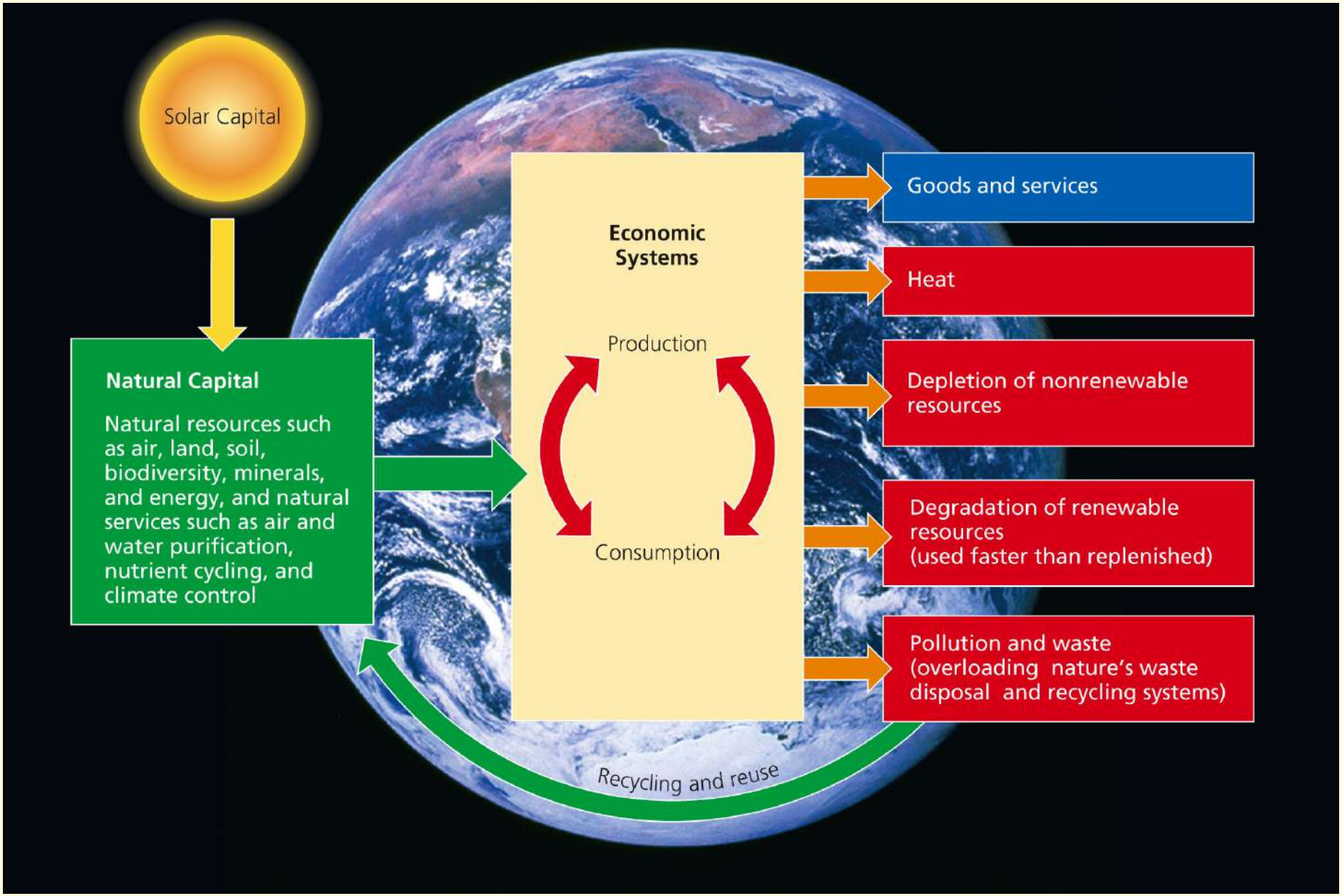
Solar Capital
Natural Capital
Natural resources such as air, land, soil, biodiversity, minerals, and energy, and natural services such as air and water purification, nutrient cycling, and climate control
Economic Systems
Production
Consumption
Goods and services
Heat
Depletion of nonrenewable resources
Degradation of renewable resources (used faster than replenished)
Pollution and waste (overloading nature's waste disposal and recycling systems)
Recycling and reuse

Fig. 17-4, p. 427

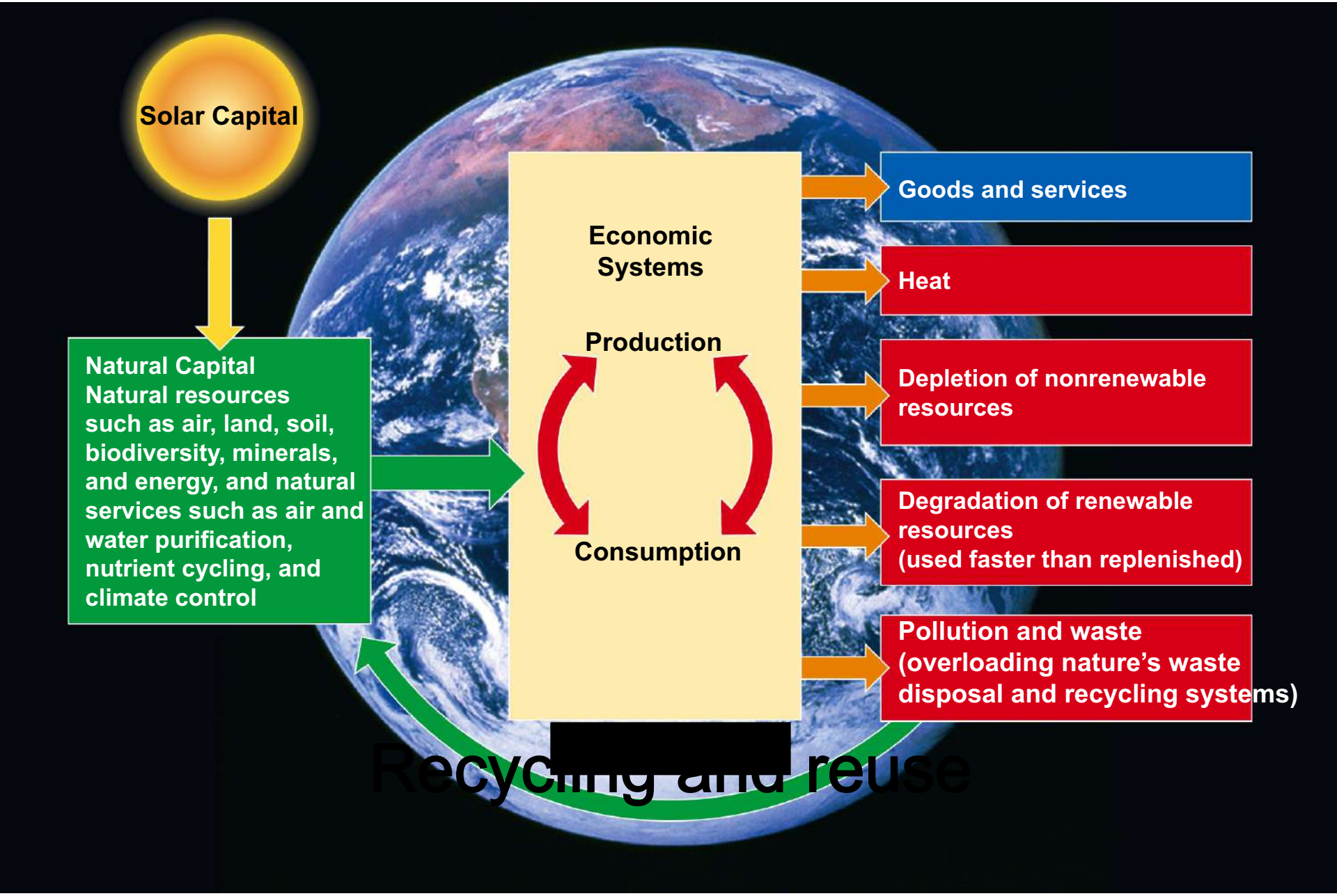
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Fig. 17-4, p. 427

17-2 How Can We Use Economic Tools to Deal with Environmental Problems?

- ***Concept 17-2*** *We can use resources more sustainably by including their harmful environmental and health costs in the market prices of goods and services (full-cost pricing), subsidizing environmentally beneficial goods and services, taxing pollution and waste instead of wages and profits, and reducing poverty.*

External Costs (1)

- Market price leaves out environmental and health costs associated with its production = external costs (hidden costs)
- Goods and services exclude external costs

External Costs (2)

- Excluding external costs
  - Hinders development of green goods and services
  - Promotes pollution
  - Fosters waste and environmental degradation

Use of Environmental Economic Indicators

- **Gross domestic product (GDP)** does not measure environmental degradation
- Green indicators
- **Genuine progress indicator (GPI)** monitors environmental well-being

Genuine Progress Indicator

Genuine progress indicator		GDP		Benefits not included in market transactions		Harmful environmental & social costs
	=		+		-	

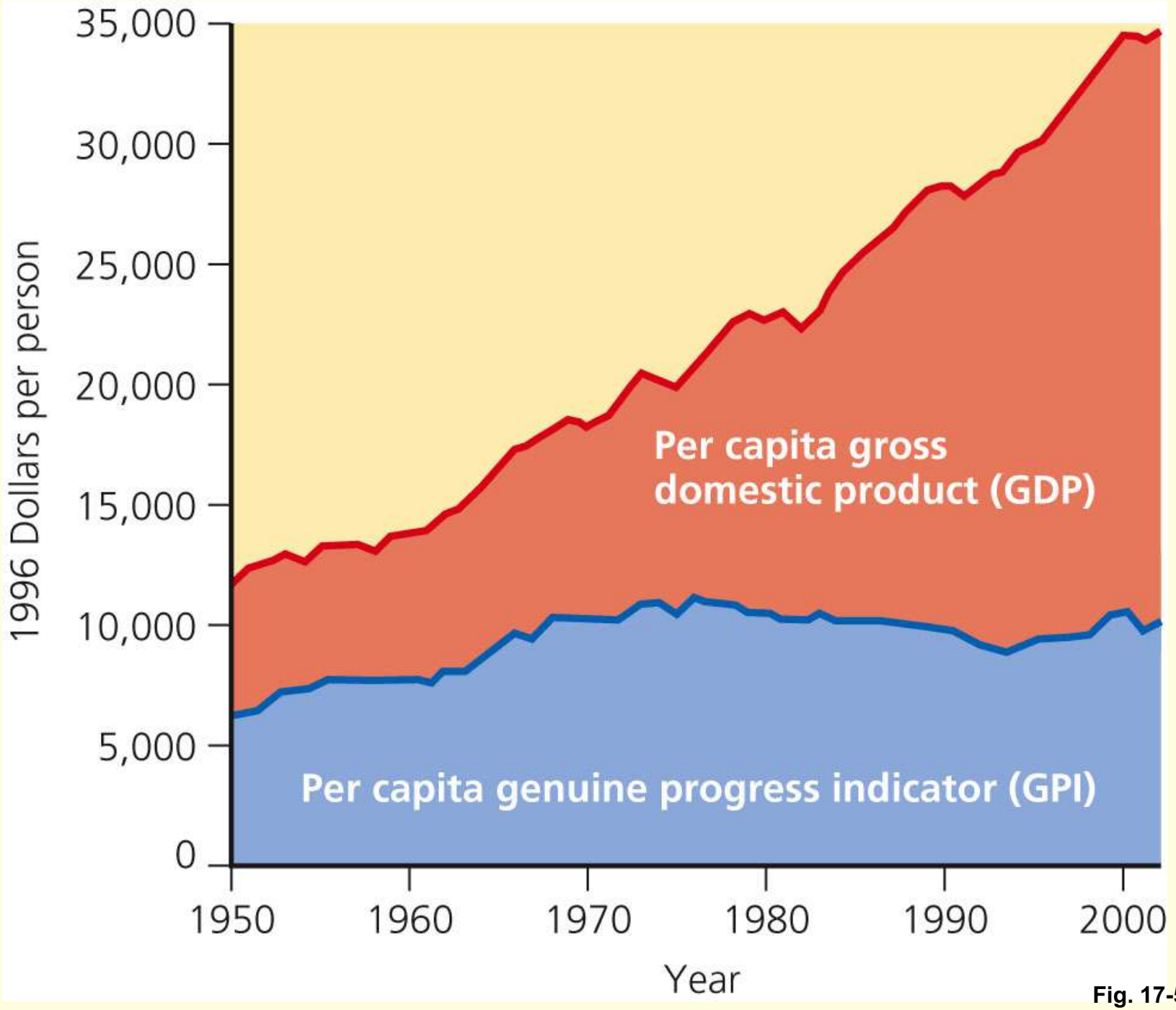
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
1996 Dollars per person
Per capita gross domestic product (GDP)
Per capita genuine progress indicator (GPI)
1950
1960
1970
1980
1990
2000
Year

Fig. 17-5, p. 428

Include Harmful Environmental Costs in Prices of Goods and Services

- Environmentally honest market system
- Not widely used
  - Wasteful and harmful producers would go out of business
  - Difficult to estimate environmental costs
  - Most consumers do not connect environmental costs with purchases
- Government action needed

Reward Environmentally Sustainable Businesses

- Encourage shifts
  - Phase out harmful subsidies and tax breaks
  - Phase in environmentally beneficial subsidies
- Harmful subsidies cost $2 trillion per year globally

Trade-Offs

Environmental Taxes and Fees

Advantages

Help bring about full-cost pricing

Encourage businesses to develop environmentally beneficial technologies and goods to save money

Easily administered by existing tax agencies

Fairly easy to detect cheaters

Disadvantages

Low-income groups are penalized unless safety nets are provided

Hard to determine optimal level for taxes and fees

Governments may use money as general revenue instead of improving environmental quality and reducing taxes on income, payroll, and profits

Fig. 17-6, p. 430

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Fig. 17-6, p. 430

Tax Pollution and Waste

- Green taxes discourage pollution and waste
- Current tax system
  - Discourages jobs and profit-driven innovation
  - Encourages pollution, resource waste, degradation
- Tax shift towards green taxes needed

Encouraging Innovations

- Regulation
- Laws – command and control
- Incentive-based regulations
- European experience positive for innovation-friendly regulations

Use of the Marketplace

- Incentive-based model
- Government caps on total pollution levels
  - Tradable pollution
  - Resource-use permits
- Shown to reduce pollution

Trade-Offs

Tradable Environmental Permits

Advantages

Flexible

Easy to administer

Encourage pollution prevention and waste reduction

Permit prices determined by market transactions

Confront ethical problem of how much pollution or resource waste is acceptable

Disadvantages

Big polluters and resource wasters can buy their way out

May not reduce pollution at dirtiest plants

Can exclude small companies from buying permits

Caps can be too high and not regularly reduced to promote progress

Self-monitoring of emissions can promote cheating

Fig. 17-7, p. 431

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Fig. 17-7, p. 431

Selling Services Instead of Things

- Shift from material-flow economy to service-flow economy
- Make more money by eco-leasing
- Eco-leasing examples
  - Xerox
  - Carrier

Individuals Matter: Ray Anderson

- Inspired by Hawken's *The Ecology of Commerce*
- His Interface tile company
  - Reduced solid waste 75%
  - Reduced gas emission 82%
  - Lowered energy consumption 27%
  - Electricity from renewable sources 88%
  - Saved $393 million

Reducing Poverty Helps the Environment

- **Poverty** – harmful health and environmental effects
- Reducing poverty benefits individuals, economies, and the environment

Actions to Reduce Poverty

- Combat malnutrition
- Combat infectious diseases
- Provide primary school education
- Stabilize population growth
- Reduce national ecological footprints
- Invest in small-scale infrastructure
- Encourage small loans to poor people

Individuals Matter: Muhammad Yunus and Microloans

- Poor lack credit record and assets for loans
- Microcredit
- Grameen Bank, Bangladesh
  - Repayment rate of 95%
  - Inspired other microloan projects

Millennium Development Goals

- Reduce poverty, hunger, and improve health care
- Developed countries agreed to devote 0.7% of national income
- Average has only been 0.28%

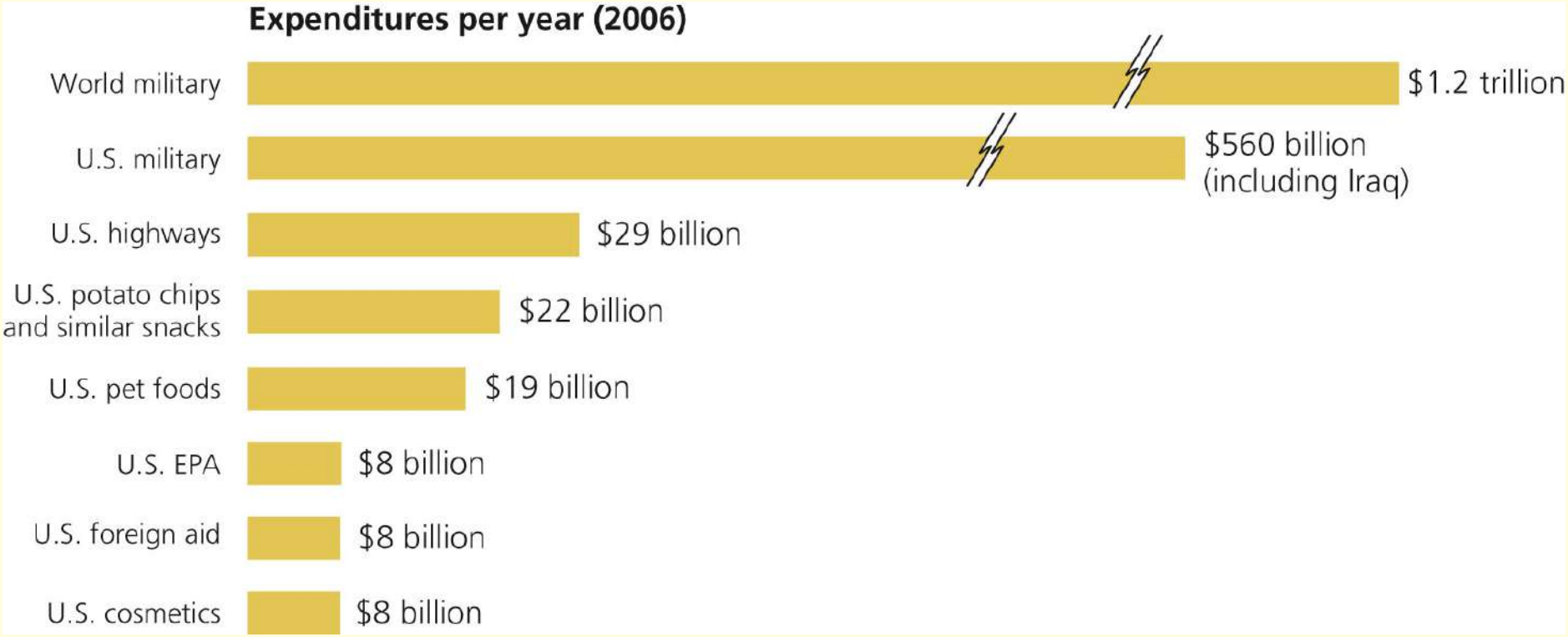
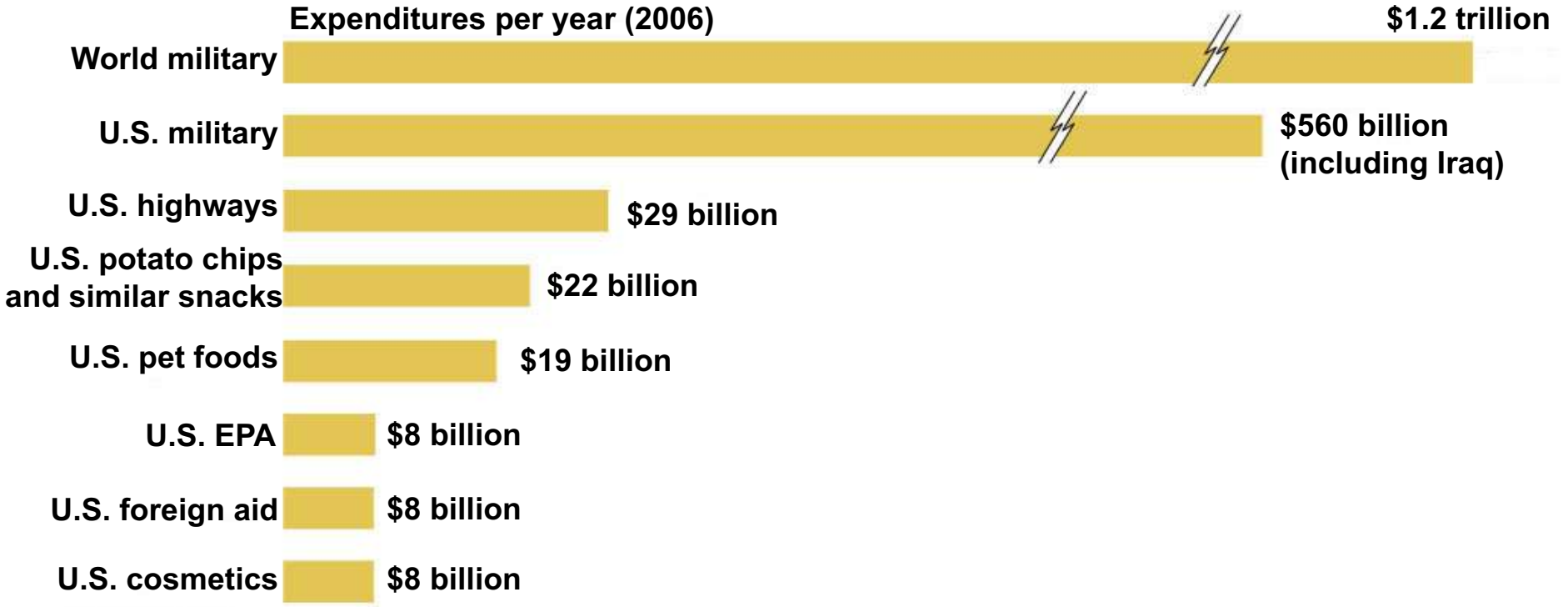

Expenditures per year (2006)
World military
$1.2 trillion
U.S. military
$560 billion
(including Iraq)
U.S. highways
$29 billion
U.S. potato chips
and similar snacks
$22 billion
U.S. pet foods
$19 billion
U.S. EPA
$8 billion
U.S. foreign aid
$8 billion
U.S. cosmetics
$8 billion

Fig. 17-8, p. 433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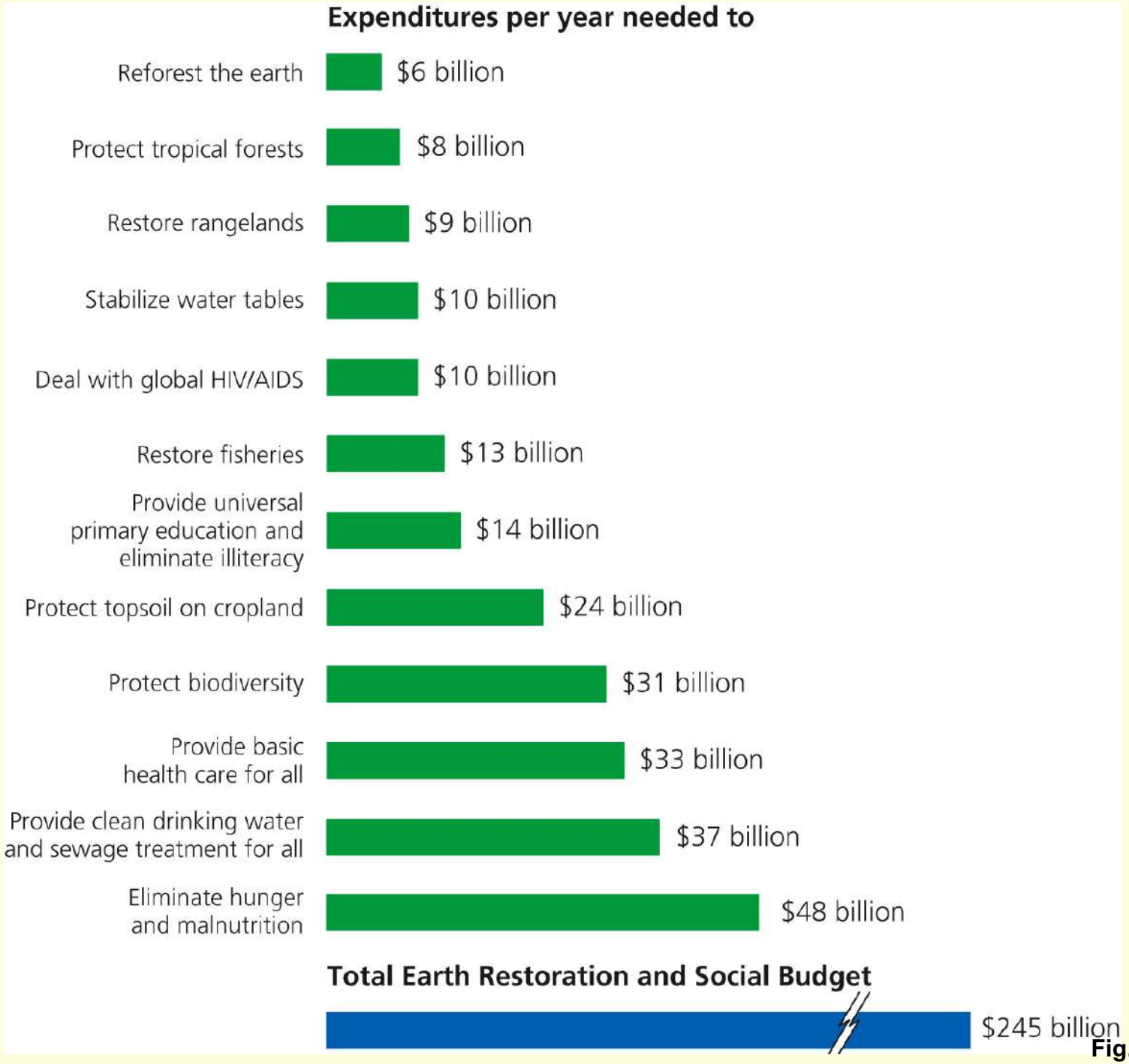
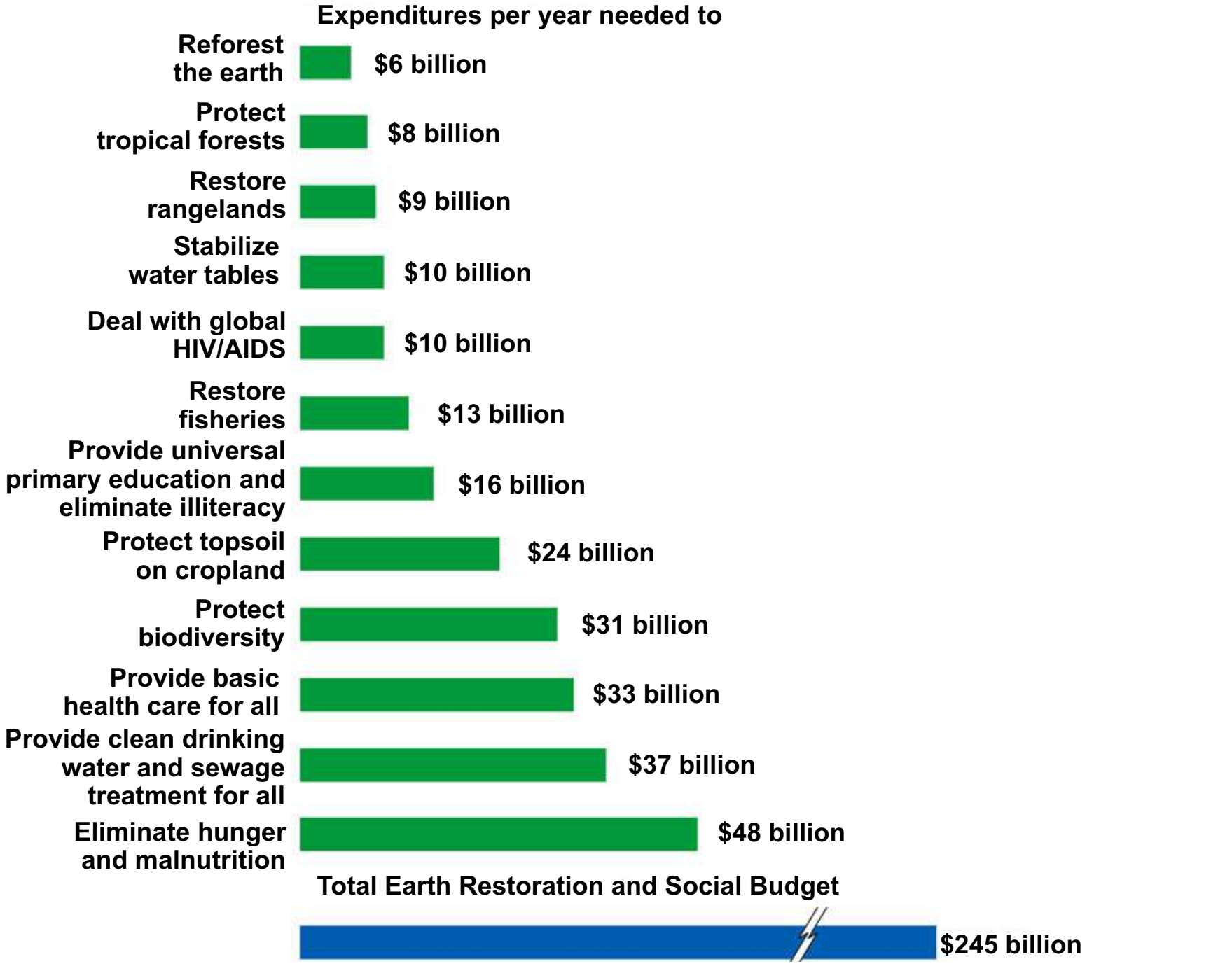

Expenditures per year needed to
Reforest the earth
$6 billion
Protect tropical forests
$8 billion
Restore rangelands
$9 billion
Stabilize water tables
$10 billion
Deal with global HIV/AIDS
$10 billion
Restore fisheries
$13 billion
Provide universal primary education and eliminate illiteracy
$14 billion
Protect topsoil on cropland
$24 billion
Protect biodiversity
$31 billion
Provide basic health care for all
$33 billion
Provide clean drinking water and sewage treatment for all
$37 billion
Eliminate hunger and malnutrition
$48 billion
Total Earth Restoration and Social Budget
$245 billion

Fig. 17-8, p. 433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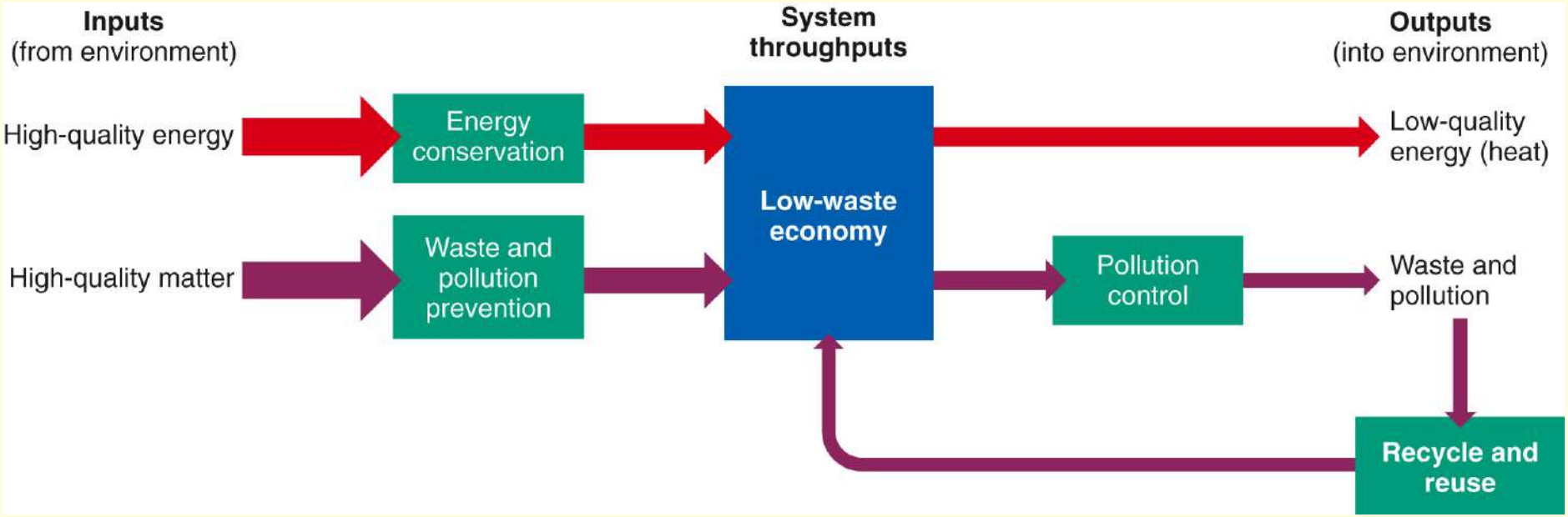
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System
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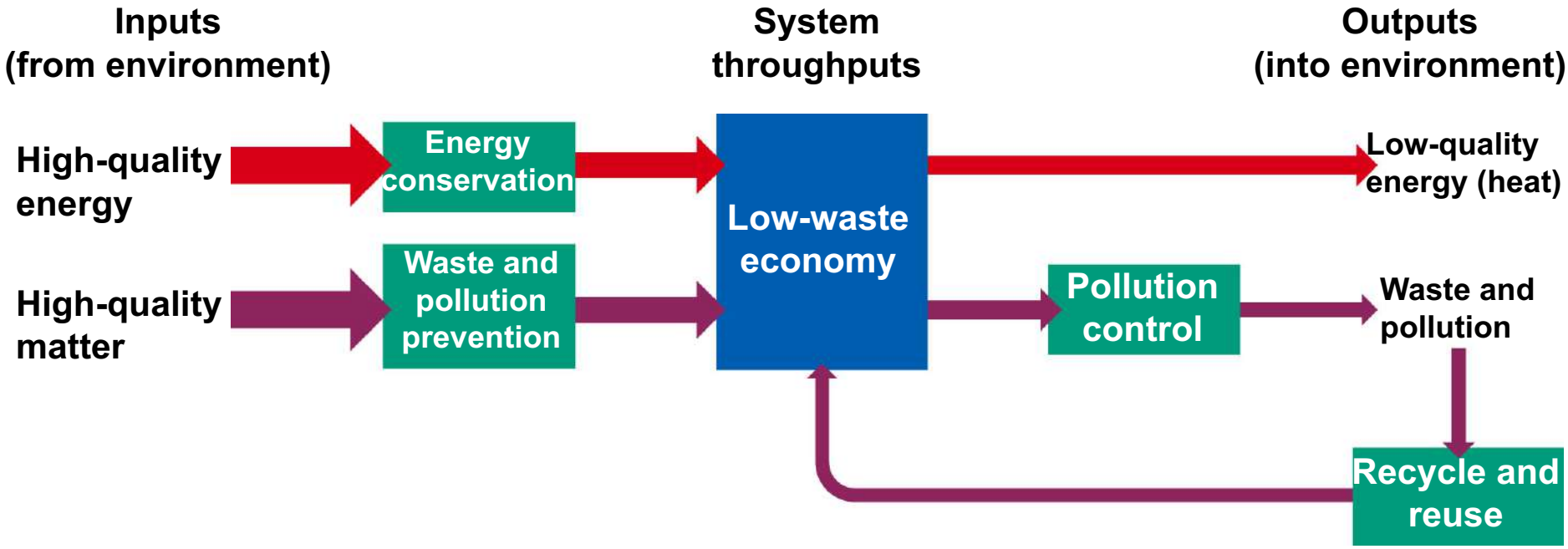
High-quality energy
Energy
conservation
Low-waste
economy
Low-quality
energy (heat)
High-quality matter
Waste and
pollution
prevention
Pollution
control
Waste and
pollution
Recycle and
reuse

Fig. 17-9, p. 434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economy
Low-quality
energy (heat)
Pollution
control
Waste and
pollution
Recycle and
reuse

Fig. 17-9, p. 434

Economics

Reward (subsidize) environmentally sustainable economic development

Penalize (tax and do not subsidize) environmentally harmful economic growth

Shift taxes from wages and profits to pollution and waste

Use full-cost pricing

Sell more services instead of more things

Do not deplete or degrade natural capital

Live off income from natural capital

Reduce poverty

Use environmental indicators to measure progress

Certify sustainable practices and products

Use eco-labels on products

Resource Use and Pollution

Cut resource use and waste by reducing, reusing, and recycling

Improve energy efficiency

Rely more on renewable solar, wind and geothermal energy

Shift from a nonrenewable carbon-based (fossil fuel) economy to a non-carbon renewable energy economy

Ecology and Population

Mimic nature

Preserve biodiversity

Repair ecological damage

Stabilize human population

Environmentally Sustainable Economy (Eco-Economy)

Fig. 17-10, p. 435

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Environmentally Sustainable Economy (Eco-Economy)

Stepped Art

Fig. 17-10, p. 435

Environmentally Sustainable Businesses and Careers

Aquaculture

Biodiversity protection

Biofuels

Climate change research

Conservation biology

Eco-industrial design

Ecotourism management

Energy efficient product design

Environmental chemistry

Environmental (green) design

Environmental economics

Environmental education

Environmental engineering

Environmental health

Environmental law

Environmental nanotechnology

Fuel cell technology

Geographic information systems (GIS)

Geothermal geologist

Hydrogen energy

Marine science

Pollution prevention

Reconciliation ecology

Selling services in place of products

Solar cell technology

Sustainable agriculture

Sustainable forestry

Waste reduction

Watershed hydrologist

Water conservation

Wind energy

Fig. 17-11, p. 436

17-3 How Can We Implement More Sustainable and Just Environmental Policies?

- ***Concept 17-3*** *Individuals can work together to become part of political processes that influence how environmental policies are made and implemented. (Individuals matter)*

Democracies

- **Policies**
- **Politics**
- **Democracy**
- Political institutions
  - Legislative
  - Executive
  - Judicial
  - Federal, state and local governments

Democratic Government and Environmental Problems

- Complex problems – biodiversity, climate change
- Long-term problems need integrated solutions
- Lack of environmental knowledge of political leaders

Principles for Environmental Policies (1)

- Humility principle
- Reversibility principle
- Net energy principle
- Precautionary principle

Principles for Environmental Policies (2)

- Prevention principle
- Polluter-pays principle
- Public access and participation principle
- Environmental justice principle

Case Study: Managing Public Lands in the United States (1)

- Federal government manages 35% of the country's land
- National Forest System – U.S. Forest Service
- Bureau of Land Management
- National Wildlife Refuges – U.S. Fish and Wildlife Service

Case Study: Managing Public Lands in the United States (2)

- The National Park System
- National Wilderness Preservation System
- Contain valuable natural resources
- Use of lands controversial
  - Conservation biologists/environmental economists
  - Developers/resource extractors

Four Principles of Public Land Use

1. Protect biodiversity, wildlife habitat, and ecosystems
2. No subsidies or tax breaks to extract natural resources
3. Fair compensation for use of property
4. Users of resource extractions responsible for environmental damage

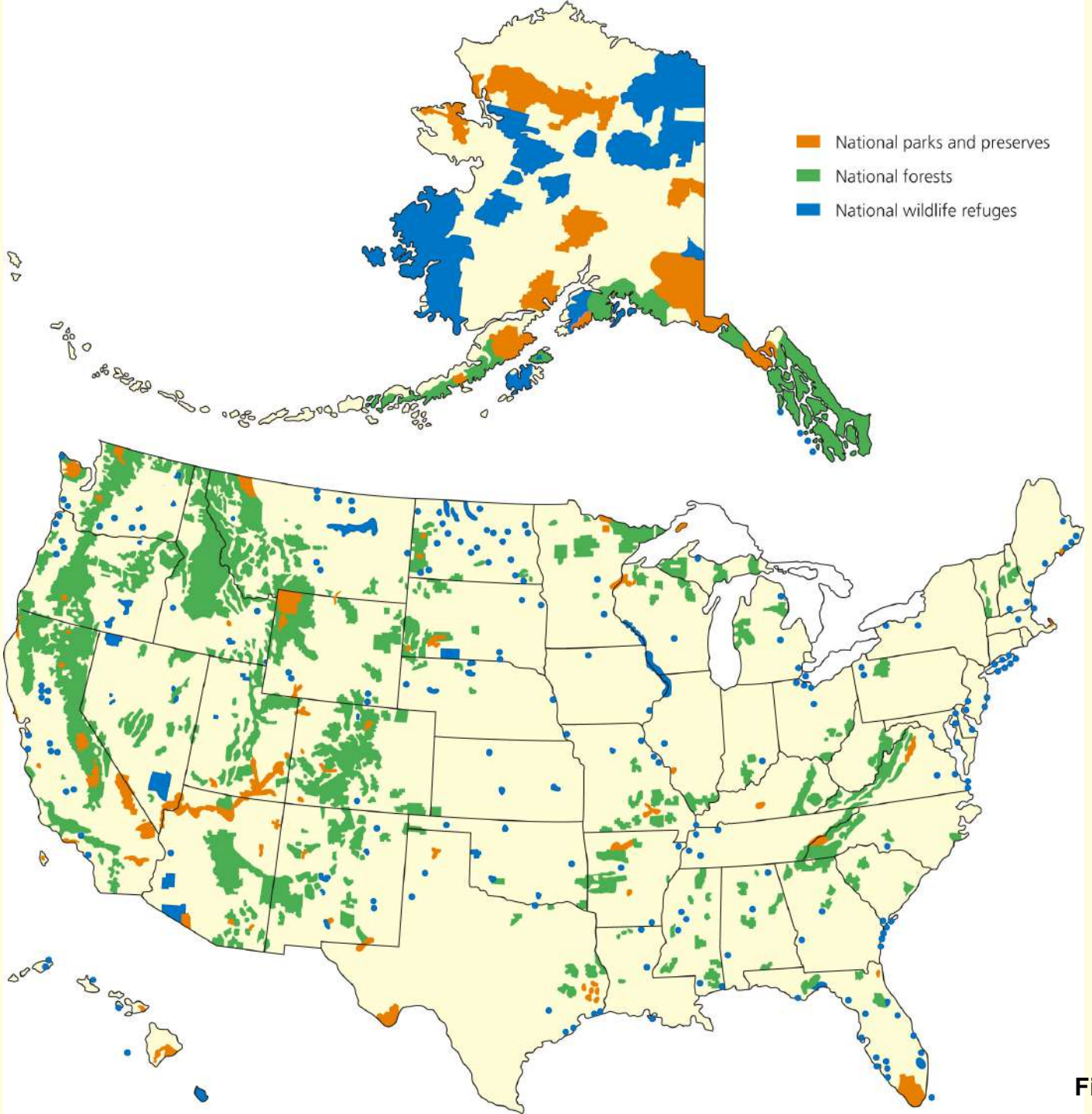


Fig. 17-12, p. 438

Individuals Matter

- People create change together – grassroots
- Politics local at a fundamental level
- Be an environmental leader
  - Lead by example
  - Work within existing systems
  - Run for local office
  - Propose and work for better solutions

What Can You Do?

Influencing Environmental Policy

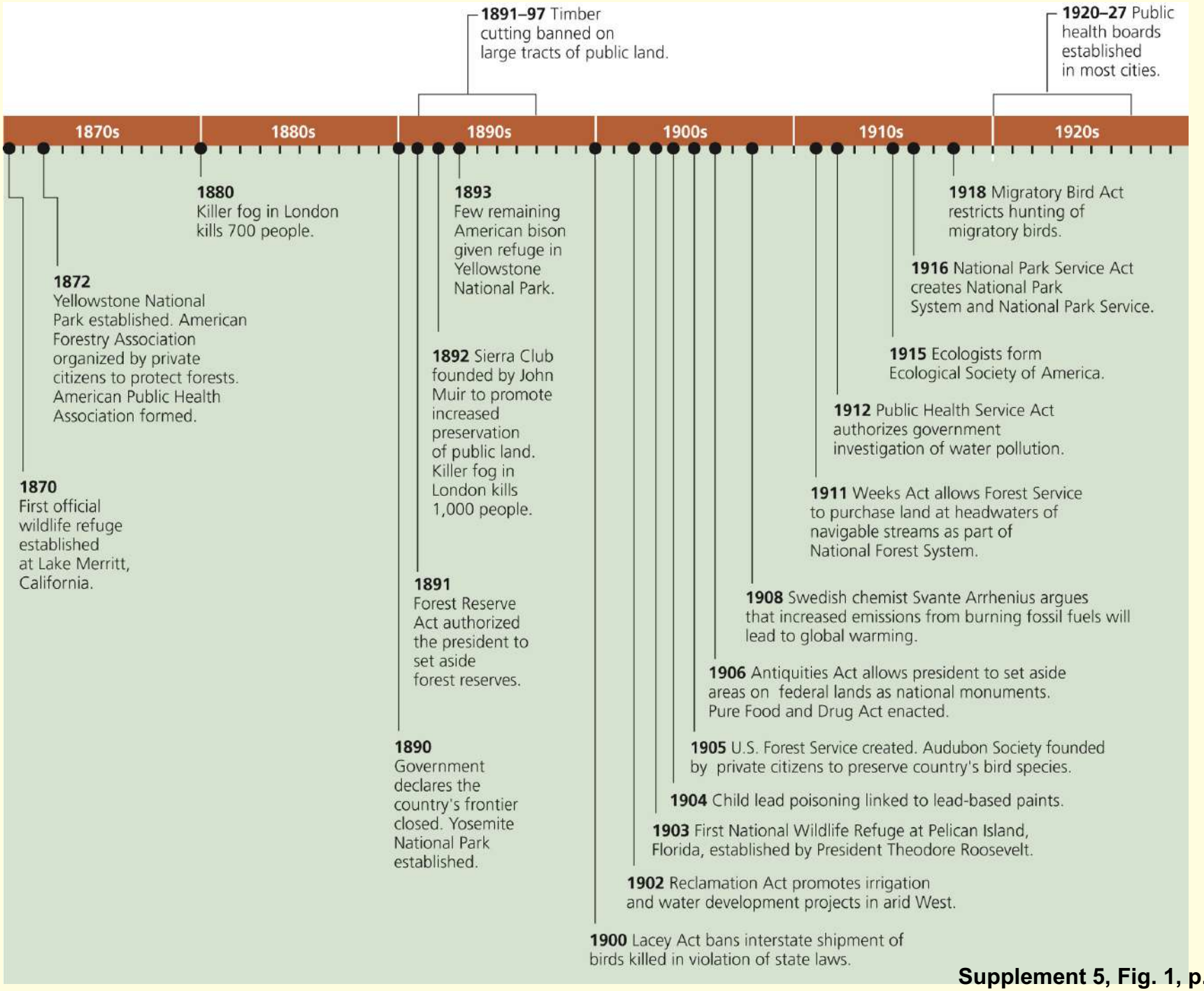
- Become informed on issues
- Make your views known at public hearings
- Make your views known to elected representatives, and understand their positions on environmental issues
- Contribute money and time to candidates for office
- Vote
- Run for office (especially at local level)
- Form or join nongovernment organizations (NGOs) seeking change
- Support reform of election campaign financing that reduces undue influence by corporations and wealthy individuals

Fig. 17-13, p. 439

United States Environmental Laws Under Attack

- Opposition
  - Corporate leaders
  - Individuals who feel threatened by environmental laws
  - State and local government officials resent implementation of federal laws
- Most federal environmental laws and regulatory agencies weakened since 2000

Fig. 17-14, p. 440



Supplement 5, Fig. 1, p. S21

Nongovernmental Organizations (NGOs)

- Range from grassroots to global organizations
- Bottom-up changes
- Citizen-based global sustainability movement
- Tactics

Individuals Matter: “Butterfly”

- Julia Hill
- 2 years in a giant redwood tree in California
- Nonviolent civil disobedience
- Lumber company preserved her tree and 200-foot circle around it

Students and Educational Institutions Can Play Important Environmental Roles

- Student environmental awareness increasing
- Environmental audits – change on campuses
- Oberlin College in Ohio

Importance of Environmental Security

- As important as military and economic security
- Depletion of natural capital leads to instability

Stronger International Environmental Policies (1)

- United Nations
  - U.N. Environmental Programme
  - World Health Organization
  - U.N. Development Programme
  - Food and Agriculture Organization
- World Bank
- Global Environmental Facility
- World Conservation Union

Stronger International Environmental Policies (2)

- International Organizations
  - Expand understanding of environmental issues
  - Gather and evaluate environmental data
  - Develop and monitor international treaties
  - Provide grants and loans to reduce poverty
  - Helped >100 nations develop environmental laws and institutions

17-4 What Are Some Major Environmental Worldviews?

- ***Concept 17-4*** *Major environmental worldviews differ over what is more important – human needs and wants, or the overall health of ecosystems and the biosphere; different worldviews include varying mixes of both priorities.*

Planetary Management Worldview

- Humans apart from nature
- Manage nature to meet our needs and wants
- Technology will keep us from running out of resources
- Economic growth potential essentially unlimited
- Manage earth and life for our benefit

Stewardship Worldview

- Ethical responsibility to be stewards
- Probably won't run out of resources, but don't waste them
- Encourage environmentally beneficial economic growth
- Success depends on managing earth's systems for our benefit and the rest of nature

Environmental Wisdom Worldview

- We are part of nature
- Nature exists for all species
- Resources are limited and shouldn't be wasted
- Encourage earth-sustaining economic growth
- Success depends on learning about nature and integrating ourselves into nature

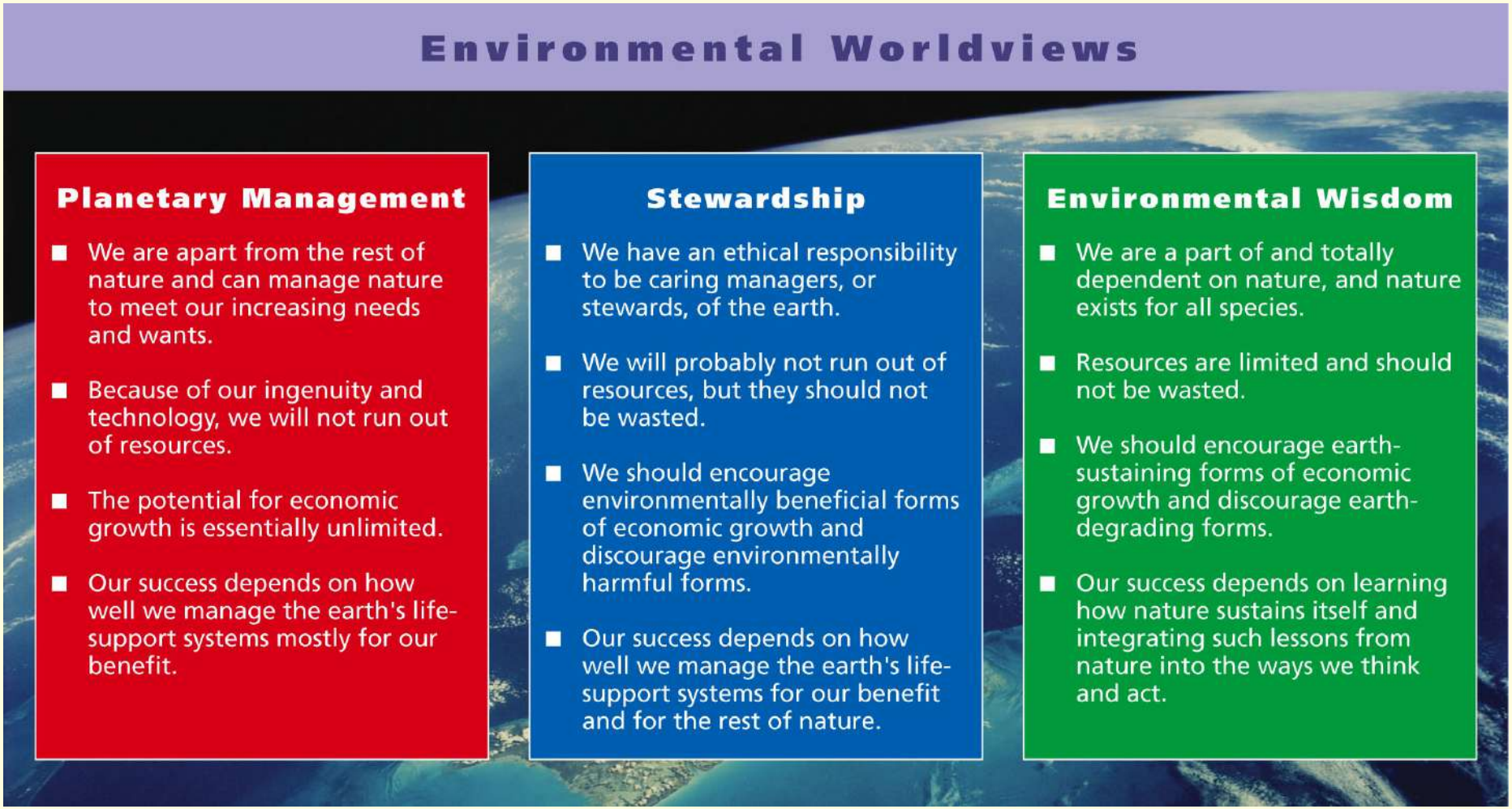
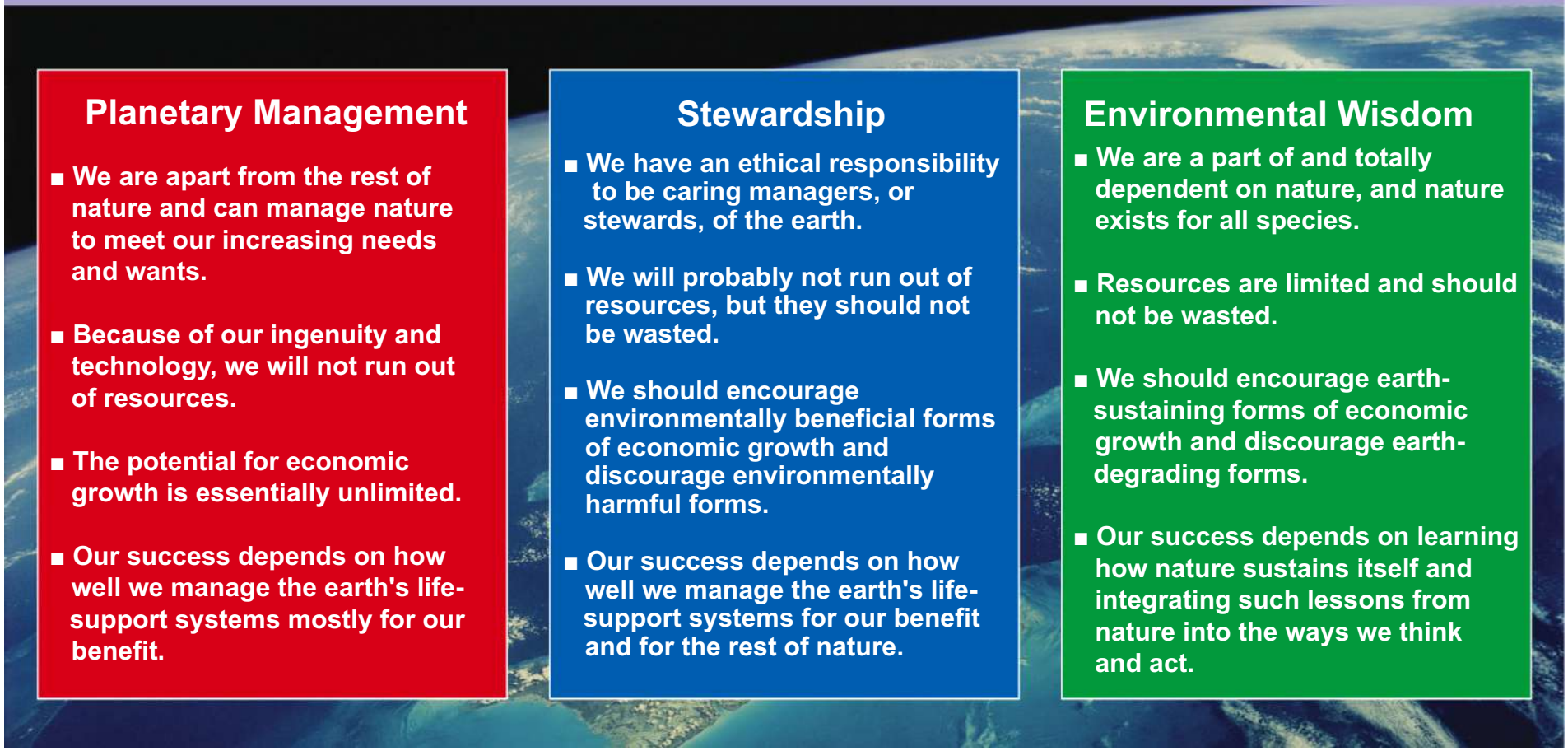


Fig. 17-15, p. 444

Environmental Worldviews



Planetary Management

- We are apart from the rest of nature and can manage nature to meet our increasing needs and wants.
- Because of our ingenuity and technology, we will not run out of resources.
- The potential for economic growth is essentially unlimited.
- Our success depends on how well we manage the earth's life-support systems mostly for our benefit.

Stewardship

- We have an ethical responsibility to be caring managers, or stewards, of the earth.
- We will probably not run out of resources, but they should not be wasted.
- We should encourage environmentally beneficial forms of economic growth and discourage environmentally harmful forms.
- Our success depends on how well we manage the earth's life-support systems for our benefit and for the rest of nature.

Environmental Wisdom

- We are a part of and totally dependent on nature, and nature exists for all species.
- Resources are limited and should not be wasted.
- We should encourage earth-sustaining forms of economic growth and discourage earth-degrading forms.
- Our success depends on learning how nature sustains itself and integrating such lessons from nature into the ways we think and act.

Fig. 17-15, p. 444

Stepped Art

Fig. 17-15, p. 444

Science Focus: Biosphere 2

- Self-sustaining glass and steel enclosure
- Artificial ecosystems and species from various biomes and aquatic systems
- Unexpected problems unraveled life-support system
- Large-scale failure of biosphere's species

17-5 How Can We Live More Sustainably?

- ***Concept 17-5*** *We can live more sustainably by becoming environmentally literate, learning from nature, living more simply and lightly on earth, and becoming active environmental citizens.*

Three Important Ideas

1. Natural capital matters
2. Our ecological footprints are immense and are expanding rapidly
3. Ecological and climate change tipping points are irreversible and should never be crossed

Environmental Literacy (1)

- Understand as much as possible about how earth works and sustains itself
- Use knowledge of earth and sustainability to guide our lives, communities, and societies
- Understand the role of economics in promoting sustainability

Environmental Literacy (2)

- Use critical thinking skills
- Understand and evaluate environmental worldviews

Major Components of Environmental Literacy

- Concepts such as environmental sustainability, natural capital, exponential growth, carrying capacity, risk, and risk analysis
- Three scientific principles of sustainablility
- Environmental history (to help us to keep from repeating past mistakes)
- The two laws of thermodynamics and the law of conservation of matter
- Basic principles of ecology, such as food webs, nutrient cycling, biodiversity, ecological succession, and population dynamics
- Human population dynamics
- Ways to sustain biodiversity
- Sustainable agriculture

Fig. 17-16, p. 446

Major Components of Environmental Literacy

- Sustainable forestry
- Soil conservation
- Sustainable water use
- Nonrenewable mineral resources
- Nonrenewable and renewable energy resources
- Climate change and ozone depletion
- Pollution prevention and waste reduction
- Sustainable cities
- Environmentally sustainable economic and political systems
- Environmental worldviews and ethics

Fig. 17-16, p. 446

We Can Learn from Nature

- Kindle a sense of awe, wonder, mystery, and humility
- Develop a sense of place
- Choose to live more simply and sustainably
- Gandhi's *principle of enoughness*
- Reduce environmental footprint

Solutions

Some Guidelines for Living More Sustainably

- Learn about, respect, and mimic how nature sustains itself
- Do not degrade or deplete the earth's natural capital
- Take no more from nature than what nature can replenish
- Do not waste matter and energy resources
- Protect biodiversity
- Avoid climate-changing activities
- Help maintain the earth's capacity for self-repair
- Repair ecological damage that we have caused
- Leave the world in as good a condition as we found or better
- Cultivate a passion for sustaining all life and let this passion energize your actions

Fig. 17-17, p. 447

Solutions

Some Guidelines for Living More Sustainably

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Fig. 17-17, p. 447

Avoid the Mental Traps

- Gloom-and-doom pessimism
- Blind technological optimism
- Paralysis by analysis
- Faith in simple, easy answers

Fig. 17-18, p. 448

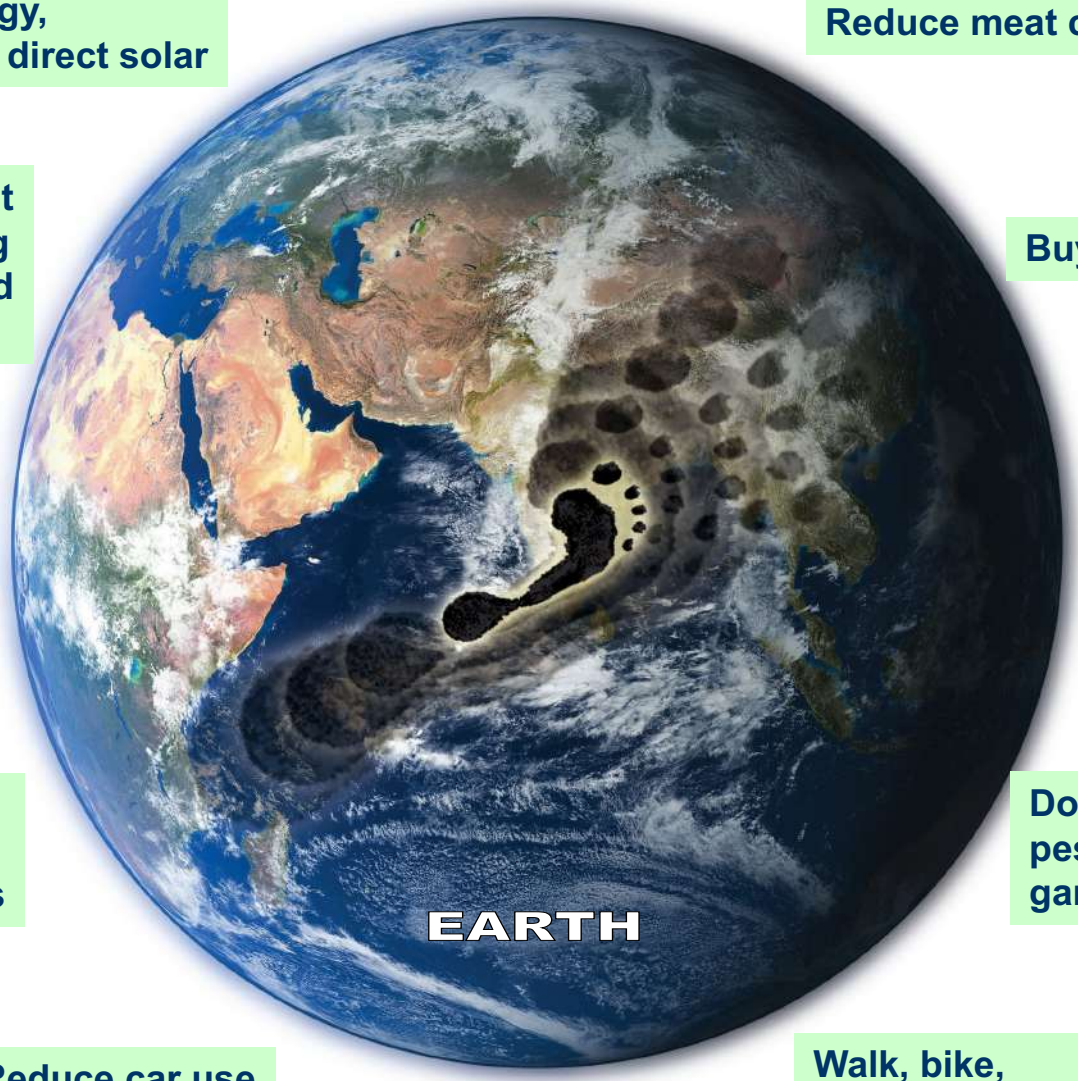


Fig. 17-18, p. 448

Interrelated Components of Sustainability Revolution

- Biodiversity protection
- Commitment to eco-efficiency
- Energy transformation
- Pollution prevention
- Emphasis on sufficiency
- Demographic equilibrium
- Economic, political transformation

Fig. 17-19, p. 449

Fig. 17-19, p. 449

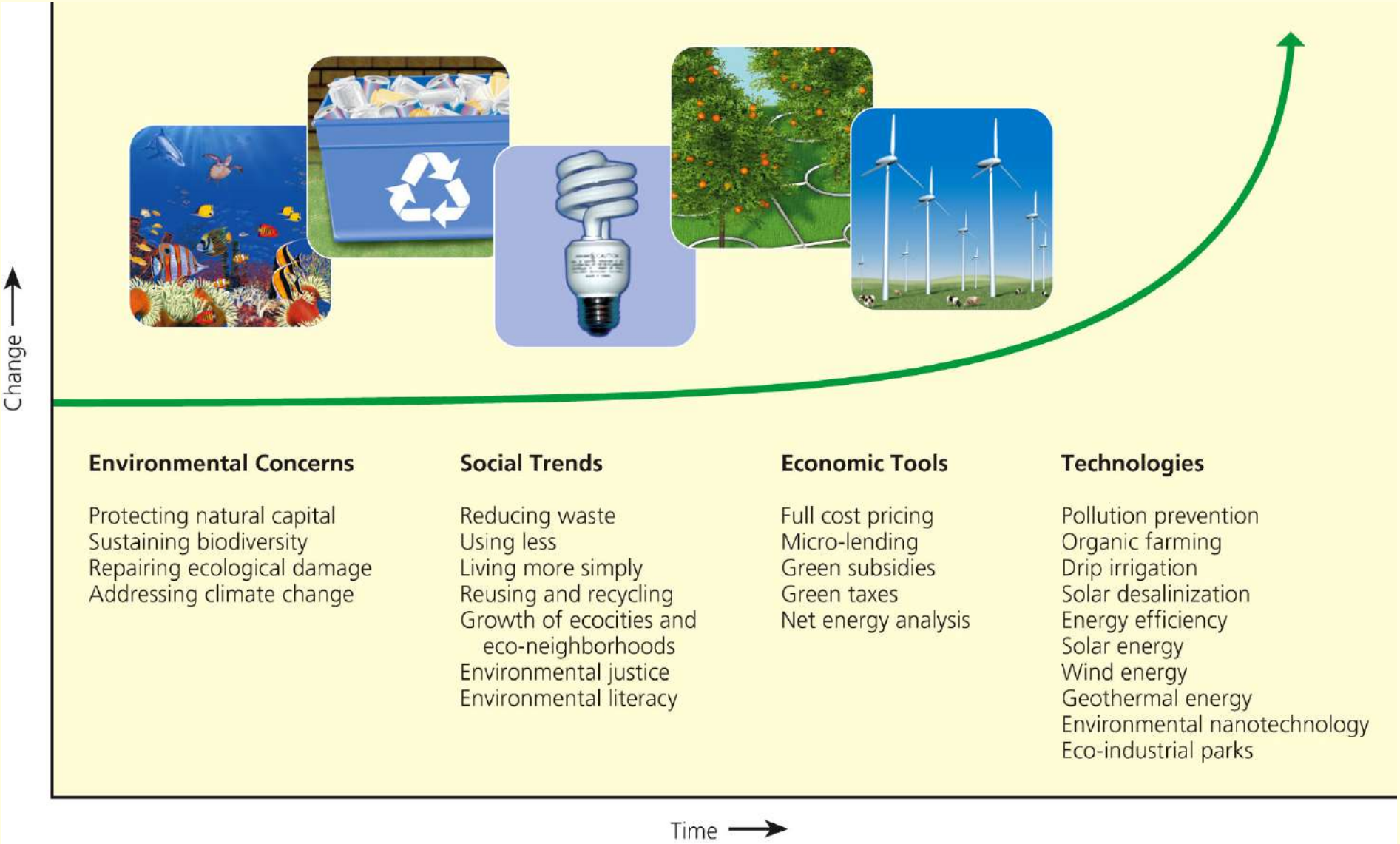


Fig. 17-20, p. 450

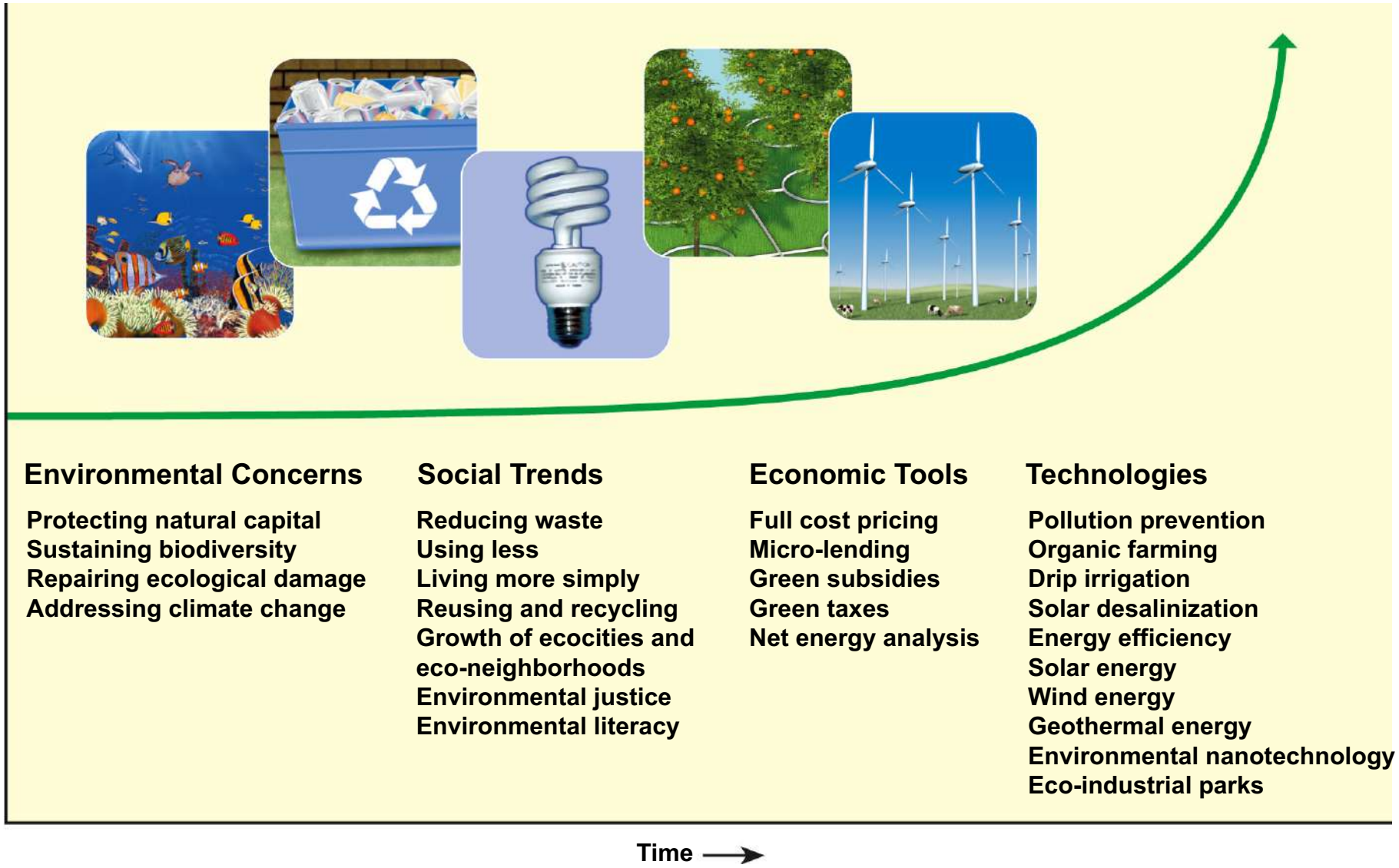


Fig. 17-20, p. 450

Three Big Ideas from This Chapter - #1

A more sustainable economic system would include the harmful environmental and health costs of producing and using goods and services in their market prices, subsidize environmentally beneficial goods and services, tax pollution and waste instead of wages and profits, and reduce poverty.

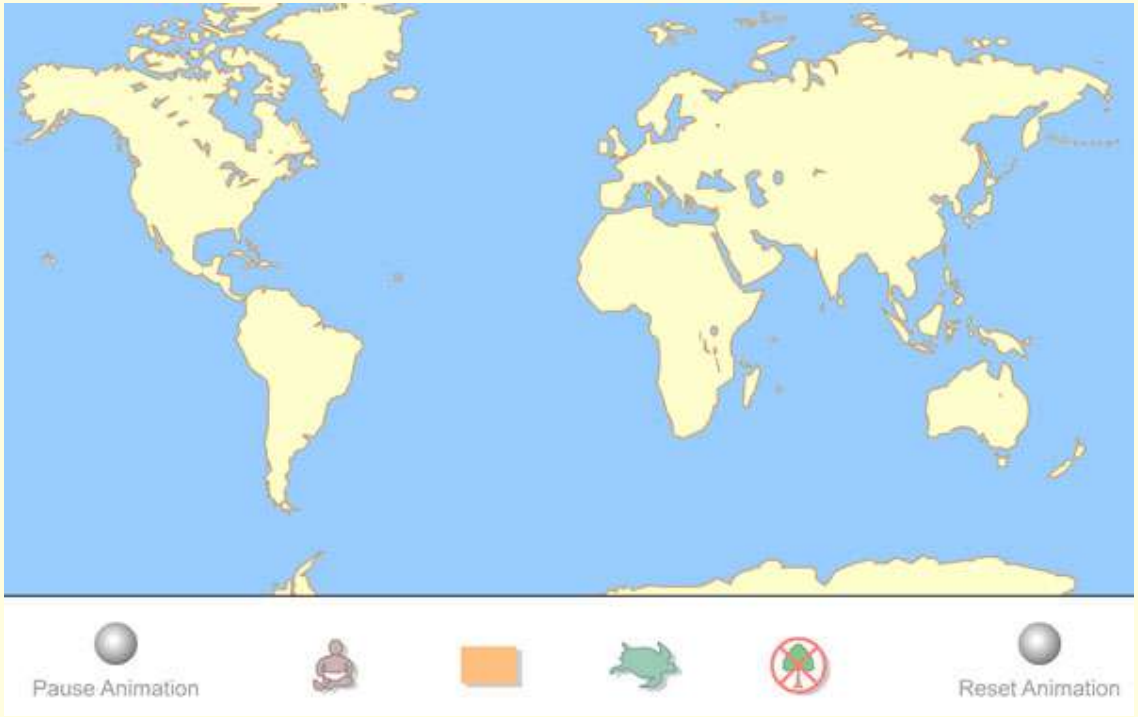
Three Big Ideas from This Chapter - #2

Individuals can work together to become part of the political processes that influence how environmental policies are made and implemented.

Three Big Ideas from This Chapter - #3

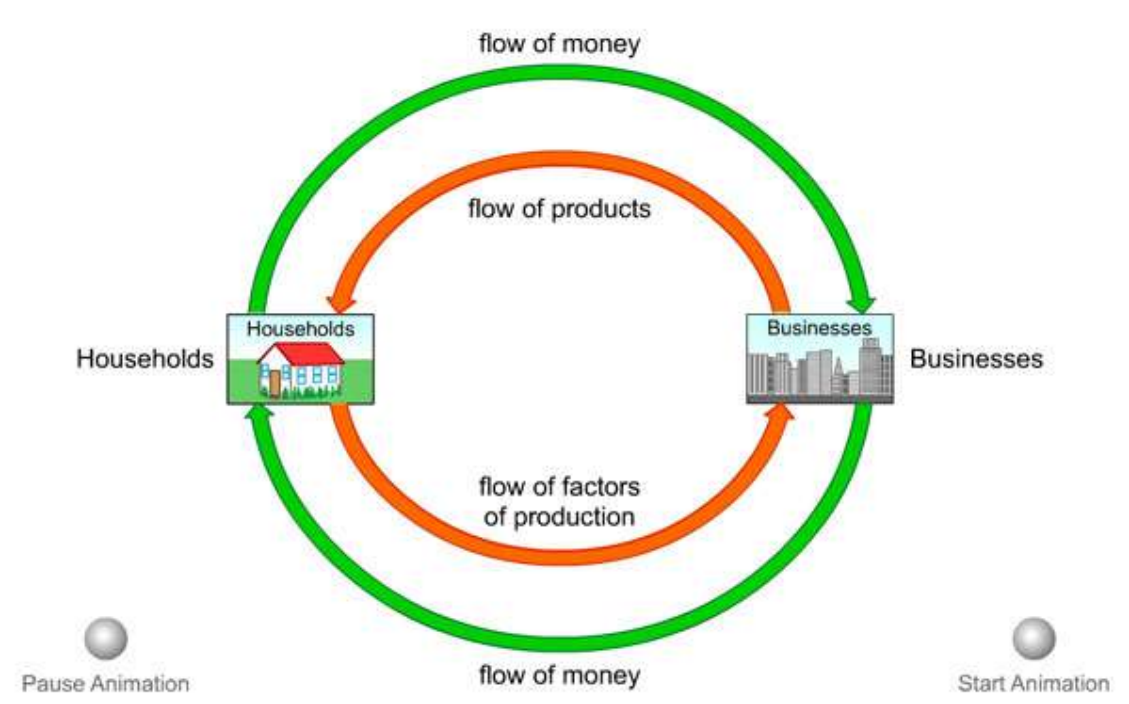
Living more sustainably means becoming environmentally literate, learning from nature, living more simply, and becoming active environmental citizens.

Animation: Resources Depletion and Degradation



PLAY ANIMATION

Animation: Two Views of Economics



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