**The Ecosystem and the Human Community**

**Relationship Between the Ecosystem and the Human Community & Major Areas of Concern**

Ecosystems provide a wide variety of materials that are used for fuel, food, clothing, and shelter. People began as hunters and gatherers, and nature provided all that was needed to survive. Many people (especially poorer people in rural areas) still depend on hunting and gathering to survive. Prior to the end of the Neolithic Era, people moved around in search of food, allowing the ecosystem to replenish and maintain balance. Once people became settled and relied on agriculture, the proximate land and surrounding ecosystems suffered. Land was cleared for crops, displacing the wild plants and animals. Nutrients were not reintroduced into the soil, and the nutrient level became depleted hindering future growth potential. As crop yields diminished, people returned to the practice of hunting and gathering, but because they were fixed in one location, the surrounding areas became depleted of resources. Once the entire area was destroyed, people moved on to a new location.

Modern agriculture is done on a large scale to produce food for the masses, often requiring that the products be transported a large distance. Most often one crop is planted in vast quantities, allowing large machines designed to pick that specific crop to be used. While this is an efficient process when it comes to harvesting, it leaves the crop susceptible to pests and crop disease. If disease hits one section of the crop, it is more likely to threaten the entire crop. Protective measures such as the introduction of chemical pesticides are required to protect the crop yield. Pesticide enters the air cycle during its application and the water system through runoff from rain storms. Animals that feed off of the pests that these chemicals are designed to kill, suffer from ingesting the contaminated food and have a decrease in population because of lower food resources. Mechanization allows more work to be done by fewer people in less time therefore decreasing the amount of jobs created by this sector.

The human population also impacts the environment through extracting resources for energy, raw materials, and other natural resources. Coal remains a major fuel source in much of the industrialized world. To lessen the dangers to workers and increase yield, a process known asstrip mining was introduced. The process removes entire layers of rock and soil (repeatedly) allowing the coal to be collected from the surface. Once production is completed, the landscape is scarred and contaminated from toxic material associated with coal. The ecosystem has little hope of recovery.

Oil is another important energy source. The extraction process poses localized contamination threats through soil and aquifer saturation, including the introduction of benzene into the water system. Methane is a viable fuel that is associated with oil production. It is often wasted to expedite oil extraction. Methane is a clean burning fuel, but when introduced into the atmosphere unburned, it is a greenhouse gas that is considerably more harmful than carbon. Oil needs to be transported, and oil spills do happen, wreaking havoc on ecosystems. Larger ships are being built to accommodate the increased need for fuel, increasing the risks of even greater spills.

Gold, silver, uranium, coltan (a rare metal used for the production of cell phones, video games, and other sophisticated electronic products), and diamonds are highly valued resources. The distribution of these materials is not uniform, and the areas they are primarily located in have historically been the victims of conquest. In Africa, this conquest is ongoing.

Other materials such as hardwood, fur, tortoise shell, rhino horn, and other animal parts are coveted by many cultures. International agreements have been developed to protect these vulnerable resources, but many countries have not agreed to these terms and individuals who have the ability to pay high prices for these materials can still obtain them. The reality is that ecosystem capital is governed by supply and demand; if someone is willing to pay the price for these resources, poachers and black market dealers can obtain them.

Less-developed countries are becoming more industrialized, and the amount of carbon released into the environment is expected to increase exponentially. Carbon has been identified as a greenhouse gas and is theorized as contributing to a warming of the Earth. Industrialization of the less-developed countries will also increase the demand on natural resources.

**Legislation that Impacts the Natural Environment**

To describe in any detail the pending and existing legislation in the United States and globally with regard to environmental concerns and destruction would be impossible here. Everything from solid waste disposal, pesticides, water and air protection, and wildlife preservation has either existing or pending legislation. The Clean Water Act and the Clean Air Act are most notable. The Clean Water Act is primarily focused on reducing discharge of materials into fresh water rivers, lakes, and streams. Sewage was still allowed to be dumped into the water system, but it had to first go through more advanced processing. Ocean discharge, oil contamination of water, and development adjacent to designated wetlands was also governed by this act. The Clean Air Act was originally enacted in 1955 with major revisions in subsequent years. The goal of this act was to have local and state officials set goals for limiting air pollution to a level healthy for humans. Regulations of vehicle emissions, industrial contaminants, and power plant derived pollution were created.

**Sustainable Communities and Lifestyles**

At the onset of the Industrial Revolution, people did not realize the impact that their actions would have on future generations. Today, people face the reality of the actions taken by those who came before them. In building sustainable communities and lifestyles, one must determine his or her individual level of commitment and willingness to sacrifice convenience.

Transportation allows people to live and work in the most opportune areas for both activities. Building cities that allow for employment opportunities and creating a high standard of living for citizens conflicts with current standards. Most people would prefer not to live directly next to a factory. The confines of current infrastructure would also need to evolve. Commuting habits are major contributors to air pollution. In the future, many workers will be able to complete most tasks from home, using home offices and computers. Currently, it is important that mass transportation projects and services that are already available are invested in. Cars are convenient but not essential. Walking and cycling are viable alternatives for short trips, and shopping locally reduces energy consumption while increasing local tax revenues. Maintaining vehicles in peak running condition conserves fuel while decreasing emissions.

Heating homes requires enormous amounts of energy. Living in a large house is a personal choice as well as a status symbol in the United States. A shift in perception is required before change can be affected. Lowering the home temperature by two degrees will provide a significant fuel savings. Turning off lights and heat in parts of the home that are not being used will increase this savings. Wearing sweaters while indoors decrease the need for additional external heating. Energy-efficient lighting, natural lighting, and fuel conserving appliances all play a role in energy conservation.

**A Global Perspective**

Globalization allows trade of goods and materials from regions throughout the planet. The benefit of globalization is that once people become financially interconnected and reliant upon each other for survival, there is less likelihood of future wars. The drawback is that goods and services use a vast amount of energy to move long distances, creating excess pollution and decreasing local jobs. As lesser developed countries industrialize, one can anticipate a rapid increase in pollution and resource consumption. Technologies will need to be developed that reduce waste, and these advances will need to be shared with the global community.

**Conclusion**

The decisions made today may not have immediate and tangible results. Stewardship means making choices and decisions that will benefit the world in the future. You may not be around to see the benefits of the decisions made today. Oftentimes, immediate needs such as the need for energy resources will negatively impact people in the future. People need to realize that they have a responsibility not to create situations that future generations cannot rectify. The choices made for energy and conservation will decide what options are available in the future. The care provided to the environment and its component ecosystems will limit or augment the choices that can be made in the future.

# The Environment, the Economy & Policy

Cities and nations are developing environmental policies in order to achieve local, regional, national and global sustainability. The relationship between the environment, the economy and policy is a reflexive and dynamic relationship. As economies become increasingly global, as awareness of global dependencies becomes more intense, the focus of public and global policies becomes more concentrated.

The key to any economy is its resources. The environment supplies the raw materials needed and without its ability to absorb wastes the economy would degrade. This natural capital is indispensable and although much of it is renewable, use of it at high rates does not allow enough time for that renewal. Even with the threat of wasting our natural capital looming in the future, industries that are in the business of producing goods continue harmful environmental practices. Therefore, public policies are enacted in order to address specific problems. As these programs incur costs, they affect the economy and debate is heavy over their effectiveness vs. their economic impact. Cost-benefit analysis is done to measure the benefits of a project against its overall cost to implement. With increasing global economic interests, environmental policies have become more diverse and in some case, more problematic.

Politics is obviously a large part of the policy creation process. Political parties have decided interests in the economy and special interest groups are consistently lobbying them to enact or support programs. Citizen involvement is important and keeping yourself educated and aware of the policies and changes in policy is the best way to help promote the economy without damaging the environment. Grassroots groups and lobbying on the part of the average citizens may well be the key to obtaining fair policies.

Urban trends since World War II are marked by exurban migration, urban sprawl, urban decay and a growing dependence on cars. In the original integrated city after World War II, the markets and major economic producers were centralized so reliance on cars was minimal. As cities grew and became increasingly crowded, people began to develop land on the outskirts of the city. This continual migration from the city and building of settlement upon settlement is called urban sprawl. Urban sprawl has many detrimental effects upon the environment including: depletion of energy resources, air pollution, water pollution and degradation of water resources, loss of landscapes and wildlife, and loss of agricultural land. Possible solutions to this problem have been posed. Among the more promising is smart growth. This solution recognizes that growth will happen, but addresses the problem with environmentally responsible building patterns and practices. Zoning laws and integrated communities are gaining acceptance and smart growth is becoming more popular.

One of the outcomes of exurban migration is urban blight or decay. As the more affluent people moved away from the city and shopped at new developments, the city lost a great deal of its economic inflow. Redevelopment efforts have been enacted to attract people back to the cities, but livability is still an issue for many people. Livability is defined by an index based on a high population density mixed with a decent ratio of residences to stores and shops, as well as a layout that supports activities centered on human interaction. The movement toward sustainable communities and cities is a goal being embraced by citizens and federal councils.

# Factors in Environmental Public Policy

**Question 1: What are the two basic kinds of economic systems, and how do they differ?**

**Answer 1:** The two types of basic economic systems are the

* centrally planned economy, associated with socialist countries (former Soviet Union, North Korea, and China); those with the power and the money (ruling class) get to make the decisions.
* free market economy, associated with capitalist countries (United States); the market itself that determines what will be exchanged; businesses compete against each other in a supply and demand set up.

They are similar in that the cycle of consumption and production is the same. Money cycles from households to businesses (purchase of goods and services) and then back from the business to the households (people get paid for labor). However, they are different in what determines what products are made, how many products are made, and by whom.

It is important to note that no country holds true completely to one type of economic system. It is often a combination of the two types.

**Question 2: How is environmental public policy developed in modern societies?**

**Answer 2:** Some environmental issues are dealt with on a local level (state agencies), and others are dealt with on a larger scale (government agencies). Regardless of the magnitude, all public policy is developed in four stages:

1. **Recognition:**There is a perception of an environmental problem (increase of disease, dead animals, etc.), a scientific investigation with published reports, and then the media bringing the subject to the public’s attention. At this point, there is no or very low political weight.
2. **Formulation:**The public, scientists, and government debate on what should be done and possible policy options. This second stage rapidly increases political weight.
3. **Implementation:** The policy is actually put to work. A powerful regulatory agency such as the Environmental Protection Agency enforces the new policy. This stage has real political and economic costs extracted.
4. **Control:**Many public policies remain at this stage for decades. During this stage, the environmental problem is getting better, and new regulations to meet the demands of the problem are being constructed as the environment changes.

**Question 3: What is economic exclusion?**

**Answer 3:** *Urban sprawl* displaced the demand for goods and services to areas outside the city. To make a profit, businesses started to leave the city and move toward the suburbs. Those individuals left in the city not only lost the access to goods and services but also lost their source of income as employment opportunities decreased. Because they now make less money, they cannot afford to move to the suburbs. So, they become economically excluded from the mainstream.

**Question 4: What are the environmental effects of urban sprawl?**

**Answer 4:** Urban sprawl refers to the network of interconnecting highways that expand from the cities to the urban areas. The practice of building things away from the city has made people dependent on automobiles. The more people that move to the suburbs, the more cars there are on the road. The more cars there are on the road, the higher the demand on fossil fuels, and the higher the pollution emission entering the environment. With more cars on the road, the need for more highways arose. Soon farm land was being lost to expand the highways. Wildlife areas are destroyed and water resources polluted. Urban sprawl is depleting energy sources; increasing air pollution; increasing water pollution; and degradation of water resources causes a loss of landscapes, wildlife, and agricultural land.

**Question 5: What characteristics make a city livable?**

**Answer 5:** Determining what makes a city livable is an extremely important concept because if the world population continues to increase, we will need to successfully revitalize cities. The most livable cities in the world maintain high populations; have a variety of businesses, shops, and stores; and have adequate areas for recreation.

For a city to be livable, it must have the following six things:

* an adequate public transportation system
* availability to grocery stores and pharmacies
* available living quarters
* adequate schools
* city parks for recreation
* an adequate sewage system

Without one of these things, people will not want to remain in the city.

# Environmental Solutions, Laws & Agencies

**Question 1:** Which agencies or organizations establish, enforce, and monitor international environmental laws, agreements, or policies?

**Answer 1:** Environmental laws and policies can be established at many levels from the municipal level to international laws or agreements. This is appropriate as environmental issues range many scales from local to regional, national, or global in scope. For example, a city may decide to restrict development to protect natural areas, or green space. The international community might address global climate change issues, such as the potential for global warming or destruction of the ozone layer.

Environmental agencies or commissions are established across all scales, and they reflect government structure. For example, in the United States, the Environmental Protection Agency (EPA) has the mission to protect environment and human health (About EPA, 2006). There are many other federal agencies, such as the United States Department of the Interior, United States Department of Agriculture, or the United States Department of Energy, which also addresses and manages environmental solutions (Government Agency, Federal, n.d.). Federal environmental laws in the United States follow the process by which all laws are passed through Congress and are then sent for signing or vetoing to the President. State and local laws follow their typical governmental processes. To carry out the provisions of the laws, detailed regulations are adopted and enforced by authorized agencies. For example, in the United States, the EPA sets levels of pollutants under the Clean Air Act and enforces these standards nationwide (Major Environmental Laws, 2006).

International laws or agreements are discussed and enacted by nations through organizations such as the United Nations and especially the United Nations Environment Programme (UNEP) established in 1972. Its mission is "to provide leadership and encourage partnership in caring for the environment by inspiring, informing and enabling nations and peoples to improve their quality of life without compromising that of the future generations." UNEP assists in development of environmental laws and provides “technical, legal and institutional advice to Governments”  (Environmental Law Programme: About, 2006). It also functions in compliance. “It undertakes and assists training and coordination activities among national enforcement authorities, convention secretariats, Interpol and the World Customs Organizations” (Environmental Law Programme: About, 2006).

International laws are known as either *hard* *law* or *soft* *law* instruments. Hard laws are legally binding and include multilateral environmental agreements (MEAs), such as the Stockholm Convention on Persistent Organic Pollutants (POPs) (Development of International Environmental Law, 2006). Soft laws are nonlegally binding instruments that urge voluntary environmental protection by nations, such as the Code of Ethics on the International Trade in Chemicals (Environmental Law Programme: Compliance, 2006).

**Question 2:** What is the National Environmental Policy Act (NEPA)? What is the NEPA process?

**Answer 2:** Signed into law January 1, 1970, the National Environmental Policy Act (NEPA) is the cornerstone for environmental policy and protection in the United States, and it establishes processes for oversight by the Council on Environmental Quality (CEQ). The CEQ monitors federal agencies for compliance with NEPA, suggests policies, and conducts research about environmental concerns and ecosystem functions (Basic Information, 2006).

NEPA regulations were passed in 1978 and modified in 1986; they are binding upon all federal agencies. There are three levels to the NEPA process. At the first level, it may be determined that no detailed environmental analysis is needed. It is categorically excluded if “a federal agency has previously determined as having no significant environmental impact” (Basic Information, 2006).  At the second level, the federal agency writes an environmental assessment (EA) to determine whether or not a federal undertaking would significantly affect the environment (Basic Information, 2006). If no significant impact is anticipated, the action may proceed, perhaps with mitigation to address environmental concerns. However, if significant impact is likely, the agency proceeds to level three—the preparation of an environmental impact statement (EIS). This is a "detailed statement assessing the environmental impact of and alternatives to major federal actions significantly affecting the environment" (Basic Information, 2006). The public can submit comments as part of the EIS process.

The Environmental Protection Agency (EPA) has a key administrative role in the NEPA process. It reviews and prepares responses on EISs and works on NEPA issues with government agencies at all levels and with the general public. The EPA is also charged with compliance, developing regulations, and providing recommendations for programs (National Environmental Policy Act, 2006).

**Question 3:** What are examples of major environmental laws in the United States?

**Answer 3:** In addition to the National Environmental Policy Act, there are many federal environmental laws to sustain ecosystems and protect public health. Examples are the Pollution Prevention Act (PPA), the Clean Air Act, the Toxic Substances Control Act (TSCA), and the Clean Water Act (CWA) (Major Environmental Laws, 2006).

The Pollution Prevention Act (1990) focuses on "reducing the amount of environmental pollution through cost-effective changes in production, operation, and raw materials use." Some recommended practices include "recycling, source reduction, and sustainable agriculture" (Pollution Prevention Act, 2006).

Under the 1990 Clean Air Act, the Environmental Protection Agency (EPA) sets limits on atmospheric pollutants and tasks the individual states with developing State Implementation Plans to meet these standards. The Act also requires any large company that releases pollutants into the air to apply for a permit; the application contains detailed information about the type and level of pollution as well as procedures for monitoring and control. The Act establishes an incentive program for companies that exceed pollution reduction goals (Features of the 1990 Clean Air Act, 2006).

Under the Toxic Substances Control Act (1976), the EPA tracks industrial chemicals that are either produced in or imported into the United States. The EPA can screen, test, and ban manufacture and import of chemicals that pose a hazard to humans or the environment (Toxic Substances Control Act, 2006).

The Clean Water Act (1972) and its amendments set goals to protect and restore surface water quality and sustainable aquatic ecosystems through the reduction and management of water pollution. The EPA sets regulations, provides funding, and develops education to accomplish the broad goals of the Clean Water Act (Clean Water Act, 2006).

**Question 4:** What are examples of major international environmental laws?

**Answer 4:** It can be difficult to obtain consensus among nations to both draft and adopt international laws. Despite challenges for continued support and enforcement of international laws, it can be argued that global negotiations and discussions about environmental concerns are themselves valuable and should continue. Examples of international agreements include the Montreal Protocol on Substances That Deplete the Ozone Layer (1987), the Stockholm Convention on Persistent Organic Pollutants (POPS) (2001), the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (1999), and the United Nations Framework Convention on Climate Change (1994) (Global Environmental Agreements, 2006).

The Montreal Protocol on Substances That Deplete the Ozone Layer was signed in 1987 and amended in 1990 and 1992 (The Montreal Protocol, n.d.). Scientists determined that several chemicals, such as chlorofluorocarbons (CFCs), deplete the stratosphere ozone shield that protects the Earth from harmful ultraviolet radiation. The Montreal Protocol provided for a phaseout of the production and use of these harmful atmospheric pollutants (The Montreal Protocol, n.d.).

The Stockholm Convention was passed in 2001 to eliminate the release of persistent organic pollutants (POPs) into the environment. They remain in the environment for long periods of time, and they can accumulate in the fatty tissue of living organisms. POPs are toxic to both humans and wildlife (Stockholm Convention, n.d.).

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (1999) is a global agreement that seeks to minimize the production and movement of hazardous wastes. Specifically, it calls for environmentally sound management of hazardous wastes, "taking all practical steps to minimize the generation of hazardous wastes and strictly controlling its storage, transport, treatment, reuse, recycling, recovery, and final disposal, the purpose of which is to protect human health and the environment" (Introduction, n.d.).

The United Nations Framework Convention on Climate Change (1994) addresses the issues of potential climate change in the face of increasing levels of anthropogenic greenhouse gases, such as carbon dioxide, in the atmosphere. Under the terms of the Convention, nations will cooperate to share information and determine strategies to deal with greenhouse gas emissions and their potential impacts (The United Nations, n.d.). Subsequently, the Kyoto Protocol was drafted in 1997 to commit developed countries in legal agreements to limit or reduce greenhouse emissions. The United States has signed but not ratified the Kyoto Protocol (Kyoto Protocol, Status of Ratification, n.d.).

**Question 5:** What are the costs and benefits of environmental regulations?

**Answer 5:** Regulations may include upfront costs for implementation and technological improvements, or penalties may be levied against those who do not comply with regulations. In addition, placing restrictions on the harvest of natural resources can impact those who earn a living from jobs such as commercial fishing, timber harvest, or mining. Critics claim that environmental laws increase costs to small business owners or individual taxpayers and that these costs are passed to consumers or taxpayers (Earth Day n.d.; Pompili, n.d.).

Environmental economics and cost-benefit analyses can be used to determine the economics of regulations that are enacted to protect the ecosystem and human health. In the United States, by federal executive order, any proposed federal regulatory actions must include a cost-benefit analysis, which includes environmental regulations (Wierenga, 2003).

If economists can determine the values of ecosystem goods and services, it is possible to calculate economic loss if these services are degraded or destroyed. Loss of human productivity because of environmental pollution and health hazards can also be evaluated. According to the World Bank, "Valuation, the process of placing monetary values on environmental impacts, is an essential element in incorporating the benefits of costs of environmental effects into the analysis of alternatives" (Environmental Economics, 2006). In addition, it can be argued that the environment is a source of economic wealth and a "key resource for development" (Environmental Policy, 2006). Environmental regulations protect this wealth.

**Question 6:** How are natural lands protected?

**Answer 6:** Natural lands can be set aside as parks, wilderness areas, wildlife refuges, or protected areas. There are many designations, and protection and conservation can be found at many scales from actions taken by individual landowners to nations that establish global biopreseves.

At the individual level, a homeowner may protect or restore natural species on his or her property and may then enter into a conservation easement, "a legal agreement between a landowner and a land trust or government agency that permanently limits uses of the land in order to protect its conservation values. It allows you to continue to own and use your land and to sell it or pass it on to heirs" (Conservation Options, n.d.)

Cities may set aside green space for recreation and conservation. One of the smart growth principles for cities is to "preserve open space, farmland, natural beauty and critical environmental areas" (Smart Growth Overview, 2006). Smart growth principles are designed to incorporate quality of life considerations into development patterns, and they include a "strong environmental ethic" (Smart Growth Overview, 2006).

Nations set aside land for preserves, parks, and wilderness areas for recreation and natural resource use. In the United States, the United States Department of the Interior (DOI) manages land for various uses through several federal agencies. "The DOI manages 500 million acres of surface land, or about one-fifth of the land in the United States, including 261.7 million acres managed by the Bureau of Land Management, 94.3 million acres managed by the Fish and Wildlife Service and 84.6 million acres managed by the National Park Service" (DOI Quick Facts, 2006).

In 2005, the Natural Areas Association conducted a study about the status of natural area programs at the state level in the United States and compared it to a similar study done in 1976. According to the study, “Although fewer states have comprehensive natural area programs today than in 1976, many programs continue to grow, expand and maintain public support” (Thom, Lisenbardt, Kramer, & Schuller, 2005). The report found many differences among state natural area programs; however, the report concluded that the state programs are important to protect natural systems and biodiversity (Thom, Lisenbardt, Kramer, & Schuller, 2005).

At the global level, the United Nations Educational, Scientific and Cultural Organization (UNESCO) promotes the establishment of biosphere reserves through the Man and the Biosphere Program (MAB). Under this program, participating nations set up preserves and share information with each other; the goals are geared toward conservation and sustainable development. “There are 482 sites worldwide in 102 countries” (Biosphere Reserves, 2006).

**Question 7:** How are individual species protected?

**Answer 7:** To protect species, an important first step is to identify and catalogue the world’s species and their statuses, in other words, assess global biodiversity. This is a daunting task, but international groups such as the Species Survival Commission (SSC), and the International Union for the Conservation of Nature (IUCN), and Natural Resources Species Programme have set these as goals. “SSC is committed to providing the world with the most objective, scientifically-based information on the current status of global biodiversity. It disseminates this information through the IUCN Red List of Threatened Species” (Our Work: What We Do, 2006).

Efforts to identify and catalogue species in comprehensive databases are also ongoing at the national level. In the United States, a network of Natural Heritage Programs identifies “species, natural communities, and ecosystems in need of protection at the local, regional, national, and global levels” (The Natural Heritage Network, n.d.).

If a species is experiencing population decline or is facing extinction, it is imperative to understand the species’ biology and ecological niche. In some cases, a species may be protected under local, national, or global laws that may apply not only to the species but also to its habitat. For example, in the United States the Endangered Species Act “prohibits any action, administrative or real, that results in a ‘taking' of a listed species, or adversely affects habitat. Likewise, import, export, interstate, and foreign commerce of listed species are all prohibited.” The United States Fish and Wildlife Service and the Department of the Interior maintain the list of threatened or endangered species under the Endangered Species Act and enforce the regulations (Endangered Species Act, 2006).

International laws and agreements also list and protect species biodiversity (UNEP Activities in Biodiversity, n.d.). The United Nations Convention on Biodiversity (1992) establishes three main goals: the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits from the use of genetic resources (Sustaining Life on Earth, 2005). U.N. member nations that have signed the Convention assume the responsibility to promote the sustainable uses of biodiversity through species identification, protection, and restoration of degraded ecosystems, and educational outreach (Sustaining Life on Earth, 2005).

**Question 8:** What is ecosystem management?

**Answer 8:** As an ecosystem is the functional unit that integrates living organisms, abiotic factors, and their interactions, ecosystem management is a logical approach to maintaining sustainable ecosystems and their services. The importance of ecosystem services to human sustainability is incorporated into this management approach. According to the IUCN’s Commission on Ecosystem Management (CEM), "Ecosystem management is a process that integrates ecological, socio-economic, and institutional factors into comprehensive analyses and action in order to sustain and enhance the quality of the ecosystem to meet current and future needs" (What is Ecosystem Management, 2006).

In the United States, all federal agencies that maintain public lands and biological resources, such as the United States Forest Service (USFS) and the Bureau of Land Management (BLM), have adopted an ecosystem approach to sustainable resource management. As part of its educational outreach, the BLM explains, "The goal of ecosystem management is to achieve healthy, productive, and diverse ecosystems as well as healthy human communities—people working in ways that keep the environment healthy and sustainable in perpetuity" (The Ecosystem Sustained, 2003).

Despite differences in defining and applying ecosystem management, staff at the University of Washington’s Silviculture Laboratory has identified two common themes, "(1) management should maintain or improve ecosystems, and (2) ecosystems should provide a range of goods and services to current and future generations" (Ecosystem Management, n.d.). The protection of threatened or endangered species and their habitats continues to be important. The ecosystem approach not only protects individual species but also maintains healthy, functional ecosystems in a proactive manner that may help to prevent population declines.

**Question 9:** What is ecological restoration?

**Answer 9:** The Society for Ecological Restoration defines ecological restoration as “the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed” (What is Ecosystem Restoration, 2006). Therefore, ecological restoration may often be an important component of ecosystem management. Humans and other species can benefit from ecosystem services because degraded ecosystems may need to be restored. The Commission on Ecosystem Management (CEM) states, “Ecosystem restoration should be a primary component of conservation and sustainable development programmes so that livelihoods of people depending on these degraded ecosystems can be sustained” (What is Ecosystem Restoration, 2006).

To determine whether an ecosystem has been restored, certain criteria should be met. According to the Society for Ecological Restoration, the restored ecosystem will have the abiotic and biotic structure, and it will function as a natural ecosystem. It will be able to sustain itself through time and recover from a range of disturbances typical for the area. “It will interact with contiguous ecosystems in terms of biotic and abiotic flows and cultural interactions” (The SER International Primer, 2004).

In the United States, the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) provides funding and regulations for “cleaning up abandoned or uncontrolled hazardous waste sites” (CERCLA Overview, 2006). These superfund sites are examples of severely polluted sites that may require extensive remediation, and although health hazards may be removed, the natural ecosystem may or may not recover. Although ecological restoration projects may succeed, other management options such as protection, conservation, and sustainable use are likely to be more cost-effective approaches, especially when trying to restore severely damaged ecosystems.

**Question 10:** What are the roles of individuals in the development of sustainable environmental solutions?

**Answer 10:** Individuals can seek information about environmental issues and proposed solutions to make informed personal decisions. There are many educational resources in the public media from both educational outreach programs and publications supplied by local, national, and global organizations and research published by ecologists and environmental scientists.

There are also numerous nongovernmental organizations (NGOs) that present views and information about environmental issues. NGOs may focus on one issue or several, and they often have differing opinions about the best courses of action depending upon their political views. A group may be proenvironment, such as the Sierra Club. Others may take the stance that environmental problems are overstated and environmental solutions infringe upon private or business interests, generally stated by followers of the Wise Use Movement (Arnold, n.d.).

Individuals who read and analyze this wealth of information will reach decisions about environmental solutions and about their personal involvement in conservation or preservation or in participation in organizations (Concerned Citizens, 2006). They may decide to offer comment on proposed governmental regulations and actions. For example, in the United States, the public can participate in the NEPA process by sending comments about what issues should be considered in an EIS, attend and speak at a public hearing, and submit comments about a draft EIS during the comment period (Basic Information, 2006).

# Easter Island: Impact of Humans on Earth

The impact our species has on the environment is best illustrated by the history of Easter Island. Imagine a place one quarter the size of Walt Disney World, located 2,000 miles by boat from the nearest land. Welcome to Easter Island—the world’s most isolated location—surrounded on all sides by the vast Pacific Ocean. The mystery of how ancient man found and inhabited this speckle of land remains an open debate, but a civilization did develop and prosper for a time. The natives were known as the Rapa Nui.

The Rapa Nui began as hunters and gatherers. They were sustained by the food the environment had to offer. The land was bountiful and the population grew rapidly. The island also had a ruling class that demanded a higher proportion of the island's commodities. Eventually the island's resources were not sufficient to meet the needs of the people. The society had to change.

Change came in the form of the Neolithic Revolution, a time when people stopped being hunters and gatherers and began venturing into agriculture. It was thought that by growing food in one location, it would be easier to collect and more readily available to feed the growing population.

The forests were cleared to make room for farming. When large rocks were discovered, they were removed to create statues in homage to the gods. The Rapa Nui did not realize that the rocks and trees served the vital function of holding the soil in place. The rains came and washed the soil into the sea, blanketing the nutrients meant to feed plankton. Without nutrients, the plankton died; without plankton, the fish left in search of new feeding grounds.

The trees served the secondary function of cooling the island with shade. Without tree cover (and root structures) the island's water supply began to disappear. The still-growing population found itself isolated from the rest of the world and without enough resources to sustain it. People died of disease and malnutrition. War and civil strife started as people struggled to maintain their families on the ever decreasing food and water supplies.

Eventually, the island was discovered by Dutch whalers. Among other things, the whalers brought goats to the island as a way of providing fresh meat for future voyages. But rather than help the Rapa Nui, the Dutch exploited the weakened population for slave labor and prostitution, introducing sexually transmitted diseases to the natives. Today, the population of Rapa Nui is estimated to be less than 300 people.

The lessons we learn from the events of Easter Island are many. People can take from the environment as long as the environment has time to replenish. When the demand on resources becomes greater than the environment can sustain, the environment will die.

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