LIVING IN THE ENVIRONMENT, 18e

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23

Economics, Environment, and Sustainability

Case Study: Germany: Using Economics to Spur a Shift to Renewable Energy

- Phase out dependence on fossil fuels and nuclear energy
  - By 2050
  - 80% of electricity from renewable sources
- Government legislation
- Offshore wind farms

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Fig. 23-1, p. 632

23-1 How Are Economic Systems Related to the Biosphere?

- Ecological economists and most sustainability experts regard human economic systems as subsystems of the biosphere

Economic Systems Vary, But All Depend on Natural Capital

- Economics
  - Goods and services
- Economic system
  - Social institution
- Free-market system
  - Supply and demand

Economic Systems Vary, But All Depend on Natural Capital (cont'd.)

- Natural capital
  - Resources provided by the earth's natural processes
- Human capital
  - People's physical and mental talents
- Manufactured capital
  - Tools and materials

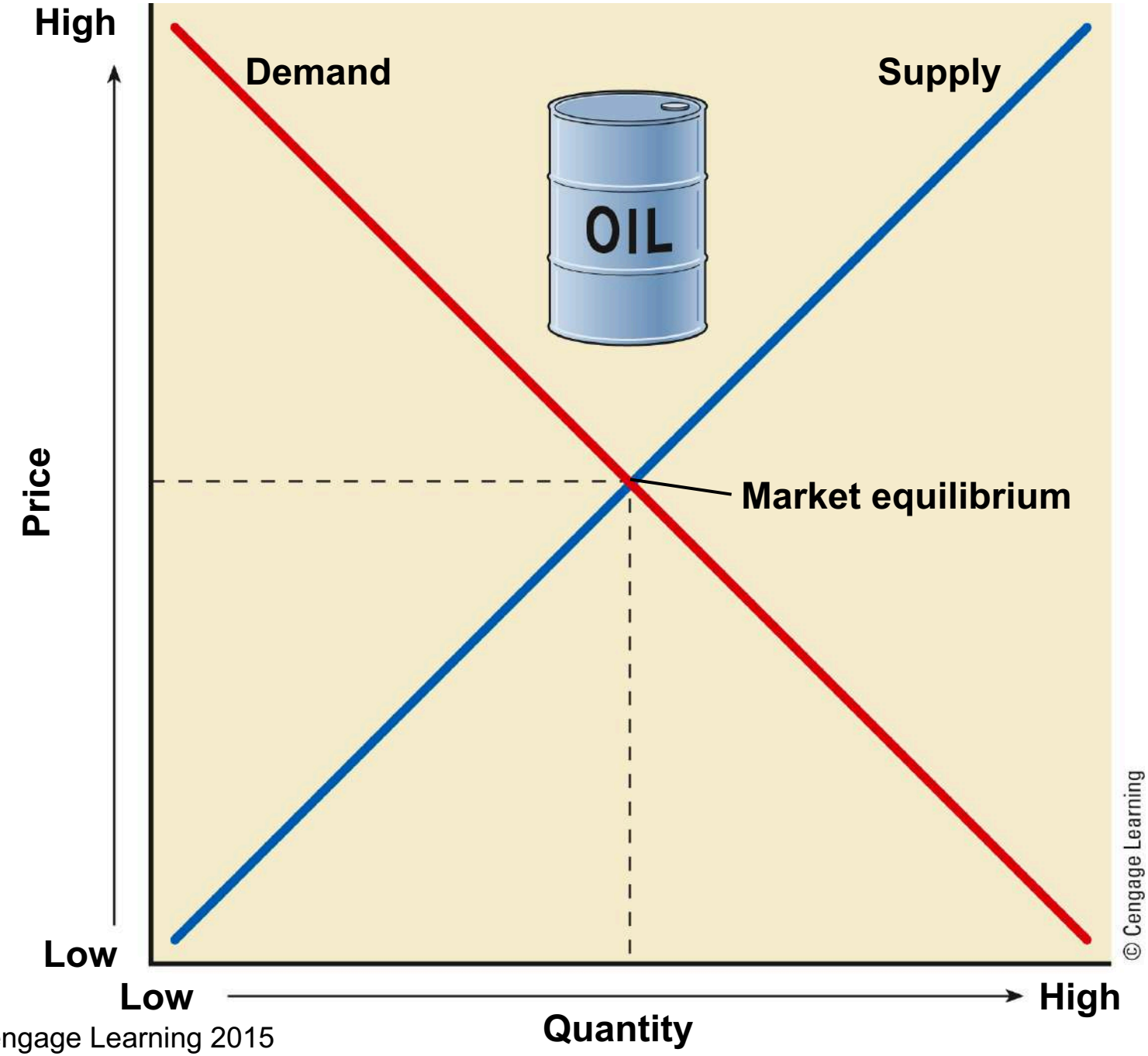


Fig. 23-2, p. 633

Governments Intervene to Help Correct Market Failures

- Market failures
  - Provide public services
  - Inability to prevent degradation of open-access resources
- No monetary value assigned to natural capital

Economists Disagree

- Economic growth
  - Increased capacity to supply goods and services
  - Requires increased production and consumption
  - Requires more consumers
- High-throughput economy

Economists Disagree (cont'd.)

- Economic development
  - Improvement of living standards
- Environmentally sustainable economic development
  - Environmentally beneficial

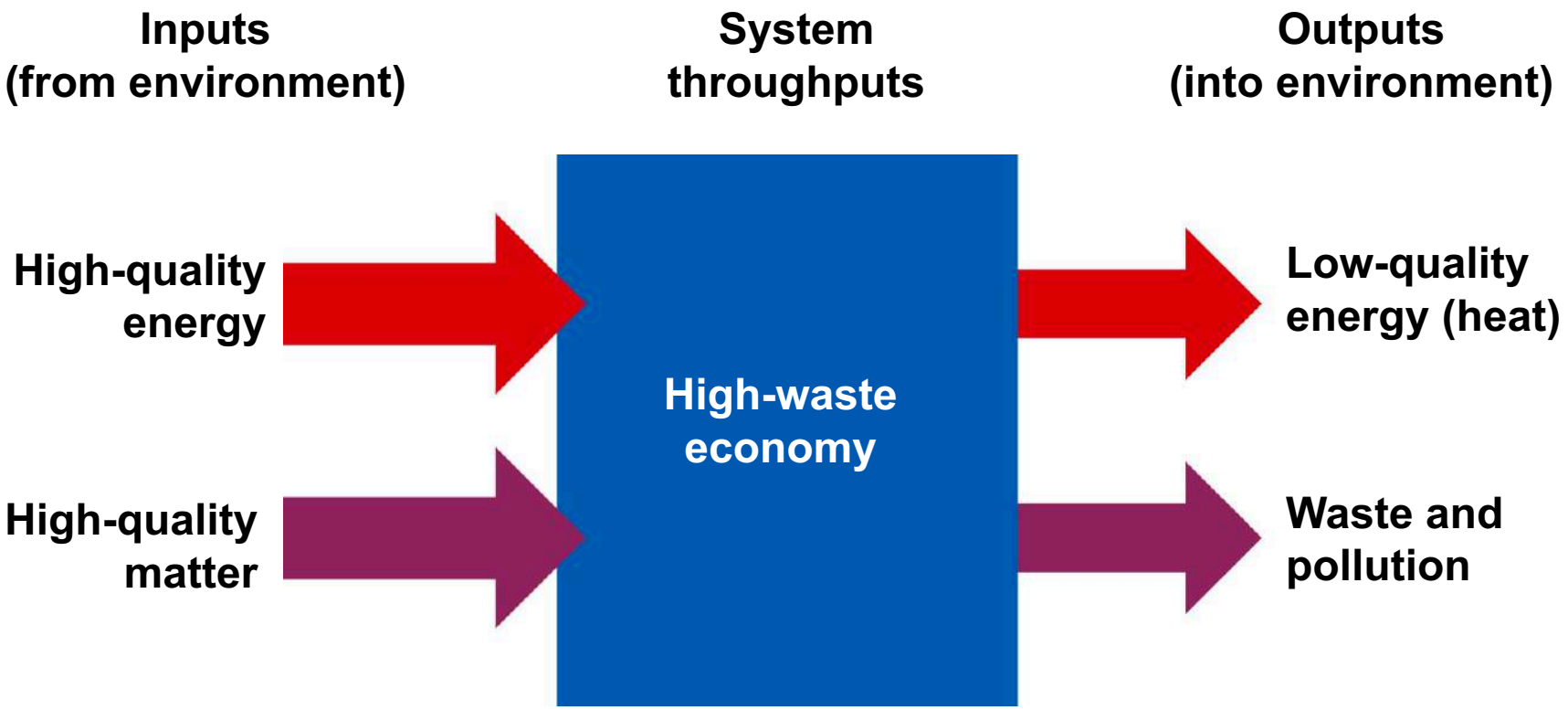


Fig. 23-4, p. 634

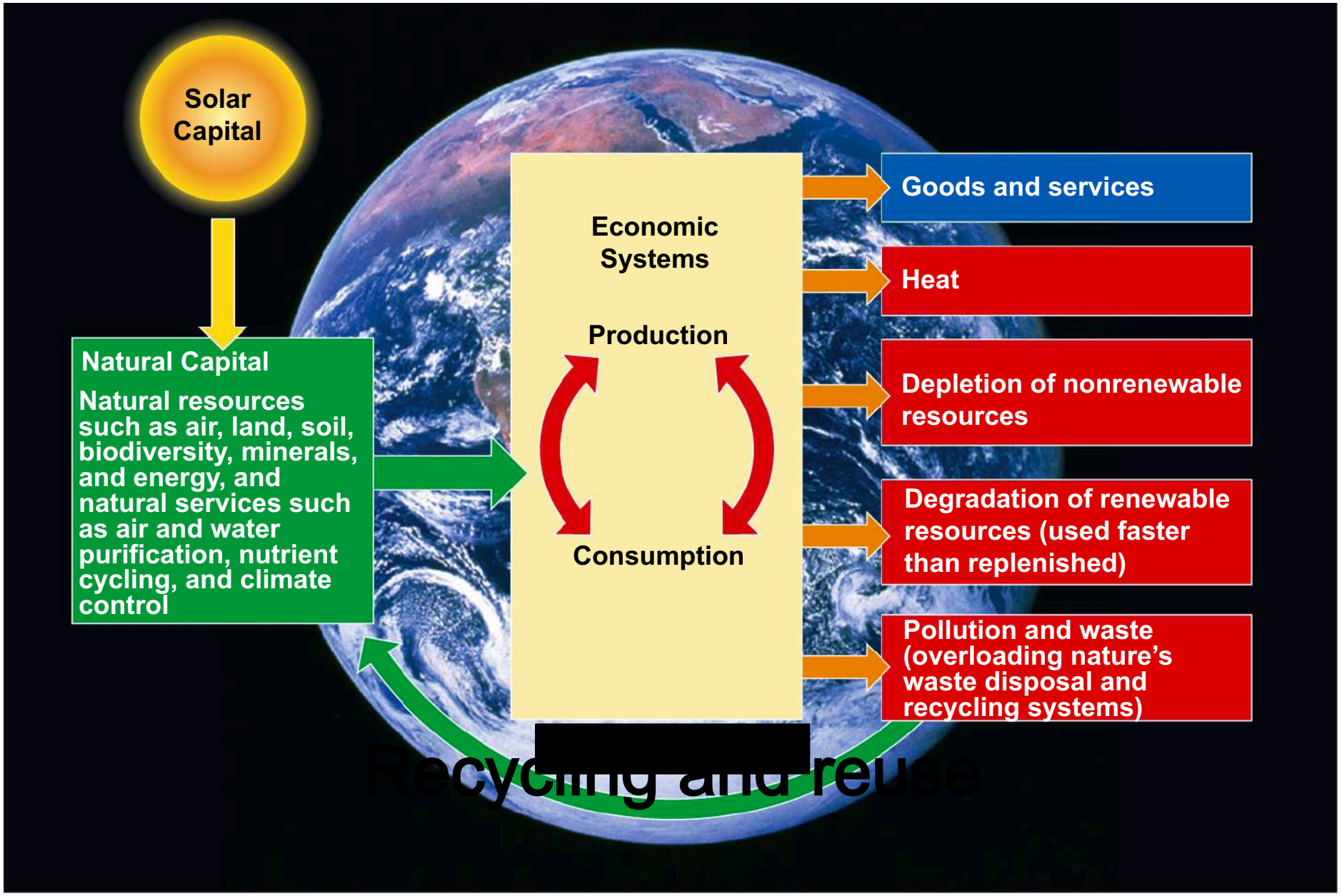


Fig. 23-5, p. 635

Economists Disagree (cont'd.)

- Neoclassical economists
  - View the earth's natural capital as part of a human economic system
- Ecological economists
  - View human economic systems as subsystems of the biosphere
  - Believe that conventional economic growth will become unsustainable
- Environmental economists: middle ground

23-2 How Can We Estimate Natural Capital, Pollution Control, Resource Use?

- Economists have developed several ways to estimate:
  - Present and future values of a resource or ecosystem service
  - Optimum levels of pollution control and resource use
- Comparing the likely costs and benefits of an environmental action is useful, but it involves many uncertainties

23.2 Estimating the Values of Earth's natural Capital

- Robert Castanza
- Value of pollution
- Ecosystem services

Ecological economist point out that until we correct the underpricing of the market price we will continue our unsustainable use of forest, oceans, the atmosphere and other irreplaceable forms of natural capital.

Nonuse Values

- Existence value
- Aesthetic Value
- Option Value

Discount Rate

- Discount Rate-
- What is the idea of discount rate based off of?
- High discount rates
- Low or 0% discount rate
- 1-3% Discount Rate
- Discount rate does not take into account ecosystem services provided by forest. i.e.:

We can estimate optimum levels of pollution control and resource use

- Marginal cost: ex: coal
- Optimum levels-
- Equilibrium point or optimum level for pollution cleanup.

Cost-benefit analysis-

- Direct cost-
- Indirect cost-

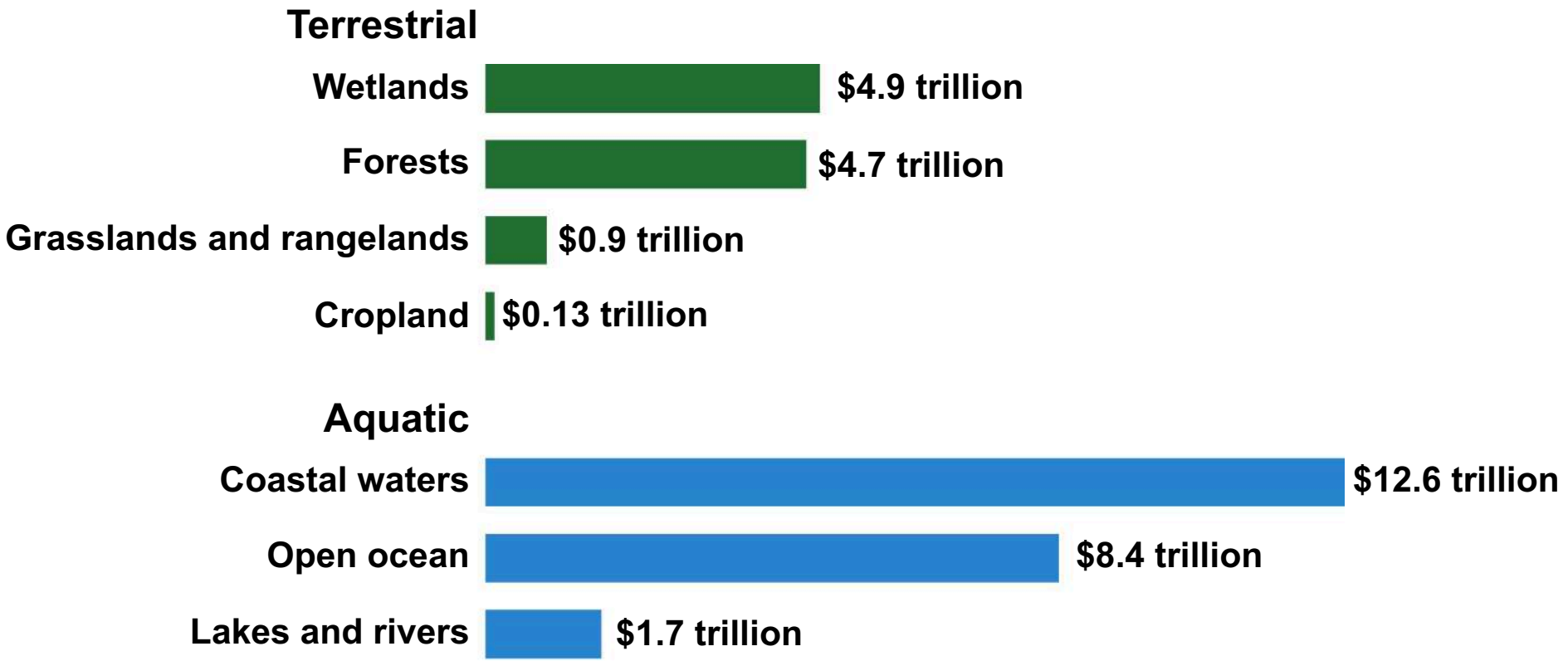
Homework

If you owned a forested area, would you want the discount rate for resources such as tress from the forest to be high, moderate or zero? Explain.

STOP!

There Are Various Ways to Value Natural Capital

- Estimating the values of the earth's natural capital
  - Monetary worth
- Estimate nonuse values
  - Existence value
  - Aesthetic value
  - Bequest value, option value



(Compiled by the authors using data from Robert Costanza et al., "The Value of the World's Ecosystem Services and Natural Capital," *Nature*, 1997.)

Fig. 23-6, p. 636

Estimating the Future Value of a Resource Is Controversial

- Discount rates
  - Estimate of a resource's future economic value compared to its present value
- Proponents of a high discount rate
  - Inflation
- Critics of a high discount rate
  - Encourages rapid exploitation of resources

We Can Estimate Optimum Levels of Pollution Control and Resource Use

- Marginal cost of resource production
  - Cost of removal goes up with each additional unit taken
- Optimum level of resource use
  - Intersection of supply and demand curves
- Optimum level for pollution cleanup
  - Equilibrium point

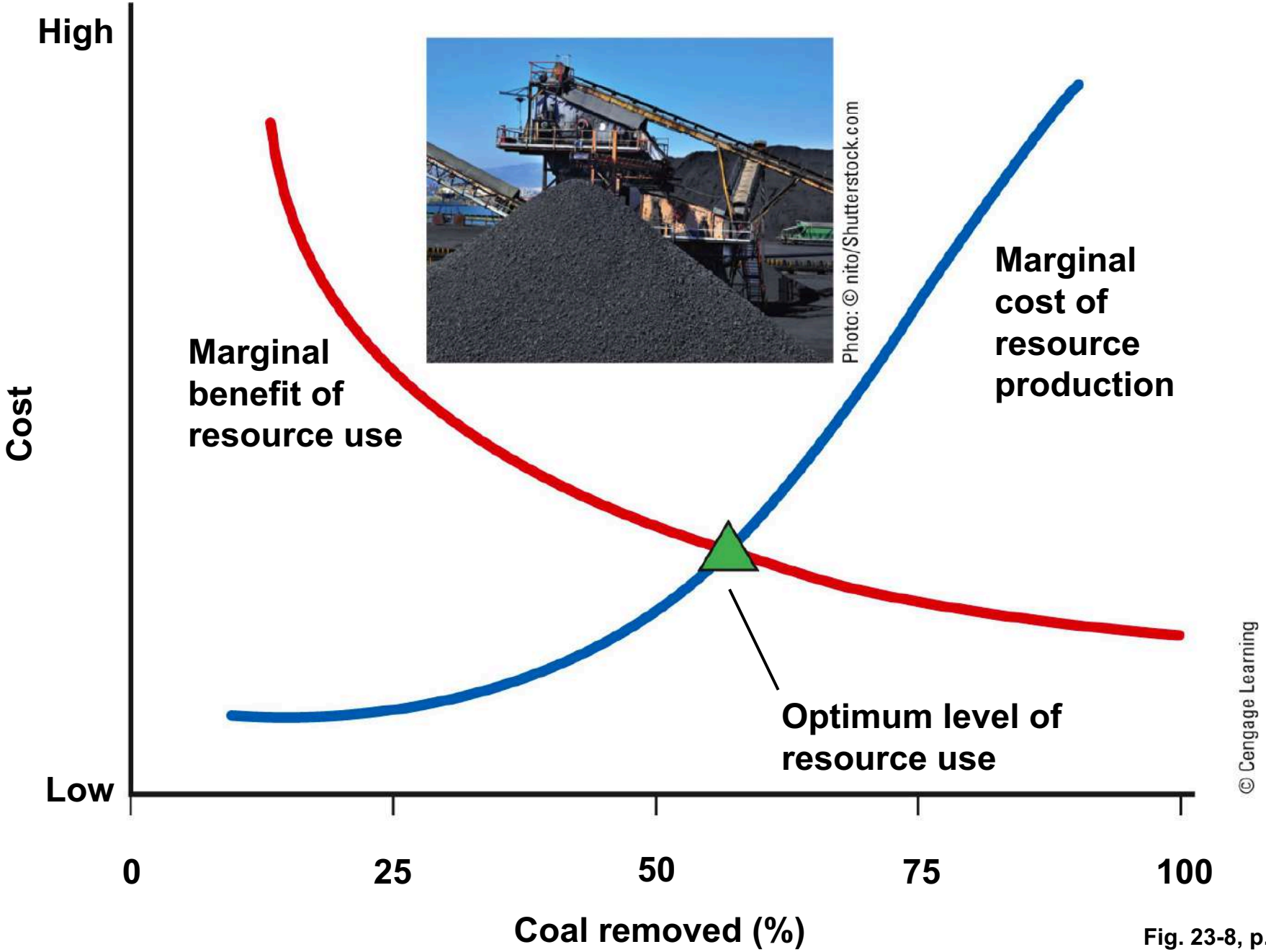

High
Low
Cost
0
25
50
75
100
Coal removed (%)
Marginal benefit of resource use
Marginal cost of resource production
Optimum level of resource use
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Fig. 23-8, p. 638

Cost-Benefit Analysis Is a Useful but Crude Tool

- Cost-benefit analysis follows guidelines
  - State all assumptions used
  - Include estimates of the ecological services
  - Estimate short-and long-term benefits and costs
  - Compare the costs and benefits of alternative courses of action
- There are always uncertainties

23-3 How Can We Use Economic Tools to Deal with Environmental Problems?

- We can use resources more sustainably by:
  - Including the harmful environmental and health costs of producing goods and services in their market prices (full-cost pricing)
  - Subsidizing environmentally beneficial goods and services
  - Taxing pollution and waste instead of wages and profits

We Can Apply the Principle of Full-Cost Pricing

- Market price
  - Does not include indirect, external, or hidden costs
- What are the direct and indirect costs of a car?
- Full-cost pricing
  - Includes estimated costs of harmful environmental and health effects of production

Subsidies Can Be Environmentally Harmful or Beneficial

- Perverse subsidies
  - Lead to environmental damage
  - Should be phased out
- Lobbying groups
  - Influence governments
- Subsidies can also be used for environmental benefits

Environmental Economic Indicators Could Help Reduce Our Environmental Impact

- Measurement and comparison of the economic output of nations
  - Gross domestic product (GDP)
  - Per capita GDP
- Newer methods of comparison
  - Genuine progress indicator (GPI)
    - GDP plus estimated value of beneficial transactions

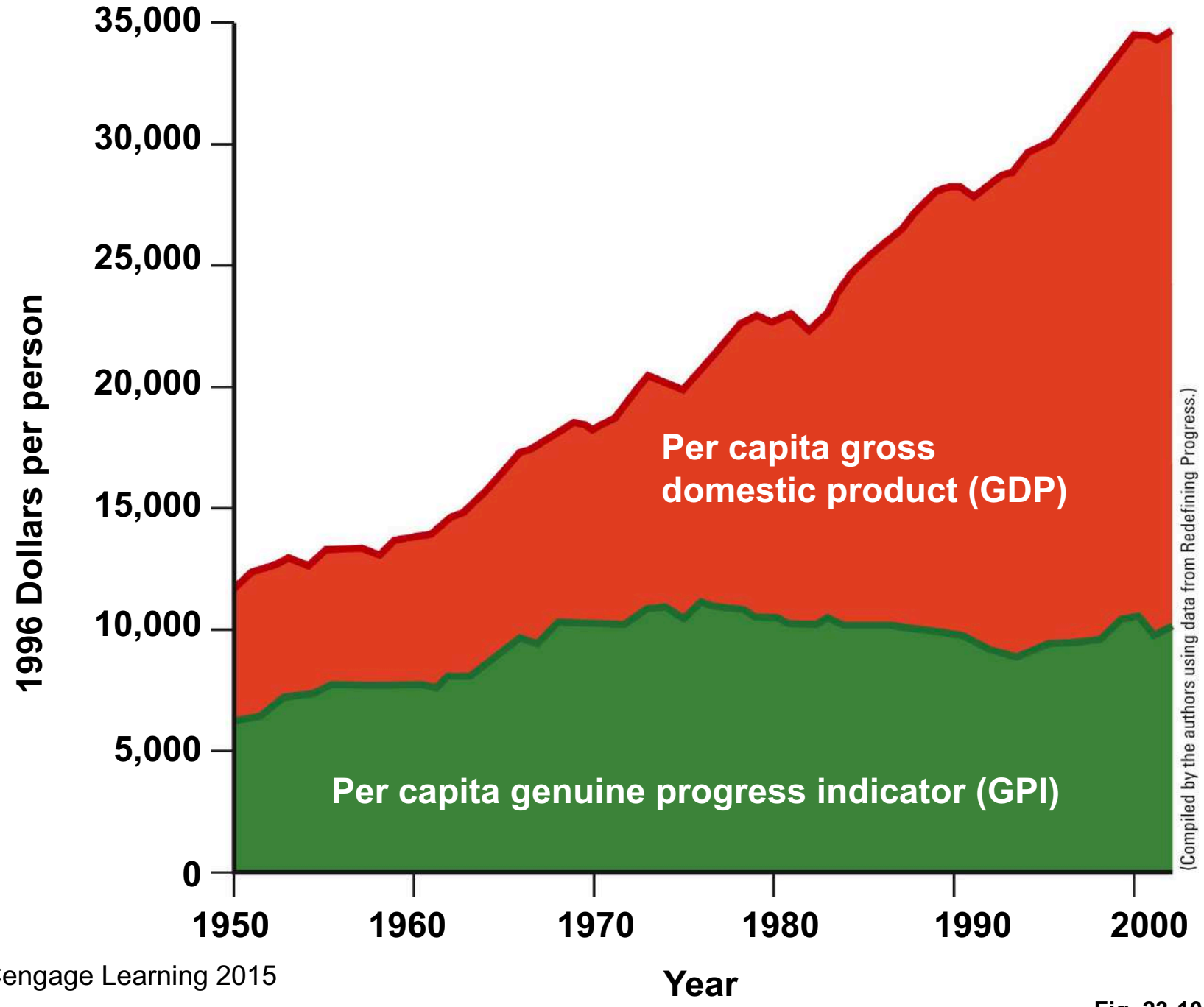

Fig. 23-10, p. 641

Tax Pollution and Wastes Instead of Wages and Profits

- Green taxes
  - So that harmful products and services are at true cost
- Steps for successful implementation of green taxes
  - Phased in slowly, other taxes reduced, safety-net for the poor
- Costa Rica
  - 3.5% tax on market prices of fossil fuels

Trade-Offs

Environmental Taxes and Fees

Advantages

Help bring about full-cost pricing

Encourage businesses to develop environmentally beneficial technologies and goods

Easily administered by existing tax agencies

Disadvantages

Low-income groups are penalized unless safety nets are provided

Hard to determine optimal level for taxes and fees

If set too low, wealthy polluters can absorb taxes as costs

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Fig. 23-11, p. 641

We Could Label Environmentally Beneficial Goods and Services

- Product eco-labeling
  - Help consumers
- Greenwashing
  - Deceptive practice
  - Spin environmentally harmful products as green

Environmental Regulations Can Discourage or Encourage Innovation

- Environmental regulation
  - Control pollution and reduce environmental degradation
- Command and control approach
- Incentive-based environmental regulations
  - Uses economic forces
- Innovation-friendly regulations
  - Frees industries and allows time for innovation

Using the Marketplace to Reduce Pollution and Resource Waste

- Incentive-based regulation example
  - Tradable pollution or resource-use permits
- Cap-and-trade approach used to reduce SO_2

Trade-Offs

Tradable Environmental Permits

Advantages

Flexible and easy to administer

Encourage pollution prevention and waste reduction

Permit prices determined by market transactions

Disadvantages

Wealthy polluters and resource users can buy their way out

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

Self-monitoring of emissions can allow cheating

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Fig. 23-13, p. 644

Reducing Pollution and Resource Waste by Selling Services Instead of Goods

- Shift from material-flow to service-flow economy
  - Lease or rent services that goods provide
- Shift underway in some businesses
  - Xerox
  - Carrier

23-4 How Can Reducing Poverty Help Us to Deal with Environmental Problems?

- Reducing poverty can help us to reduce:
  - Population growth
  - Resource use
  - Environmental degradation

We Can Reduce Poverty

- Poverty
  - People cannot meet basic needs
  - One fifth of the world's population lives on less than $1.25 per day
- Reducing poverty benefits society

We Can Reduce Poverty (cont'd.)

- Important measures
  - Combat malnutrition and infectious diseases
  - Enact universal primary school education
  - Stabilize population growth
  - Reduce total and per-capita ecological footprints
  - Large investments in small-scale infrastructure

Case Study: Microlending

- Microloans give hope to the poor
- Microloans help more than direct aid
  - $5 to $500
  - Mostly to women

Fig. 23-15, p. 645

Working Toward the Millennium Development Goals

- Millennium development goals
  - Sharply reduce hunger and poverty
  - Improve health care
  - Empower women
  - Environmental sustainability by 2015
  - Developed countries: spend 0.7% of national budget toward these goals

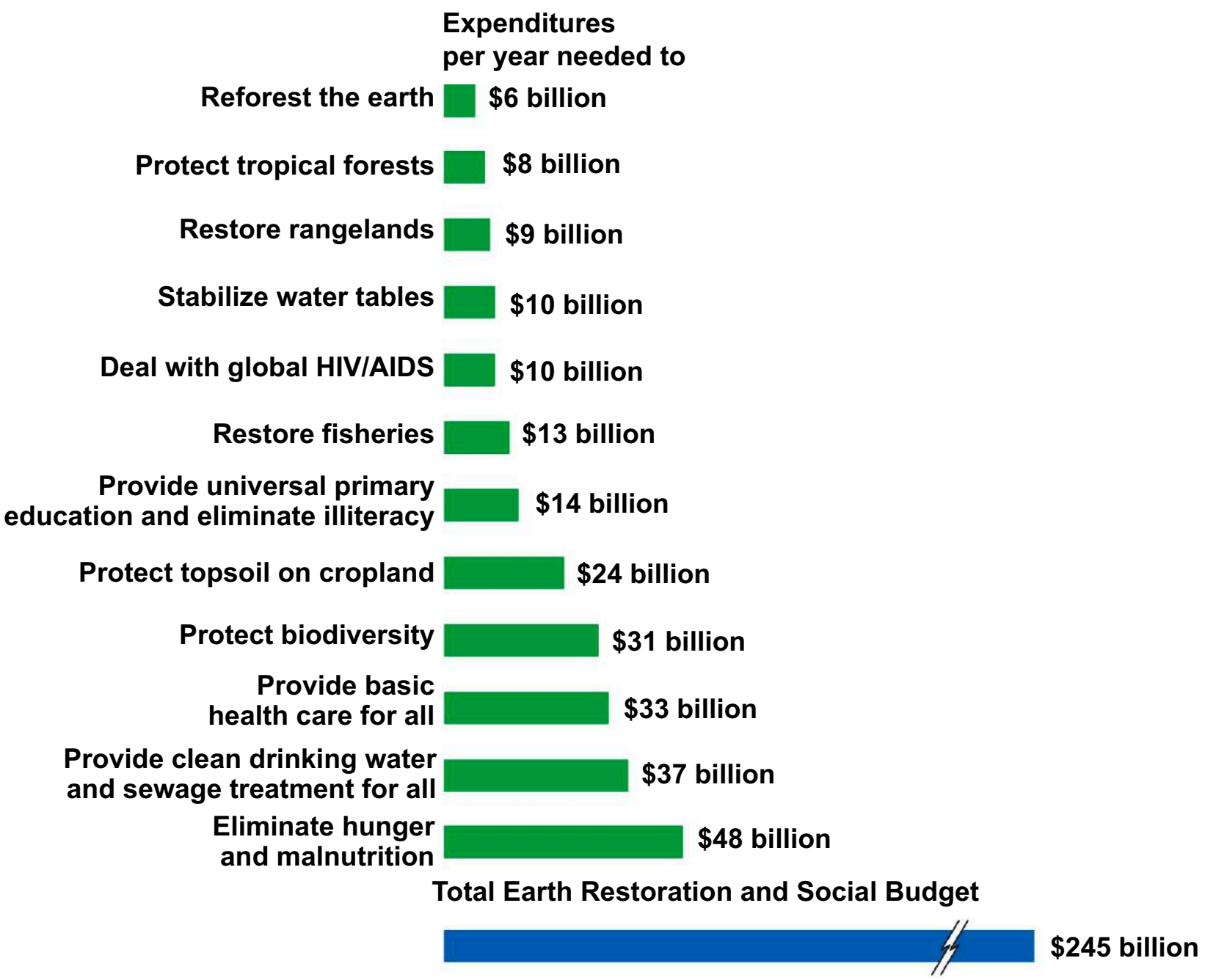

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Fig. 23-16a, p. 647

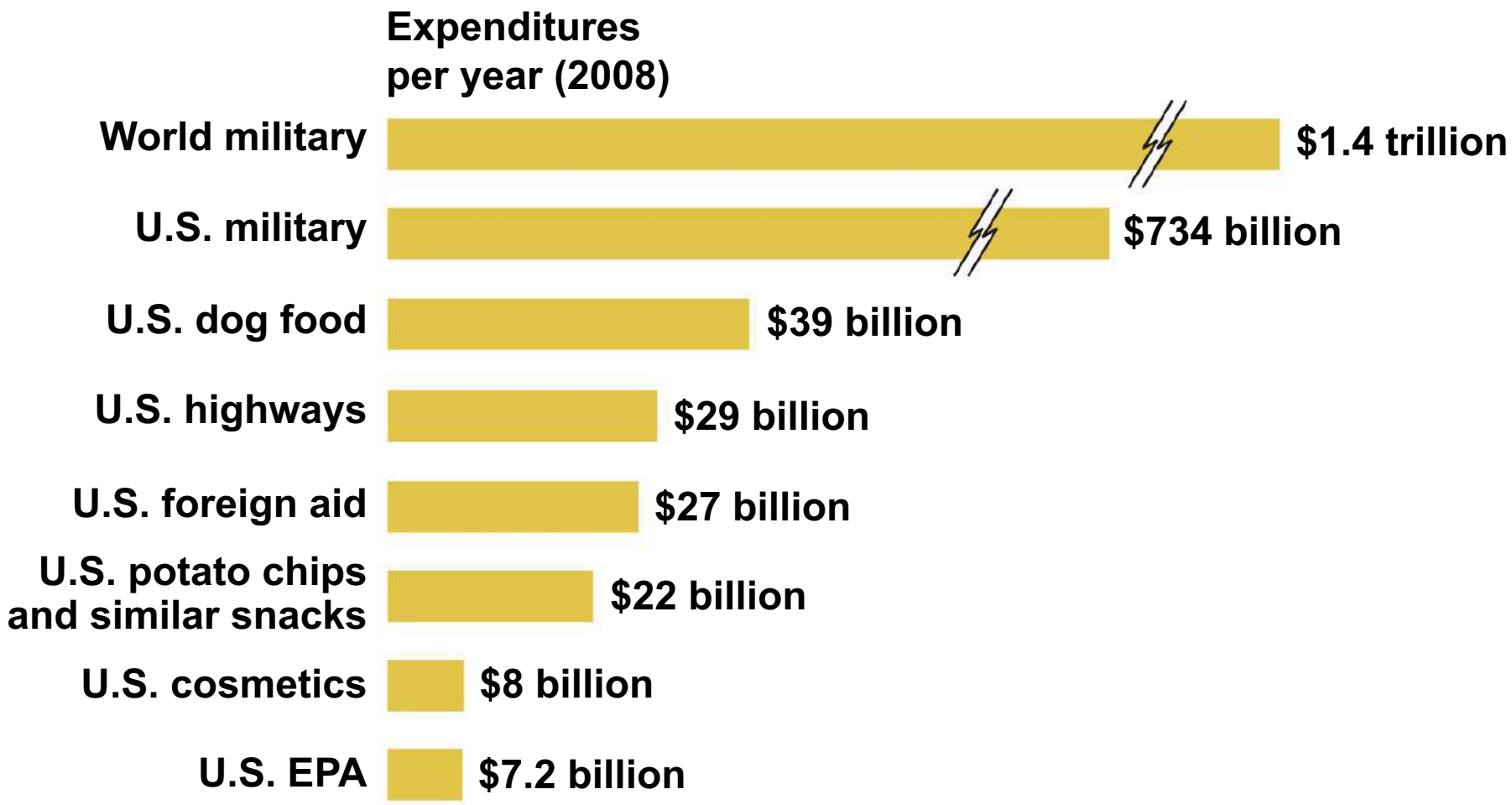

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Fig. 23-16b, p. 647

23-5 Making the Transition to More Environmentally Sustainable Economics

- We can use the principles of sustainability, as well as various economic and environmental strategies, to develop more environmentally sustainable economies

We Are Living Unsustainably

- We are depleting natural capital
- Convert linear throughput economy to circular matter recycling and reuse economy
  - Mimics nature

Low-Throughput Economies Are More Sustainable

- Low-throughput economy
  - Based on energy flow and matter recycling
    - Reusing and recycling nonrenewable matter
    - Don’t use renewable resources too fast
    - Reduce waste with efficiency
    - Reduce harmful forms of consumption
    - Promote pollution prevention and waste reduction

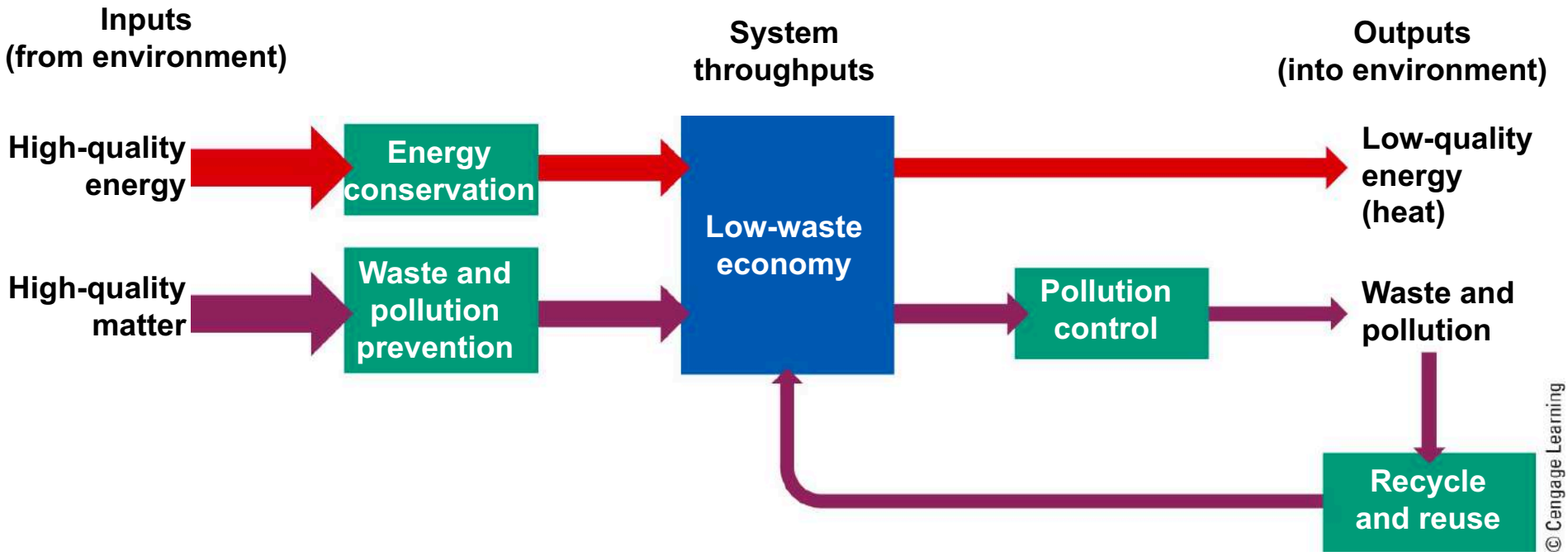

Fig. 23-17, p. 648

We Can Shift to More Sustainable Economies

- Economic succession
  - New and more innovative businesses
- Green jobs
  - Environmentally friendly
- Require governments and industries to increase spending on research and development

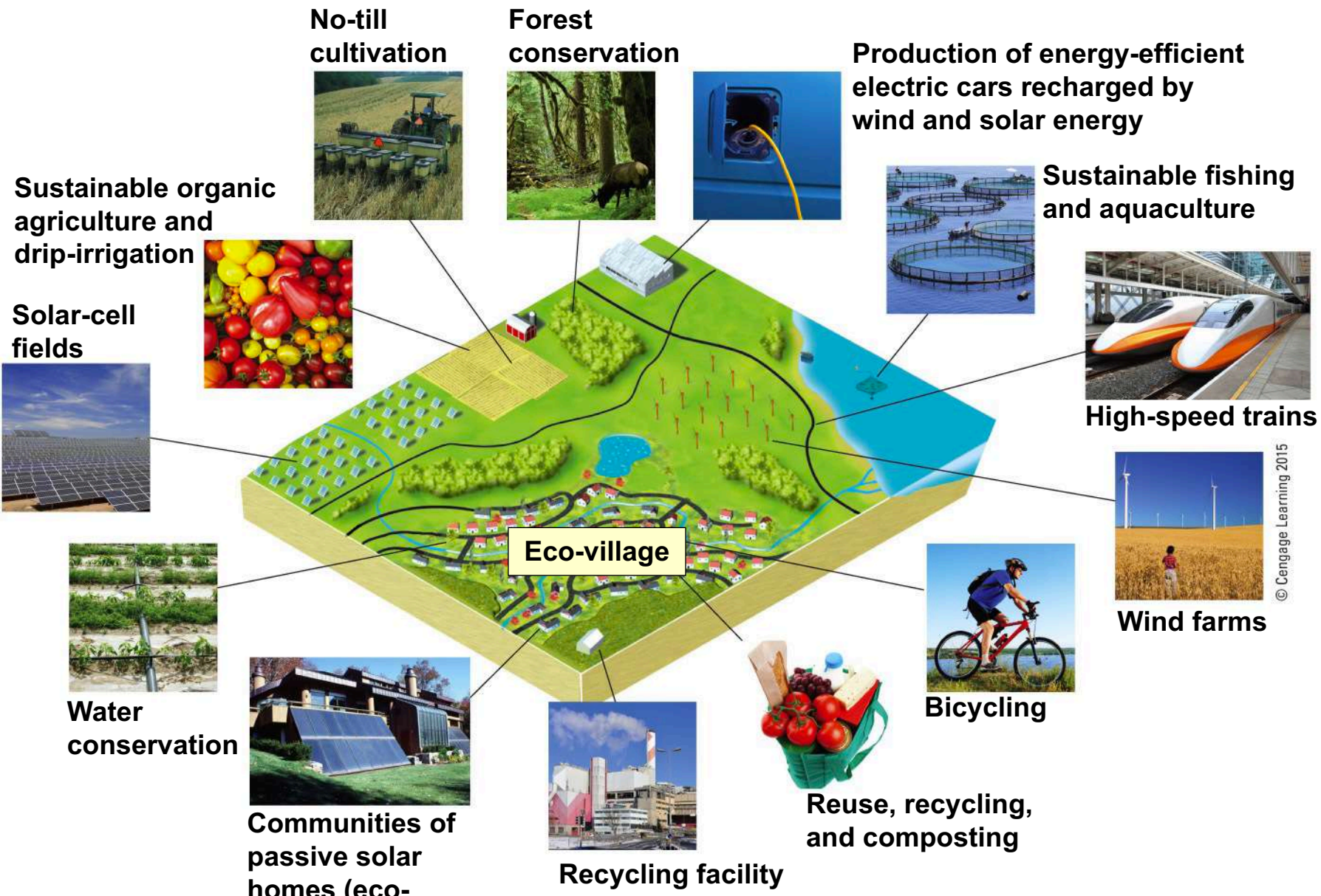

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Fig. 23-18, p. 649

Environmentally Sustainable Businesses and Careers

- Aquaculture
- Biodiversity protection
- Biofuels
- Climate change research
- Conservation biology
- Ecotourism management
- Energy-efficient product design
- Environmental chemistry
- Environmental design and architecture
- Environmental economics
- Environmental education
- Environmental engineering
- Environmental entrepreneur
- Environmental health

- Environmental law
- Environmental nanotechnology
- Fuel cell technology
- Geographic information systems (GIS)
- Geothermal geologist
- Hydrogen energy
- Hydrologist
- Marine science
- Pollution prevention
- Recycling and reuse
- Selling services in place of products
- Solar cell technology
- Sustainable agriculture
- Sustainable forestry
- Urban gardening
- Urban planning
- Waste reduction
- Watershed hydrologist
- Water conservation
- Wind energy

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Fig. 23-19, p. 651

Lessons From Nature Will Help Us in Making the Transition

- For the earth:
  - Just so much and no more
  - Take what you need and leave your competitor enough to live
  - Never take more in your generation than you can give back to the next

Three Big Ideas

- Making a transition to more sustainable economies will require finding ways to estimate and include the harmful environmental and health costs of producing goods and services in their market prices

Three Big Ideas (cont'd.)

- Making this economic transition will also mean phasing out environmentally harmful subsidies and tax breaks, and replacing them with environmentally beneficial subsidies and tax breaks

Three Big Ideas (cont'd.)

- Another way to further this transition would be to tax pollution and wastes instead of wages and profits, and to use most of the revenues from these taxes to promote environmental sustainability and reduce poverty

Tying It All Together: Germany's Transition and Sustainability

- A country can use economic policy to affect the energy market
- Economics can play a major role in determining the size of a country's ecological footprint
  - Use renewable energy resources
  - Use full-cost pricing