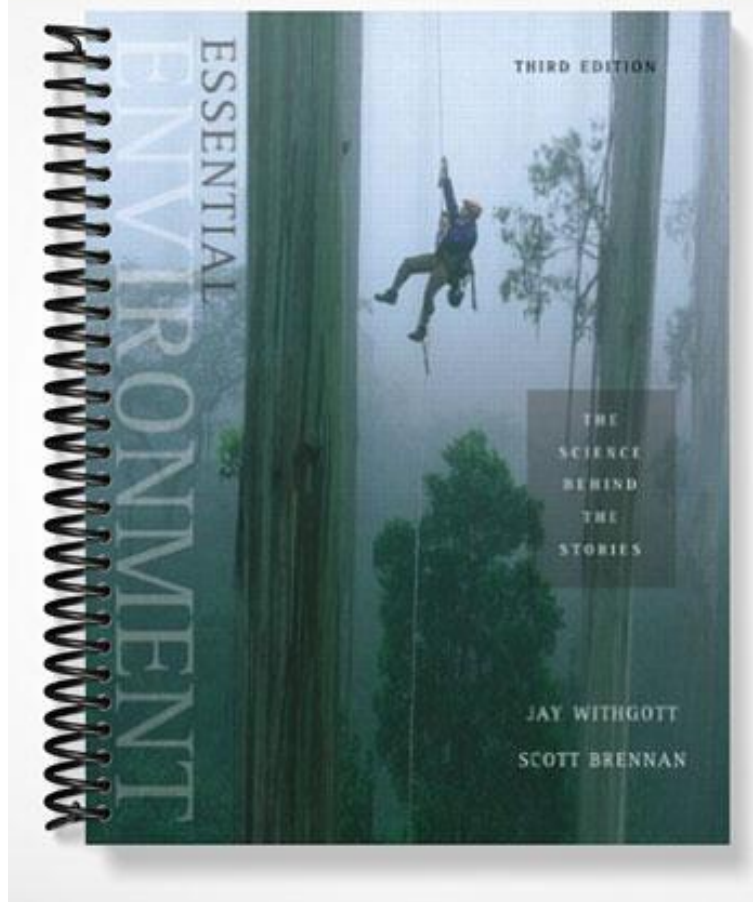


SOLUTIONS MANUAL



ESSENTIAL
ENVIRONMENT

THIRD EDITION

THE
SCIENCE
BEHIND
THE
STORIES

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2

Environmental Economics and Environmental Policy

Chapter Objectives

This chapter will help students:

Describe principles of economic theory, and summarize their implications for the environment

Compare the concepts of economic growth, economic health, and sustainability

Explain the approaches of environmental economics and ecological economics

Describe the aims of environmental policy and assess its societal context

Discuss the history of U.S. environmental policy and recognize major U.S. environmental laws

Characterize the institutions involved with international environmental policy

Delineate the steps of the environmental policy process and evaluate its effectiveness

Contrast the different approaches to environmental policy

Lecture Outline

I. Central Case: San Diego and Tijuana's Sewage Pollution Problems and Policy Solutions

A. In 1996, officials closed all public beaches in San Diego, California, due to stormwater runoff that contaminated local rivers and coastal waters.

B. This also occurred across the border in the Mexican city of Tijuana, whose aging sewer system became clogged, causing raw sewage to overflow into streets and onto beaches.

- C. The international **watershed**, all the land from which water drains into a river, of the Tijuana River covers 4,500 km² (1,750 square miles), and is home to 2 million people of two nations.
- D. Many people in the San Diego and Tijuana areas, from coastal residents to grassroots activists to businesspeople, have pressed policymakers to address this problem.

II. Economics: Approaches and Environmental Implications

- 1. Economic inequities have exacerbated pollution problems.
 - 2. **Economics** is the study of how people decide to use scarce resources.
- A. Several types of economies exist today.
- 1. An **economy** is a social system that converts resources into **goods** and **services**, or work done for others.
 - 2. The oldest type of economy is the **subsistence economy** in which people meet most or all of their daily needs directly from nature.
 - 3. In the **capitalist market economy**, buyers and sellers interact to determine the types and amounts of goods and services to produce.
 - 4. In a **centrally planned economy**, a nation's government determines how to allocate resources.
 - 5. Today, capitalist and socialist economies borrow much from one another and are in fact hybrid systems (often termed **mixed economies**).
- B. Environment and economy are intricately linked.
- 1. Economies receive inputs from the environment, process them in complex ways that enable human society to function, then discharge outputs of waste into the environment.
 - 2. Economic activity uses natural resources, but traditional economic schools of thought have overlooked the importance of the connections, and ignore the environment.
 - 3. Environmental systems also naturally function in a manner that supports economies, purifying air and water, cycling nutrients, providing pollination, and serving as receptacles for waste; these are called **ecosystem services**.
 - 4. The environment enables economic activity by providing ecosystem goods and services, and economic activity can affect the environment in return.

C. Adam Smith helped found **classical economics**.

1. Adam Smith, the father of classical economics, believed that when people are free to pursue their own economic self-interest in a competitive marketplace, the marketplace will behave as if guided by “an invisible hand” that ensures their actions will benefit society.

D. Neoclassical economics incorporates psychology and cost-benefit analysis.

1. Neoclassical economics examines the psychological factors underlying consumer choices.
2. The conflict between buyers and sellers results in a compromise price being reached and the “right” quantity of commodities being bought and sold.
3. In **cost-benefit analysis**, the estimated costs for a proposed action are totaled and compared to the sum of benefits estimated to result from the action; the decision on the action then depends on whether benefits exceed costs.
4. Not all costs and benefits are easily identified, defined, or quantified, or even identified or defined.
5. Economic benefits are more easily quantified than environmental costs, and so they tend to be overrepresented in traditional cost-benefit analyses.

E. Aspects of neoclassical economics have profound implications for the environment.

1. There are four fundamental assumptions of neoclassical economics that have contributed to environmental problems.
 - a. Workers and other resources are infinite or substitutable.
 - b. Long-term effects, occurring far in the future, should be discounted.
 - c. Costs and benefits are internal.
 - 1) The market does not take the costs of pollution into account.
 - 2) Costs or benefits of a transaction are all borne by individuals engaging in the transaction. However, this is often incorrect.

There can be **external costs**, such as health problems or pollution cleanup, which are paid by others.

3) By ignoring the external costs, economies create a false idea of the true and complete costs of particular choices.

d. Growth is required to keep employment high and maintain social order.

F. Economists disagree on whether economic growth is sustainable.

1. Many observers worry that growth has become an end in itself. Resources are ultimately limited, they argue, so nonstop growth is not sustainable.
2. Some proponents of unrestrained growth believe that technology can solve everything.
3. **Ecological economists** argue that civilizations do not overcome environmental limitations in the long run.
4. Ecological economists advocate economies that are stable, neither growing nor shrinking; these **steady-state economies** are intended to mirror natural ecological systems.
5. **Environmental economists** maintain that we can attain sustainability within our current economic systems by modifying the principles of neoclassical economics to address environmental challenges.

G. We can give ecosystem goods and services monetary values.

1. Ecosystem services are said to have **nonmarket values**, values not usually included in the price of a good or service.
2. One technique of assigning nonmarket value is using surveys to determine how much people would be willing to pay to protect a resource or to restore it.
3. An alternative approach is to calculate the overall economic value of all services that an ecosystem provides.

H. Corporations are responding to sustainability concerns.

1. Consumers and investors express preferences for sustainable products and services.
2. Some companies such as Ben & Jerry's Ice Cream were founded on sustainable principles. Now, many corporations are adopting sustainable practices.

3. Corporations exist to make a profit. Consumers can choose businesses that are authentically sustainable from those that do not behave in sustainable ways.

I. Markets can fail.

1. **Market failure** occurs when markets do not take into account the environment's positive effects, or do not reflect the negative effects on the environment or on people (external costs).
2. Traditionally, market failure has been countered by government intervention.

III. Environmental Policy: An Overview

1. When a society reaches broad agreement that a problem exists, it may persuade its leaders to try to resolve the problem through the making of **policy**, a formal set of general plans and principles.
2. **Public policy** is policy made by governments, and consists of laws, regulations, orders, incentives, and practices intended to advance societal welfare.
3. **Environmental policy** is policy that pertains to human interactions with the environment. It generally aims to regulate resource use or reduce pollution to promote human welfare and/or protect natural systems.
4. Forging effective policy requires input from science, ethics, and economics.

A. Environmental policy addresses issues of equity and resource use.

1. The capitalist market economic systems of modern constitutional democracies are largely driven by incentives for short-term economic gain rather than long-term social and environmental stability.
2. The tragedy of the commons, as explained by Garrett Hardin, is that a resource held in common that is unregulated will eventually become overused and degraded.
3. If a community agrees to reduce use, or pollution, in a common resource, but one or two groups or individuals do not participate, they are **free riders** on the efforts of others; this can lead to the system collapsing.
4. **External costs** are harmful impacts that result from market transactions, but are borne by people not involved in the transactions.

IV. U.S. Environmental Policy

1. The three branches of the U.S. federal government—legislative, executive, and judicial—are each involved in aspects of environmental policy.
 2. **Legislation** is passed by Congress, the legislative branch. Implementation and enforcement of legislation is assigned to administrative agencies, sometimes nicknamed the “fourth branch” of government.
 3. Once legislation has passed, it is then signed by the president, who heads the executive branch.
 4. **Regulations** are specific rules based on the more broadly written statutory law.
- A. Early U.S. environmental policy addressed land management.
1. The early environmental laws were intended to promote settlement, and the extraction and use of the West’s abundant natural resources.
 2. The Western lands were considered practically infinite, and inexhaustible in natural resources.
- B. The second wave of U.S. environmental policy addressed impacts of the first.
1. During this time the government created national parks, wildlife refuges, and the forest system.
- C. The third wave responded largely to pollution.
1. The publication of Rachel Carson’s *Silent Spring* awakened the American public to the negative ecological and health effects of pesticides and industrial chemicals.
 2. The burning of the Cuyahoga River on several occasions in the 1950s and 1960s, along with an oil spill off the Pacific coast near Santa Barbara, California in 1969, moved the public to prompt Congress and the president to do more to protect the environment.
 3. Earth Day, first celebrated in 1970, continues to be supported by millions of people worldwide.
- D. NEPA gives citizens input into environmental policy decisions.
1. **NEPA (National Environmental Policy Act)** was signed in 1970 and requires that an **environmental impact statement (EIS)** be prepared for any major federal action.

E. Creation of the EPA marked a shift in federal environmental policy.

1. The **Environmental Protection Agency (EPA)** is charged with conducting and evaluating research, monitoring environmental quality, setting and enforcing standards for pollution levels, assisting the states in meeting standards and goals, and educating the public.

F. Other prominent laws followed.

1. Two major laws were the Federal Water Pollution Control Acts (1965 and 1972) and Clean Water Act (1977).

G. The social context for environmental policy changes over time.

V. International Environmental Policy

A. International law includes customary law and conventional law.

1. International law arises from long-standing practices, or customs, and is known as **customary law**.
2. **Conventional law** is international law arising from conventions, or treaties, into which nations enter.

B. Several organizations shape international environmental policy.

1. The United Nations has taken an active role in shaping international environmental policy, and sponsors environmental agencies.
2. The World Bank funds economic development, and has frequently been criticized for funding unsustainable projects that cause more environmental problems than they solve.
3. European Union (EU) is active in environmental affairs.
4. The World Trade Organization (WTO) has recently attained surprising power, and has the authority to impose financial penalties.
5. A number of nongovernmental organizations (NGOs) are international in scope and influence international environmental policy.

VI. The Environmental Policy Process

1. Anyone can become involved in helping ideas become environmental policy.
2. Unfortunately, money wields influence.

A. Policy results from a multistep process.

1. The environmental policy process begins when a problem is identified.
 2. Identifying causes of the problem is the second step in the policy process.
 3. The third step is envisioning a solution.
 4. Getting organized is the fourth step.
 5. Gaining access to political powerbrokers is the fifth step.
 - a. Lobbying is spending time or money trying to change an elected official's mind.
 - b. Making campaign contributions is another way to get our voices heard.
 - c. The movement of powerful officials between the private sector and governmental agencies helps gain political influence and is called the revolving door.
 6. Shepherding a solution into law is the sixth step in the policy process.
- B. Science plays a role in environmental policy but can be misused.
1. The best policy follows when policymakers have scientific information.
 2. Sometimes policymakers distort science. For example, the Union of Concerned Scientists released a statement faulting the administration of George W. Bush for manipulating, censoring, editing, and suppressing reports.

VII. Approaches to Environmental Policy

1. Many environmental laws and regulations set strict legal limits, and punishments, in what is sometimes called a **command-and-control** approach. Many people have grown disenchanted with the top-down, sometimes heavy-handed nature of the command-and-control approach.
- A. Subsidies are a widespread economic policy tool.
1. A **subsidy** is a government giveaway of cash or publicly owned resources used to promote a particular activity.
 2. Subsidies can be used to promote environmentally sustainable activities, but often they have been used to prop up unsustainable ones.

B. Green taxes discourage undesirable activities.

1. By taxing activities and products that cause undesirable environmental impacts, a green tax becomes a tool for policy as well as a way to fund government.
2. Green taxes do not have much support in the United States, although they have been widely instituted in Europe.

C. Markets in permits can save money and produce results.

1. The government can issue permits to individual polluters. They may buy, sell, and trade these **marketable emissions permits**; this provides financial incentives to reduce pollution.

D. Ecolabeling empowers consumers.

1. Ecolabeling tells consumers which brands use environmentally benign processes.

E. Market incentives are being tried widely on the local level.

VIII. Conclusion

1. Environmental policymaking is a problem-solving pursuit that makes use of science, ethics, and economics, and that requires an astute understanding of the political process.
2. Conventional command-and-control approaches of legislation and regulation are the most common approaches to policymaking.
3. Equating economic well-being with economic growth, as most economists and policymakers traditionally have, suggests that economic welfare entails a trade-off with environmental quality.
4. If economic welfare can be enhanced in the absence of growth, we can envision economies and environmental quality benefiting mutually.

Key Terms

capitalist market economy
centrally planned economy
classical economics
command-and-control
conventional law
cost-benefit analysis
customary law
ecolabeling
ecological economists

economics
economy
ecosystem services
environmental economists
environmental policy
Environmental Protection Agency (EPA)
external costs
goods legislation

green tax	policy
market failure	public policy
marketable emissions	regulations
permits	services
mixed economies	Smith, Adam
National Environmental Policy Act (NEPA)	steady-state economies
neoclassical economics	subsidy
nonmarket values	subsistence economy
	watershed

Teaching Tips

1. Discuss some of the environmental laws that were passed in the late 1960s and early 1970s to emphasize that the “third wave of U.S. environmental policy responded largely to pollution problems.” The Clean Water Act; the Clean Air Act; the Federal Insecticide, Fungicide, and Rodenticide Act; and the Wilderness Act are just a few. Summaries of the major environmental statutes are available on the U.S. EPA website (www.epa.gov/epahome/laws.htm).
2. Have students work in groups. Ask the groups to identify several issues of concern that could be addressed by introducing new legislation. Refer them to the text on page 42, Figure 2.13, Understanding the steps of the policy process. As each group chooses a topic of interest, have them map out how they could implement the steps outlined in the text. One industrious student group went online to the state legislature website and downloaded a copy of a recent agriculture bill. They followed the outline and drafted a bill that would protect pollinators, an overlooked, but essential “ecological service” that was now threatened. The activity was empowering for the students.
3. Have students go to the website for the *Resources for the Future* group (www.rff.org) and choose one of the topics listed under a Core Knowledge section to do an overview. One possible topic is Environment and Development: Cost-Benefit Analysis. You can have students do this in small groups or independently, to present a short report to the class or to write a brief paper.
4. The chapter briefly describes three major impacts of raw sewage on humans and the environment: pathogens that cause illness, lowered dissolved oxygen levels, and economic impacts caused by reduced tourism and recreation. Discuss these impacts in more detail in class and ask the students to rank those impacts in order of importance to them. Is human health most important? The economy? The environment? Ask students to conduct Internet research for updates on San Diego’s sewage problem. Is the Tijuana River Valley Estuary and Beach Sewage Cleanup Act being implemented? What has been done so far? Has it been successful?

5. Assign students to read Garrett Hardin's paper, "The Tragedy of the Commons," published in *Science* 162:1243–1248. The article can be found on the *Science* magazine website at www.sciencemag.org. Ask them to answer the following questions:
 - a. Why does the "economic man" behave differently in a commons than on private property?
 - b. What are the implications of this behavior on public lands?
6. Getting to Know Your Students, and the Utility of Groups.
 - a. Place your students in groups of three to six, to have discussions and projects for the semester. One quick sorting method is to have students fill out a 3" x 5" card indicating their familiarity and comfort level with a) biology, b) math, c) Internet searches, d) PowerPoint, and e) public speaking. It should take only 10–20 minutes to sort out a set of students comfortable with biology, then add to each student card a second card for a student comfortable with math, a third card for a student who is good at Internet use, and so on. When students enter the room for the next class, have them find their card in the group to which they've been assigned.
 - b. Take used file folders and remove the tab that sticks out. This makes it easy to stand the folders up "tent" style. Have a set of these blank folders available for each group, and have each student use markers or colored pencils to write his or her name on BOTH sides so that everyone in the room can see it. Give the group a colored folder to keep these "name tents" and other group-related items. The colored folders can be the responsibility of a group member, or, ideally, left in the classroom in a box or a drawer, if you have the space to do this. Have the students use their name tents for at least the first 3 weeks of class, to assist everyone in learning names. Research shows that students who feel more "connected" to classmates have better perseverance in specific classes, and in college in general. Helping students to feel part of a group can assist with this goal.
 - c. If you have a digital camera, take a photo of each group, with each student holding his or her name tent. Put six or eight groups per page into PhotoShop or PowerPoint and print out the sheets. You now have a way to learn names of your students quickly; keep the pages with you as you grade papers or lead class discussions.

Additional Resources

Websites

1. *Tijuana River Watershed*, Department of Geography, San Diego State University
(<http://trw.sdsu.edu/English/homeFrame.htm>).

This website provides information about the physical and human characteristics of the watershed.

2. *The International Society for Ecological Economics* (www.ecoeco.org).

The ISEE provides information that “facilitates understanding between economists and ecologists, and the integration of their thinking into a transdiscipline aimed at developing a sustainable world.”

3. *Major Environmental Laws*, U.S. Environmental Protection Agency (www.epa.gov/epahome/laws.htm).

This Web resource provides full text and summaries of the major environmental laws.

4. *Environmental Justice Resources on the World Wide Web*, Working Group on Environmental Justice, Harvard University (<http://ecojustice.net/document/ejlinks.htm>).

This online resource provides links to a large number of other environmental justice websites, documents, and governmental agencies.

5. *International Environmental Law and Policy: A Comprehensive Reference Source*, Washington College of Law, American University (www.wcl.american.edu/environment/iel/).

This site provides a comprehensive list of links to international environmental issues as online support for an environmental law and policy textbook.

6. *Environmental Defense Fund*, National nonprofit organization linking science, economics, and law to create innovative, equitable, and cost-effective solutions to society's most urgent environmental problems (www.edf.org/climatecosts).

A current economic debate is focused on the alleged high cost of cutting carbon emissions as a way to bankrupt the U.S. economy. Environmental Defense analyzes state-of-the-art models suggesting that robust growth in the economy AND cutting emissions of greenhouse gas output is feasible.

Audiovisual Materials

1. *The Nature of Business: Partnering with the Environment*, 2001, distributed by Films for the Humanities and Sciences (www.films.com).

This program shows corporate leaders who are planning for a sustainable future by incorporating social responsibility and environmental protection into all processes and decisions.

2. *The God Squad and the Case of the Northern Spotted Owl*, 2001, video distributed by Bullfrog Films (www.bullfrogfilms.com/catalog/g squad.html).

In this video, the God Squad investigates the Endangered Species

Committee proceedings that selected economic interests over the survival of a species.

3. *Borderline Cases: Environmental Matters at the United States–Mexico Border*, 1996, video distributed by Bullfrog Films (www.bullfrogfilms.com/catalog/bc.html).

This video investigates the environmental impact of factories (maquiladoras) built on the U.S.–Mexico border by multinational corporations from the United States, Asia, and Europe.

4. *Greenplans*, 1995, video produced by John de Graaf and distributed by the Video Project (www.videoproject.com).

This program, hosted by CNN’s Jack Hamann, takes viewers to the Netherlands and New Zealand to see how national plans for sustainable development have been developed using a national environmental policy called a Green Plan.

5. *Green Pacts and Greenbacks*, 2000, distributed by Films for the Humanities and Sciences (www.films.com).

Business people and environmentalists explore the business behind doing business the Earth-friendly way.

Additional Reading

1. Daly, H. and Farley J. (2004). *Ecological Economics: Principles and Applications*. Island Press. Washington. The authors call this a “transdisciplinary” text, arguing that the “disciplinary structure of knowledge is a problem of fragmentation, a difficulty to be overcome, not a criterion to be met.” Instructors wanting more information on ecological economic arguments will appreciate this text. It is very well written and students will find it appealing as well. Herman Daly was a former World Bank Economist who declared during his farewell address that: “We ought not tax what we ‘want,’ so do not tax wages and savings. We ought to tax what we don’t want, pollution and long-distance transport of food and other consumer goods.” He remains a revolutionary thinker.

Weighing the Issues: Suggested Answers

Do We Really Need Environmental Policy?

Facts to Consider: As stated in Chapter 3, part of the foundation for environmental law and policy is based in the tragedy of the commons; however, the long-term vision of the common good often loses to the short-term gains from market capitalism in the United States. Striving for economic success is often not conducive to thinking about the long-term environmental consequences to today’s actions. Additionally, the perception that individual rights are most important to American society shapes much environmental law and policy to such a degree that if law interferes with

personal actions, the law is often changed regardless of the environmental consequences. For example, the Endangered Species Act provides protection to threatened and endangered species through habitat protection. But if a private land owner wants to develop the land by building houses, there are many ways for the land owner to circumvent federal law through appeals, waivers, and lawsuits. In the short term, local economies boom from construction and the tax and business revenue from incoming families. However, longer term consequences could include a decrease in the quality of living in the area. As the economic advantages from the construction industry fades, the community is left with a crowded urban environment that has a decreasing income base leading to a depressed urban community.

Trade Barriers and Environmental Protection

Facts to consider: The foundation of this issue lies in the tragedy of the commons and the fact that environmental issues recognize no political boundaries. By allowing Country *B* to export environmentally hazardous materials to Country *A*, Country *B* is spreading a potential environmental risk to Country *A*. The citizens of Country *A* will need to absorb the economic, environmental, and health consequences of the use of this material. On the other hand, if Country *A* is a wealthy industrialized nation, it is better able to properly handle or develop the technologies needed to work with the goods. Allowing the export of Country *B*'s goods to Country *A* will boost the economy of Country *B* and then allow Country *A* to export the technology back to Country *B* in an effort to reduce the environmental risk of the goods. However, this requires that both countries maintain an attitude that sustainability of resources and environment is a priority, as opposed to the priority of maximization of profits. In addition, free-trade agreements and corporate outsourcing of factories from Country *A* to Country *B* may aggravate environmental conditions in either or both countries.

Emissions Trading

Facts to consider: Each type of approach to managing pollutant emissions has advantages and liabilities. The punitive approach of command-and-control regulation and fines can be a powerful incentive, and, assuming there is adequate enforcement, can be very effective. However, it tends to alienate business, may result in lawsuits, and may impose substantial short-term economic costs. Incentive approaches seem to work more efficiently at a lower cost. Permit-trading systems need to be designed carefully, but if designed well, they can work effectively to reduce pollution. A permit-trading system has helped reduce sulfur dioxide emissions in the United States, and the current status of various carbon-trading programs is covered toward the end of Chapter 14. These programs can harness the forces of market capitalism and potentially achieve reductions with greater economic efficiency than government regulation. However, these programs may also allow pollution hotspots as companies that are having trouble complying to maximum pollution limits buy more permits from other companies that have a surplus of credits. The best approach to environmental policy may be a combination of many different types of policy approaches, while paying attention to local needs.

The Science behind the Story

Calculating the Economic Value of Earth's Ecosystems

Observation: While Earth's ecosystems provide essential life-support services, economists do not generally account for how much these services contribute to human welfare, as is done for human-based services.

Hypothesis: It is possible to estimate the net worth of services provided by ecosystems to humans.

Data analysis: Environmental economist Robert Costanza and 12 colleagues from various universities performed an exhaustive search of the scientific literature, unearthing more than 100 studies that estimated the worth of ecosystem services. Costanza and his colleagues then conducted a meta-analysis of the studies, reevaluating data and subjecting data to different valuation methods. One valuation method used technological replacement cost as the main indicator.

Results: Costanza and his colleagues calculated that ecosystems provide at least \$33 trillion in 1997 dollars in global-scale life-support services.

Observation: The results obtained by Costanza and his colleagues caused much controversy. Some other researchers posited that no quantitative values could or should be placed on clean air and water. Economists conjectured that valuation of services depends on how much people are willing to pay for those services. Others argued that combining studies on small areas of land to produce a global valuation for land use was meaningless because resource exploitation was intimately linked to local policy and conditions, and *not* to global considerations.

Hypothesis: It is possible to estimate the net worth of services provided by ecosystems to humans.

Experiment: Costanza joined with other researchers to conduct another meta-analysis of existing data. However, this time the researchers looked at the cost of preserving wild lands intact as opposed to converting these same wild lands for development such as agriculture, logging, or fish farming. Instead of a global analysis, the investigators focused on five different ecosystems: West African and Malaysian tropical forests, Thai mangrove swamps, Canadian wetlands, and Philippine coral reefs.

Results: Costanza and his colleagues calculated that these nature reserves, which cover 15% of Earth's land surface and 30% of Earth's oceans, are worth between \$4.4 and \$5.2 trillion in 2002 dollars. This valuation is 100 times higher than what the value of the area would be if it were developed for direct human use.