

Ecology and Sustainable Development in Global Business

The world community faces unprecedented ecological challenges in the 21st century. Many political and business leaders have embraced the idea of sustainable development, calling for economic growth without destroying the natural environment or depleting the resources on which future generations depend. Yet the concept has remained controversial, and implementation has been difficult. The task for government policy makers and corporate leaders will be to find ways to meet both economic and environmental goals in the coming decades, without sacrificing either.

This chapter focuses on these key learning objectives:

- Defining sustainable development.
- Understanding the obstacles to developing the world's economy to meet the needs of the present without hurting future generations.
- Assessing the major threats to the Earth's ecosystem.
- Recognizing the ways in which population growth, inequality, and industrialization have accelerated the world's ecological crisis.
- Examining common environmental issues that are shared by all nations.
- Analyzing the steps the global business community can take to reduce ecological damage and promote sustainable development.

In 1992, representatives of the world's nations gathered in Rio de Janeiro, Brazil, for a groundbreaking event, the first World Summit on Sustainable Development. In a series of contentious sessions, delegates considered, on one hand, the growing dangers of environmental degradation and, on the other hand, the urgent need for economic development in poorer nations. Would it be possible, they asked, to foster economic growth sufficient to lift the majority of the world's people out of poverty without compromising the ability of future generations to meet their own needs?

Now, a decade and a half later, progress toward achieving these goals had been in many respects disappointing. Consider that at the 1992 gathering:

- Delegates had pledged to attack the problem of global warming, increases in the Earth's temperature caused in part by carbon dioxide emissions from the world's factories, utilities, and vehicles. The conference had called on developed countries to cut back to 1990 levels by the year 2000. But only half the developed countries had met this target, and annual emissions of carbon dioxide had reached new highs, threatening disruption of the world's climate.

The United States, the world's largest emitter of greenhouse gases, had not signed an international treaty to curb carbon emissions.¹

- Delegates had committed to a framework Convention on Biological Diversity, dedicated to conserving the earth's biological resources, particularly in species-rich tropical forests. But many plants and animals remained endangered. Vast stretches of rain forest had been cut down. In Indonesia, for example, home to large numbers of endangered birds, mammals, and reptiles, tropical forest was being logged for timber and burned to clear land at an astonishing rate, destroying habitat and, not incidentally, causing serious air pollution throughout Southeast Asia.²
- Many developed nations had pledged to increase foreign aid to 0.7 percent of their gross national income (GNI) to help poorer countries develop their economies in an environmentally sustainable way. But during the intervening years, aid had actually fallen to just 0.26 percent of GNI, lower than it was in 1992.³ Now the question was just as urgent as it had been before: Who would pay for the costs of clean development in the poorer countries?

However, important progress had been made. Although the world population was still growing, the rate of growth had dropped somewhat. The World Bank, an important lender to developing countries, had instituted a strict environmental review process, refusing to fund ecologically destructive projects. Important gains had been made in efforts to restore the health of the ozone layer. Many nations, notably in Europe, had made progress on energy conservation. And possibly most promisingly, many segments of the global business community had become increasingly active in promoting environmentally sound management practices. Could the world's governments, businesses, nongovernmental organizations, and individuals, working together, meet the ecological challenges of the 21st century and put the global economy on a more sustainable course?⁴

Ecological Challenges

Humankind is now altering the face of the planet, rivaling the forces of nature herself—glaciers, volcanoes, asteroids, and earthquakes—in impact. Human beings have literally rerouted rivers, moved mountains, and burned forests. By the last decade of the 20th century, human society had transformed about half of the earth's ice-free surface and made a major impact on most of the rest. In many areas, as much land was used by transportation systems as by agriculture. Although significant natural resources—fossil fuels, fresh water, fertile land, and forest—remained, exploding populations and rapid industrialization had reached the point where, by some measures, the demands of human society had already exceeded the carrying capacity of the earth's ecosystem.

Ecology is the study of how living things—plants and animals—interact with one another in such a unified natural system, or ecosystem. Damage to the ecosystem in one part of the world often affects people in other locations. Depletion of the ozone layer, destruction of the rain forests, and species extinctions have an impact on all of society, not just particular regions or nations.

The Global Commons

Throughout history, communities of people have created *commons*. A **commons** is a shared resource, such as land, air, or water, that a group of people use collectively. The paradox of the commons is that if all individuals attempt to maximize their own private advantage in the short term, the commons may be destroyed, and all users, present and future, lose. The only solution is restraint, either voluntary or through mutual agreement.⁵ The tragedy of the commons—that freedom in a commons brings ruin to all—is illustrated by the following parable.

There was once a village on the shore of a great ocean. Its people made a good living from the rich fishing grounds that lay offshore, the bounty of which seemed inexhaustible. Some of the cleverest fishermen began to experiment with new ways to catch more fish, borrowing money to buy bigger and better equipped boats. Since it was hard to argue with success, others copied their new techniques. Soon fish began to be harder to find, and their average size began to decline. Eventually, the fishery collapsed, bringing economic calamity to the village. A wise elder commented, “You see, the fish were not free after all. It was our folly to act as if they were.”⁶

In a sense, we live today in a global commons, in which many natural resources, like the fishing grounds in this parable, are used collectively. The image of the earth as seen from space, a blue-and-green globe, girdled by white clouds, floating in blackness, dramatically shows us that we share a single, unified ecosystem. Preserving our common ecosystem and assuring its continued use is a new imperative for governments, business, and society. As we move into the 21st century, to quote Maurice Strong, secretary general of the 1992 World Summit, “We now face the ultimate management challenge, that of managing our own future as a species.”

Sustainable Development

The need for balance between economic and environmental considerations is captured in the concept of **sustainable development**. This term refers to development that “meets the needs of the present without compromising the ability of future generations to meet their own needs.”⁷ The concept includes two core ideas:

- Protecting the environment will require economic development. Poverty is an underlying cause of environmental degradation. People who lack food, shelter, and basic amenities misuse resources just to survive. For this reason, environmental protection will require providing a decent standard of living for all the world’s citizens.
- But economic development must be accomplished sustainably, that is, in a way that conserves the earth’s resources for future generations. Growth cannot occur at the expense of degrading the forests, farmland, water, and air that must continue to support life on this planet. We must leave the earth in as good shape—or better shape—than we found it.

In short, the idea of sustainable development encompasses a kind of puzzle. It challenges government and business leaders to eradicate poverty and develop the world economy but to do so in a way that does not degrade the environment or plunder natural resources.

the River Jordan had exacerbated conflict between Israel and Palestine.⁹ According to a United Nations study, one-third of the world's population lives in countries experiencing moderate to high water stress.¹⁰

Fossil Fuels

Fossil fuels, unlike water, are nonrenewable. Human society used 60 times as much energy in the late 20th century as it did in 1860, when industrialization was in its early stages. Most of this came from the burning of fossil fuels; 80 percent of all commercial energy comes from the combustion of coal, oil, and natural gas. The amount of fossil fuel burned by the world economy in one year took about a million years to form, and only one barrel is discovered for every three or four consumed. No one knows how much longer it will be possible to produce oil economically. However, some recent estimates suggest that oil production will peak sometime between 2010 and 2020.¹¹ Coal reserves are plentiful and could last three to four more centuries, although coal is more polluting than either oil or natural gas. Eventually, however, many fossil fuel reserves will be depleted, and the world economy will need to become much more energy efficient and switch to renewable energy sources, such as those based on water, wind, and sunshine.

Arable Land

Arable (fertile) land is necessary to grow crops to feed the world's people. Land, if properly cared for, is a renewable resource. Although the productivity of land increased through much of the 20th century, by the mid-2000s much of the world's arable land was threatened with decline. About half of irrigated farmland in developing countries required reclamation because of salinization (excess salt) or poor drainage. In many areas, overly intensive farming practices had caused previously arable land to turn into desert. In 2001, a massive dust storm caused by overgrazed grasslands in China blew all the way across the Pacific, darkening skies over North America.¹² The United Nations has estimated that 10 million hectares of arable land are lost every year to desertification (one hectare equals about two and a half acres).¹³

Forces of Change

Pressure on the earth's resource base is becoming increasingly severe. Three critical factors have combined to accelerate the ecological crisis facing the world community and to make sustainable development more difficult. These are population growth, world income inequality, and the rapid industrialization of many developing nations.

The Population Explosion

A major driver of environmental degradation is the exponential growth of the world's population. A population that doubled every 50 years, for example, would be said to be growing exponentially. Many more people would be added during the second 50 years than during the first, even though the rate of growth would stay the same. Just 10,000 years ago, the earth was home to no more than 10 million humans, scattered in small settlements. For many thousands of years, population growth was gradual. Around 1950, as shown in Figure 11.1, the world population reached 2.5 billion. World population crossed the 6 billion mark in 1999. The United Nations estimates that the population will eventually level out at just under

10 billion around 2150. To gain some perspective on these figures, consider that someone born in 1950 who lives to be 75 years old will have seen the world's population increase by more than 5 billion people.

This growth will not be distributed equally. In the industrialized countries, especially in Europe, population growth has already slowed. About 95 percent of the world's population growth over the next 30 years is predicted to be in less developed countries, especially in Africa, Latin America, and Asia.

The world's burgeoning population will put increasing strain on the earth's resources. Each additional person uses raw materials and adds pollutants to the land, air, and water. The world's total industrial production would have to quintuple over the next 40 years just to maintain the same standard of living that people have now. Protecting the environment in the face of rapid population growth is very difficult. For example, in some parts of western Africa, population growth has put great pressure on available farmland, which is not allowed to lie fallow. Because much of the available firewood has already been cut, people use livestock dung for fuel instead of fertilizer. The result has been a deepening cycle of poverty, as more and more people try to live off less and less productive land.

World Income Inequality

A second important cause of environmental degradation is the inequality between rich and poor. Although economic development has raised living standards for many, large numbers of the world's people continue to live in severe poverty. According to the most recent estimates, around 2.5 billion people (about 40 percent of the world's population) had incomes below the international poverty line of \$2 a day. These people, most of them in sub-Saharan Africa, South Asia, East Asia, and the Pacific, lived very near the margin of subsistence. They had only a tiny fraction of the goods and services enjoyed by those in the industrialized nations.¹⁴

Some of the most extreme poverty is found on the outskirts of rapidly growing cities in developing countries. In many parts of the world, people have moved to urban areas in search of work. Often, they must live in slums, in makeshift dwellings without sanitation or running water. In Bangkok, Thailand, a sprawling city of 9 million, 20 percent of the population live in such areas. In Manila in the Philippines, where a quarter of the 10 million inhabitants live in squatter settlements, hundreds died when a garbage dump nearby shifted, burying scores of people.

The world's income is not distributed equally. The United Nations' 2005 *Human Development Report* found that the gap between the richest and poorest countries was large and getting larger. The income of the average American, for example, was 61 times the income of the average Tanzanian. The richest 20 percent of the world's people held 73 percent of the income; the poorest 20 percent held just 2 percent.¹⁵ Figure 11.2 shows how just how inequitably the world's income is distributed.

Inequality is an environmental problem because countries (and people) at either extreme of income tend to behave in more environmentally destructive ways than those in the middle. People in the richest countries consume far more fossil fuels, wood, and meat, for example. People in the poorest countries, for their part, often misuse natural resources just to survive, for example, cutting down trees for fuel to cook food and keep warm.

Parts of the Third World are industrializing at a rapid pace. This is positive because it holds out the promise of reducing poverty and slowing population growth. But economic development has also contributed to the growing ecological crisis. Industry requires energy, much of which comes from burning fossil fuels, releasing pollutants of various kinds into the atmosphere and wastes that pollute land,

issues. For example, high global temperatures could cause sea level rise, which would displace millions of people. Deforestation and loss of biodiversity could impact the food supply and the environment. The depletion of the ozone layer could lead to an increase in skin cancer and other health problems. The depletion of the ozone layer could also lead to an increase in global warming, which could lead to an increase in sea level rise and other environmental problems.²⁰

Global Environmental Issues

Some environmental problems are inherently global in scope and require international cooperation. Typically these are issues pertaining to the global commons, that is, resources shared by all nations. Four global problems that will have major consequences for business and society are ozone depletion, global warming, decline of biodiversity, and threats to the world's oceans.

Ozone Depletion

Ozone is a bluish gas, composed of three bonded oxygen atoms, that floats in a thin layer in the stratosphere between 8 and 25 miles above the planet. Although poisonous to humans in the lower atmosphere, ozone in the stratosphere is critical to life on earth by absorbing dangerous ultraviolet light from the sun. Too much ultraviolet light can cause skin cancer and damage the eyes and immune systems of humans and other species.

In 1974, scientists first hypothesized that chlorofluorocarbons (CFCs), manufactured chemicals widely used as refrigerants, insulation, solvents, and propellants in spray cans, could react with and destroy ozone. Little evidence existed of actual ozone depletion, however, until 1985, when scientists discovered a thin spot, or hole, in the ozone layer over Antarctica. Studies showed that in the upper atmosphere, intense solar rays had split CFC molecules, releasing chlorine atoms that had reacted with and destroyed ozone. Scientists later found evidence of ozone depletion in the northern latitudes over Europe and North America during the summer, when the sun's ultraviolet rays are the strongest and pose the greatest danger.

World political leaders moved quickly in response to scientific evidence that CFCs posed a threat to the earth's protective ozone shield. In 1987, a group of nations negotiated the **Montreal Protocol**, agreeing to cut CFC production; the agreement was later amended to ban CFCs, along with several other ozone-depleting chemicals. Developing countries were given until 2010 to phase out CFCs completely. As of 2006, 189 countries, all but a tiny handful, had signed the protocol.²¹

By the turn of the century, most businesses in the developed world had completed the transition to CFC substitutes, and many had made money by doing so. Du Pont, Allied Signal, Elf-Altochem, and several other chemical companies had developed profitable substitutes for banned ozone-depleting chemicals. All the major appliance manufacturers, such as Electrolux in Sweden and Whirlpool in the United States, had brought out successful new lines of CFC-free refrigerators and freezers, and carmakers had developed air-conditioners that operated without the dangerous coolant.

Have the Montreal Protocol and business efforts to respond to it been successful? One scientific study found that the concentration of ozone-depleting chemicals in the atmosphere peaked in 1994, and then began a slow decline. The authors predicted that, because of a lag effect, the highest levels of ozone depletion would occur in the early 2000s. The protective layer would then recover gradually, provided that regulations

continued to be effective.²² The world community still faces the challenge of restricting the manufacture of other ozone-depleting substances not yet fully regulated by treaty. But overall, this is an example of world governments working together effectively to address a global environmental threat.

Global Warming

Another difficult problem facing the world community is the gradual warming of the Earth's atmosphere. Although uncertainty remains about the rate and causes of **global warming**, business and governments have begun to respond to the issue.

The Earth's atmosphere contains carbon dioxide and other trace gases that, like the glass panels in a greenhouse, prevent some of the heat reflected from the Earth's surface from escaping into space, as illustrated in Figure 11.3. Without this so-called greenhouse effect, the Earth would be too cold to support life. Since the Industrial Revolution, which began in the late 1700s, the amount of greenhouse gases in the atmosphere has increased by as much as 25 percent, largely due to the burning of fossil fuels such as oil and natural gas. According to the Intergovernmental Panel on Climate Change (IPCC), a group of the world's leading atmospheric scientists, the earth has already warmed by between 0.3 and 0.6 degrees Celsius over the past century. (One degree Celsius equals 1.8 degrees Fahrenheit, the unit commonly used in the United States.) If societal emissions of greenhouse gases continue to grow unchecked, the IPCC predicted, the Earth could warm by as much as 6 degrees Celsius more by 2100, and possibly even more.²³

The possible causes of global warming are numerous. The burning of fossil fuels, which releases carbon dioxide, is the leading contributor. But consider the following additional causes.²⁴

- *Deforestation.* Trees and other plants absorb carbon dioxide, removing it from the atmosphere. Deforestation—cutting down and not replacing trees—thus contributes to global warming. Burning forests to clear land for grazing or agriculture also releases carbon directly into the atmosphere as a component of smoke. Large-scale deforestation thus contributes in two ways to global warming.
- *Beef production.* Methane, a potent greenhouse gas, is produced as a by-product of the digestion of some animals, including cows. Large-scale cattle ranching releases significant amounts of methane.
- *Global Warming and Global Warming*

Global warming in the world may experience that a capital loss, violent storms, damaging wildfires and epidemics of tropical diseases in the 21st century. The price caps may partly melt, raising sea levels and causing flooding in low-lying coastal areas such as Florida, Bangladesh and the Netherlands may become difficult to grow when low water is now in the U.S. and that may could be a many of the world's communities to be hit by many species.²⁵

In 1997, many of the world's nations gathered in Kyoto, Japan, to consider amendments to the Convention on Climate Change, an international treaty on global warming. In difficult negotiations, the parties hammered out an agreement called the **Kyoto Protocol** that would require industrial countries to reduce greenhouse gas emissions more than 5 percent below 1990 levels, over a period of several years. The Kyoto Protocol went into effect in 2005, after countries representing 55 percent of the world's carbon emissions had ratified it. The European Union took an immediate lead, restricting the amount of carbon that could be emitted by power, steel, paper, cement, and glass plants. An official there commented that although compliance with Kyoto would cost money in the short run, energy conservation would cause European firms to become "leaner and more efficient, and that could turn into a long-term business advantage."²⁶ By 2006, 161 nations, representing 62 percent of the world's carbon emissions, had ratified; the United States, the world's largest producer of carbon emissions, was a notable exception.²⁷ (The United States declined to ratify the treaty on the grounds it would harm the U.S. economy.)

Addressing the challenge of climate change will require action not only by governments, but also by the world corporate community. The efforts of several business organizations to reduce their carbon emissions are profiled in Exhibit 11.C.

Decline of Biodiversity

Every species extinction diminishes humanity. Every microorganism, animal, and plant contains on the order of from one million to 10 billion bits of information in its genetic code, hammered into existence by an astronomical number of mutations and episodes of natural selection over the course of thousands or even millions of years of evolution. . . . Species diversity—the world’s available gene pool—is one of our planet’s most important and irreplaceable resources. . . . As species are exterminated, largely as the result of habitat destruction, the capacity for natural genetic regeneration is greatly reduced. In Norman Myers’ phrase, we are causing the death of birth.²⁸

Genetic diversity is vital to each species’ ability to adapt and survive and has many benefits for human society as well. By destroying this biological diversity, we are actually undermining our survivability as a species.

A major reason for the decline in the earth’s biodiversity is the destruction of rain forests. Rain forests receive about 100 inches of rain a year. They are the planet’s richest areas in terms of biological diversity. Rain forests cover only about 7 percent of the earth’s surface but account for somewhere between 50 and 90 percent of the earth’s species. Only about half of the original tropical rain forests still stand, and at the rate they are currently being cut, all will be gone or severely depleted within 30 years. The reasons for destruction of rain forests include commercial logging, cattle ranching, and conversion of forest to plantations to produce cash crops for export. Overpopulation also plays a part, as landless people clear forest to grow crops and cut trees for firewood.

The destruction is ironic because rain forests may have more economic value standing than cut. Rain forests are the source of many valuable products, including foods, medicines, and fibers. The pharmaceutical industry, for example, each year develops new medicines based on newly discovered plants from tropical areas. The U.S. National Cancer Institute has identified 1,400 tropical forest plants with cancer-fighting properties. As rain forests are destroyed, so too is this potential for new medicines. The Convention on Biological Diversity, an international treaty first negotiated in 1992, addresses many of these issues. By 2006 it had been ratified by 188 countries. (The United States was not among them; it declined to ratify, citing concerns with provisions on intellectual property rights and financial assistance to developing countries.) The treaty commits these countries to draw up national strategies for conservation, to protect ecosystems and individual species, and to take steps to restore degraded areas. It also allows countries to share in the profits from sales of products derived from their biological resources.

The destruction is ironic because rain forests may have more economic value standing than cut. Rain forests are the source of many valuable products, including foods, medicines, and fibers. The pharmaceutical industry, for example, each year develops new medicines based on newly discovered plants from tropical areas. The U.S. National Cancer Institute has identified 1,400 tropical forest plants with cancer-fighting properties. As rain forests are destroyed, so too is this potential for new medicines. The Convention on Biological Diversity, an international treaty first negotiated in 1992, addresses many of these issues. By 2006 it had been ratified by 188 countries. (The United States was not among them; it declined to ratify, citing concerns with provisions on intellectual property rights and financial assistance to developing countries.) The treaty commits these countries to draw up national strategies for conservation, to protect ecosystems and individual species, and to take steps to restore degraded areas. It also allows countries to share in the profits from sales of products derived from their biological resources.

Threats to Marine Ecosystems

African countries have lost 90 percent of their marine ecosystems. The same is true for the Amazon rain forest. The world’s oceans are being overfished, and the world’s coral reefs are being destroyed. The world’s oceans are being overfished, and the world’s coral reefs are being destroyed. The world’s oceans are being overfished, and the world’s coral reefs are being destroyed. The world’s oceans are being overfished, and the world’s coral reefs are being destroyed.

Today, the health of these ecosystems is increasingly threatened. Some of the key issues include the following:

Fish populations Oceans provide 90 percent of the world's fish catch. The United Nations estimates that 10 percent of the world's commercial fish species are not one-fifth the size of their counterparts in the 1950s—such as the cod of the Grand Banks (eastern United States and Canada) and the haddock of the North Sea—have probably been permanently destroyed by overfishing. Active management, such as limiting the number of fishing boats, establishing quotas, and using fishing gear that does not catch juvenile fish, are needed to restore many of the world's overfished fisheries.

Coral reefs Coral reefs are the most diverse and productive ecosystems on the planet. They are home to a quarter of all marine species, including many commercially important fish. Today, however, they are under threat from pollution, ocean warming, and sea level rise. The National Oceanic and Atmospheric Administration estimates that 70 percent of coral reefs will be gone by 2050.

Coastal development Much of the world's population now lives in coastal areas, and the number of people living in coastal areas is expected to increase. In the United States, for example, 50 percent of the population lives in coastal areas, which comprise just 7 percent of the land. Inappropriate development can have serious impacts on coastal ecosystems.²⁹

One group of businesses whose actions directly affect the health of the oceans is the cruise ship industry.

In 2006, more than 200 cruise ships, many carrying 5,000 or more passengers and crew members, plied the world's seas. By 2010, 14 million people a year are expected to take a cruise vacation. Cruise ships are literally floating cities, producing on average 30,000 gallons of human waste and seven tons of garbage and solid waste a day. Under international agreements, beyond 12 miles from shore, cruise ships are permitted to discharge untreated sewage, gray water (from kitchens, baths, and laundries), and garbage (except plastic) directly into the ocean. Cruise ships also produce large amounts of oily bilge water, toxic chemicals, and diesel pollution, and carry invasive species in their ballast water. These impacts are especially worrisome because 70 percent of cruise ship destinations are considered biodiversity "hot spots."³⁰

In a voluntary effort to address these issues, the International Council of Cruise Lines, a trade association, entered into a partnership with Conservation International in 2003 to promote responsible practices. Individual cruise operators also took action. Celebrity Cruises, for example, began outfitting its ships with smokeless gas engines. Carnival Cruises began an onboard recycling program, and Royal Caribbean decided not to discharge any waste water while cruising near Australia's Great Barrier Reef.³¹

Response of the International Business Community

Since so many ecological challenges cross national boundaries, the international business community has a critical role to play in addressing them. This section describes some of the important initiatives undertaken by companies around the world to put the principle of sustainable development into practice.

World Business Council for Sustainable Development

One of the leaders in the global effort to promote sustainable business practices is the World Business Council for Sustainable Development (WBCSD). In 2006, the council was made up of about 180 companies drawn from more than 30 countries and 20 industries, among them such major transnational corporations as IBM, Nokia, Deutsche Bank, Honda, Samsung, and Cemex. The WBCSD's goals were to encourage high standards of environmental management and to promote closer cooperation among businesses, governments, and other organizations concerned with sustainable development.³²

The WBCSD called for businesses to manufacture and distribute products more efficiently, to consider their lifelong impact, and to recycle components. In a series of publications, the group set forth the view that the most eco-efficient

companies—those that added the most value with the least use of resources and pollution—were more competitive and more environmentally sound.

Eco-efficiency was only possible, the council concluded, in the presence of open, competitive markets in which prices reflected the true cost of environmental and other resources. In the past, environmental costs have not been fully accounted, for example, in calculating measures of production such as the gross domestic product. The WBCSD recommended revising systems of national accounting to include the costs of environmental damage, and pricing products to reflect their full environmental costs.³³

~~Salomon, the WBCSD, and the World Bank, in their 1992 book, *World Development Report 1992: Environment and Development* (Washington, DC: World Bank),~~

~~Myth: Business and the environment are mutually exclusive.~~

Voluntary Business Initiatives

Many firms around the world have tried to determine how sustainable development translates into actual business practice. Some of the more important voluntary initiatives undertaken by businesses include the following.

Life-cycle analysis involves collecting information on the lifelong environmental impact of a product, all the way from extraction of raw material to manufacturing to its distribution, use, and ultimate disposal. The aim of life-cycle analysis is to minimize the adverse impact of a particular product at all stages. For example, Dell Computer has redesigned one of its lines of personal computers with a recyclable chassis and offers incentives to its customers to return their old computers to be taken apart and rebuilt with new internal parts. The redesign greatly reduced waste from discarded PCs.³⁴

Industrial ecology refers to designing factories and distribution systems as if they were self-contained ecosystems. For example, businesses can save materials through closed-loop recycling, use wastes from one process as raw material for others, and make use of energy generated as a by-product of production.

An example of industrial ecology may be found in the town of Kalundborg, Denmark, where several companies have formed a cooperative relationship that produces both economic and environmental benefits. The local utility company sells excess process steam, which had previously been released into a local fjord (waterway), to a local pharmaceutical plant and oil refinery. Excess fly ash (fine particles produced when fuel is burned) is sold to nearby businesses for use in cement making and road building. Meanwhile, the oil refinery removes sulfur in the natural gas it produces, to make it cleaner burning, and sells the sulfur to a sulfuric acid plant. Calcium sulfate, produced as a residue of a process to cut smoke emissions, is sold to a gypsum manufacturer for making wallboard. The entire cycle both saves money and reduces pollution.³⁵

Design for disassembly means that products are designed so that at the end of their useful life they can be disassembled and recycled. At Volkswagen, the German carmaker, engineers design cars for eventual disassembly and reuse. At the company's specialized auto recycling plant in Leer, old cars can be taken apart in just three minutes. Plastics, steel, precious metals, oil, acid, and glass are separated and processed. Many materials are used again in new Volkswagens.

Sustainable development will require technology cooperation through long-term partnerships between companies in developed and developing countries to transfer environmental technologies, as shown in the following example.

In South Africa, Shell entered a partnership with Eskom, a local utility company, to provide electricity to 50,000 homes in isolated rural

communities not served by the national power grid. The two firms cooperated to set up technologically advanced solar panels and metering units measuring power flow to individual homes. People could pay for the amount of electricity they actually used, without any up-front investment. The cost to customers, averaging about \$8 a month, was comparable to the amount they had been spending on candles, paraffin, and other less efficient fuels.³⁶

The idea of sustainable development is increasingly accepted in the business community. A survey of business leaders in 50 countries, for example, reported that 9 in 10 executives said sustainable development was accepted as a desirable goal in their companies. Six in 10 said that the benefits of working toward this goal outweighed the costs, and 7 in 10 regularly reported on their environmental performance to stakeholders.³⁷

Protecting the environment and the well-being of future generations is, as a founder of the WBCSD put it, “fast becoming a business necessity and even an opportunity.”³⁸ Environmental regulations are getting tougher, consumers want cleaner products, and employees want to work for environmentally conscious companies. Finding ways to reduce or recycle waste saves money. Many executives are championing the importance of corporations’ moral obligations to future generations. The most successful global businesses in coming years may be those, like the ones profiled in this chapter, that recognize the imperative for sustainable development as an opportunity both for competitive advantage and ethical action.

- Many world leaders have supported the idea of sustainable development—economic growth without depleting the resources on which future generations will depend. But achieving sustainable development remains a challenge, and the community of nations has not yet worked out who will pay.
- Major threats to the earth’s ecosystem include depletion of nonrenewable resources such as oil and coal, air and water pollution, and the degradation of arable land.
- Population growth, income inequality, and rapid industrialization in many parts of the world have contributed to these ecological problems. The limits to growth hypothesis maintains that if human society continues to exceed the carrying capacity of the earth’s ecosystem, dire consequences will follow.
- Four environmental issues—ozone depletion, global warming, declining biodiversity, and threats to the marine ecosystem—are shared by all nations. International agreements are addressing these issues, although more remains to be done.
- Global businesses have begun to put the principles of sustainable development into action through such innovative actions as life-cycle analysis, industrial ecology, design for disassembly, and technology cooperation.

Discussion Case: *Damming the Yangtze River*

In 2003, after years of construction, workers finally closed the gates of the massive Three Gorges Dam across the Yangtze River in central China. Water began to fill up the reservoir behind the one-and-a-half-mile-long hydroelectric dam, the largest such project in the world. Within months, the dam had begun to produce its first electricity, and the first ships had passed through its locks. The Yangtze quickly became the second most heavily navigated river in the world, after the Mississippi.

When fully completed in 2009, the Three Gorges Dam was expected to have the capacity to generate 18,200 megawatts of electricity, 18 times as much as a

standard nuclear power plant. This energy would be crucial to the fast-developing Chinese economy, where demand for electricity was projected to double every 15 years. "The dam will make life better for our children," said one construction worker. "They'll have electric lights, TV, be able to study their lessons. With luck they'll go to the university."

The 400-mile-long reservoir and locks that would be created behind the dam would be deep enough to bring oceangoing ships 1,500 miles inland to the city of Chongqing, opening markets in the vast interior of China. The government also hoped that the dam would end the disastrous floods that had inundated the region every five or so years throughout history. In the 20th century alone, 300,000 lives had been lost and millions of homes destroyed. In 1998, a flood on the river had killed 3,656 people and cost the nation \$38 billion. The construction effort itself employed 40,000 people and pumped billions of dollars into the local economy.

But the project had its share of critics, both inside and outside China. To make way for the water, 1.9 million Chinese, mostly in rural towns and villages along the river, would have to be resettled to higher ground by the time the project was completed. Homes and jobs would need to be found for them. A quarter-million acres of fertile farmland would be flooded, as would many unexcavated archaeological sites.

The project would inundate the Three Gorges, thought by many to be among the most starkly beautiful scenery in the world. At this point in its course, the Yangtze passes through a narrow passage, with dramatic limestone walls towering as high as 3,000 feet above the river. In addition to destroying this landscape, the dam would radically transform the ecology of the river. Environmentalists pointed out that fish migrations would be blocked and plants and animals adapted to the river habitat would die out.

~~More than 100 million people live in the Three Gorges region.~~

But other environmentalists thought the project had merit. Hydroelectric power, of the sort to be generated by the Three Gorges Dam, was nonpolluting. The main practical alternative to the dam was to build more coal-fired power plants, which in the late-1990s supplied over three-fourths of China's energy. Coal combustion produces sulfur dioxide, a cause of acid rain, and carbon dioxide, a major contributor to global warming. China was already the second-biggest emitter of carbon in the world (after the United States); it was responsible for 13 percent of the world's emissions, even though its economy accounted for only 2 percent of the world's GDP. The air in much of China is fouled by coal dust and smoke, and one-fourth of all deaths are caused by lung disease.

Sources: "Yangtze Highway," *Newsweek*, July 25/August 1, 2005; "As Dam on Yangtze Closes, Chinese Tally Gain and Loss," *The New York Times*, June 9, 2003; and Kari Huus, "The Yangtze's Collision Course," November 22, 1999, www.msnbc.com/news. Dramatic photographs may be found in Arthur Zich, "China's Three Gorges: Before the Flood," *National Geographic* 92, no. 3 (September 1997), pp. 2-33.

¹ The Web site for the United Nations Framework Convention on Climate Change is available at <http://unfccc.int>.

² The Web site for the Convention on Biological Diversity is available at www.biodiv.org.

³ Data on percent of GNI devoted to development assistance by industrialized nations are available at the Web site of the Organization for Economic Cooperation and Development, Development Assistance Committee, at www.oecd.org/dac.

⁴ For current data, including the biannual report *Global Environmental Outlook*, see the Web site of the United Nations Environment Programme at www.unep.org.

⁵ Garrett Hardin, "Tragedy of the Commons," *Science* 162 (December 1968), pp. 1243-48.

⁶ Abridgment of "The Story of a Fishing Village," from *1994 Information Please Environmental Almanac*. copyright © 1993 by World Resources Institute. Reprinted by permission of Houghton Mifflin Co. All rights reserved.

⁷ World Commission on Environment and Development, *Our Common Future* (Oxford: Oxford University Press, 1987), p. 8

The Natural Step (TNS) was founded in 1989 by a prominent Swedish physician, Karl-Henrik Robert. Dr. Robert joined other leading scientists in Sweden to develop a consensus document on how businesses, governments, and individuals could act in a way that was consistent with the principle of sustainable development. Their report was endorsed by the King of Sweden, and a summary was distributed to all households in the country.

The Natural Step encouraged businesses to act voluntarily to cut back on the use of synthetics and nonrenewable resources, minimize their consumption of energy, and preserve natural diversity and ecosystems. Within a decade, more than 300 companies and half the cities in Sweden had adopted TNS principles, and the movement was spreading to other countries, including the United States, the Netherlands, and Australia. An example of a company that has followed The Natural Step is IKEA, the Swedish-based global home-furnishings retailer. IKEA signed on, committing itself to the use of materials, technologies, and transportation methods that had the least possible damaging effect on the environment. For example, the company switched from truck to rail shipping where possible to conserve fuel and introduced a new line of furnishings, called the Eco-Line, that used only recycled materials or wood and fibers that had been sustainably harvested. The company said the initiative not only had enabled it to protect the environment and attract “green” customers, it had also actually helped the bottom line by avoiding waste and saving on energy and materials.

Sources: Hilary Bradbury and Judith A. Clair, “Promoting Sustainable Organizations with Sweden’s Natural Step,” *Academy of Management Executive* 13, no. 4 (November 1999), pp. 63–74; Andrea Larson and Joel E. Reichart, “IKEA and The Natural Step,” Darden School of Management, University of Virginia, 1996. IKEA’s corporate Web site, including material on the company’s environmental policies, is available at www.ikea-group.ikea.com. The Web site of The Natural Step in the United States is at www.naturalstep.org.

⁸“India’s Holiest River, The Ganges, Brings Disease and Pollution,” Associated Press, May 7, 2002;

“New Delhi: A Sewer Runs Through It,” *The Toronto Star*, November 6, 1999.

⁹“Water Wars: Climate Change May Spark Conflict,” *The Independent*, February 28, 2006.

¹⁰ A report on world water resources may be found at www.wri.org/wri/trends/water.html. For a projection of water stress levels in 2025, see the United Nations Environmental Program *Global Environmental Outlook* at www.unep.org/geo2000/english/i42a.htm.

¹¹ “Peak Oil Forum,” *World Watch*, January/February 2006, available online at www.worldwatch.org. The Web site of the Association for the Study of Peak Oil and Gas may be found at www.peakoil.net.

¹² This dust storm was tracked by NASA; see <http://science.nasa.gov>.

¹³ “Implementation of Desertification Convention Seen as Key to Promoting Sustainable Development, Fighting Poverty in Drylands,” available online at www.johannesburgsummit.org/html/whats_new/otherstories_desertification.htm.

FIGURE 11.1

World Population Growth

Source: United Nations Population Division, “Long-Range World Population Projections,” November 23, 2005. These figures represent the medium-range scenario. Other estimates are higher and lower. All estimates are available at www.un.org/esa/population.

FIGURE 11.2

World Income Distributed by Deciles (Tenths) of the Population, 2000

Source: Yuri Dikhanov, “Trends in Global Income Distribution, 1970–2000, and Scenarios for 2015,” United Nations Development Programme, Human Development Report Office Occasional Paper, 2005, p. 12.

¹⁴ United Nations Development Programme, *Human Development Report 2005* (New York: Oxford University Press, 2005); and Yuri Dikhanov, “Trends in Global Income Distribution, 1970–2000, and Scenarios for 2015,” United Nations Development Programme, 2005.

¹⁵ *Human Development Report 2005*, pp. 36–37.

Part Five *The Corporation and the Natural Environment*

¹⁶ Worldwatch Institute, *State of the World 2006: Special Focus—China and India* (New York: W.W. Norton, 2006).

¹⁷ Herman E. Daly, *Beyond Growth: The Economics of Sustainable Development* (Boston: Beacon Press, 1996); Paul Hawken, Amory Lovins, and L. Hunter Lovins, *Natural Capitalism: Creating the Next Industrial Revolution* (Boston: Little, Brown, 1999); Kenneth Arrow et al., “Economic Growth, Carrying Capacity, and the Environment,” *Science* 28 (April 1995).

The term *ecological footprint* has been defined as the amount of land and water a human population needs to produce the resources it consumes and to absorb its wastes, given prevailing technology.

In 2005, for each living human being, the earth contained 4.4 acres of biologically productive area—farmland, forest, fresh water, and so forth. That year, each person had, on average, an ecological footprint of 5.4 acres. What that means is that human society was using resources at a rate well above what the earth’s ecosystem could sustainably

support. (Overshooting the earth's carrying capacity is possible in the short run because people can consume resources without allowing them to regenerate.) Historical data show that human resource use first exceeded world ecological capacity in the late 1980s, and the gap between the two has been widening steadily since then.

Not surprisingly, some nations and individuals have bigger ecological footprints than others. For example, in the United States the average citizen has an ecological footprint of 24 acres, more than 5 times their share of the world's resources. By comparison, in Panama the average citizen's ecological footprint is 4.2 acres, and in Tanzania it is just 1.7 acres. In part, a nation's footprint size is a function of affluence: rich societies tend to use more resources per person. But footprint size also reflects national policy and individual choices. The Netherlands, for example, is a relatively affluent nation, but has a footprint of 10.9 acres per person, less than half that of the United States, because of a strong public commitment to sustainability.

Source: Global Footprint Network, at www.footprintnetwork.org. Individuals can estimate their own ecological footprint by taking a quiz available at www.myfootprint.org.

¹⁸ Donella H. Meadows, Dennis L. Meadows, and Jorgen Randers, *Beyond the Limits: Confronting Global Collapse, Envisioning a Sustainable Future* (Boston: Chelsea Green, 1992).

¹⁹ "U.S. Seeking Cleaner Model of Coal Plant," *The New York Times*, February 28, 2003.

²⁰ For a critique of the limits to growth hypothesis, see Bjorn Lomborg and Olivier Rubin, "Limits to Growth," *Foreign Policy*, November/December 2002, online at www.foreignpolicy.com. Lomborg's views are fully elaborated in his book *The Skeptical Environmentalist* (Cambridge: Cambridge University Press, 2001). A defense of the limits to growth view by Keith Suter on Australian television, titled "Fair Warning," may be found online at www.abc.net.au/science/slab/rome/default.htm. Allen Hammond, in *Which World? Scenarios for the 21st Century* (Washington, DC: Island Press, 1998), contrasts three possible future environmental scenarios that might arise under differing conditions.

²¹ The text of the Montreal Protocol and its various amendments and a list of signatories may be found at <http://ozone.unep.org>.

FIGURE 11.3 Global Warming

²² World Meteorological Organization, National Oceanic and Atmospheric Administration, National Aeronautics and Space Administration, European Commission, and United Nations Environment Program, "Scientific Assessment of Ozone Depletion: 1998." An executive summary may be found at www.noaa.gov/wwwhd/pubdocs/Assessment98/executive-summary.html #A.

²³ A complete set of materials may be found at IPCC's Web site at www.ipcc.ch.

²⁴ For a collection of diverse views on global warming, see Andrew J. Hoffman, ed., *Global Climate Change: A Senior Level Debate at the Intersection of Economics, Strategy, Technology, Science, Politics, and International Negotiations* (San Francisco: New Lexington Press, 1997).

²⁵ Photographs of observable evidence of global warming appear in "Signs from Earth: Heating Up, Melting Down," *National Geographic*, September 2004.

²⁶ "New Limits on Pollution Herald Change in Europe," *The New York Times*, January 1, 2005.

²⁷ The Web site of the U.N. Framework Convention on Climate Change is at <http://unfccc.int>.

In 2003, the Chicago Climate Exchange (CCX) opened for business. Unlike other trading exchanges operating out of the Windy City, the CCX did not trade pork bellies or soybean futures but something even more exotic—carbon emissions credits. A group of large American companies, including Ford, DuPont, International Paper, and BP America, had come together to launch the project. The participating companies agreed to reduce their overall carbon emissions—a major cause of global warming—by 2 percent from their 1999 levels in the first year, and then another 1 percent a year thereafter. Companies that did not meet these goals would have to buy credits from other companies that had earned them by exceeding their goals. Participants could also earn credits by supporting projects that removed carbon from the atmosphere, such as reforestation or energy efficiency. By 2005, the exchange had more than 100 members, including companies, municipalities, and even some universities. What was remarkable about the whole experiment was that it was entirely voluntary, since the United States had not ratified the Kyoto Protocol, and no U.S. law required companies to cut their carbon emissions.

Sources: "Voluntary Scheme Proves Its Point," *Financial Times* (London), July 6, 2005, p. 32; "Trading Hot Air: A New Approach to Global Warming," *The Economist*, October 17, 2002; "Firms Start Trading Program for Greenhouse Gas Emissions," *The Washington Post*, January 17, 2003, p. A14; and "New Market Shows Industry Moving on Global Warming," *The Wall Street Journal*, January 16, 2003, pp. A1, A8.

²⁸ Edward O. Wilson, "Threats to Biodiversity," in *Managing Planet Earth: Readings from Scientific American Magazine* (New York: W. H. Freeman, 1990), pp. 57–58. This article originally appeared in *Scientific American*, September 1989. Used by permission.

²⁹ Pew Charitable Trusts, "Coastal Sprawl: The Effects of Urban Development on Aquatic Ecosystems in the United States," available at www.pewtrusts.org.

³⁰ The Ocean Conservancy, "Cruise Control: A Report on How Cruise Ships Affect the Marine Environment," available at www.oceanconservancy.org; and "Protect Our Oceans: Stop Cruise Ship Pollution," www.northamerica.oceana.org.

³¹ Center for Environmental Leadership in Business, "A Shifting Tide: Environmental Challenges and Cruise Industry Responses," www.celb.org.

³² The WBCSD's agenda is described in Charles O. Holliday, Jr., Stephan Schmidheiny, and Philip Watts, *Walking the Talk: The Business Case for Sustainable Development* (San Francisco: Berrett-Koehler, 2002).

A number of national and international organizations have developed codes of environmental conduct. Among the most important ones are the following.

INTERNATIONAL CHAMBER OF COMMERCE (ICC)

The ICC developed the Business Charter for Sustainable Development, 16 principles that identify key elements of environmental leadership and call on companies to recognize environmental management as among their highest corporate priorities.

GLOBAL ENVIRONMENTAL MANAGEMENT INITIATIVE (GEMI)

A group of over 40 companies dedicated to fostering environmental excellence, GEMI developed several environmental self-assessment programs, including one that helps firms assess their progress in meeting the goals of the Business Charter for Sustainable Development.

CERES PRINCIPLES

These are 10 voluntary principles developed by the Coalition for Environmentally Responsible Economies that commit signatory firms to protection of the biosphere, sustainable use of natural resources, energy conservation, risk reduction, and other environmental goals.

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 14000 is a series of voluntary standards introduced in 1996 by the ISO, an international group based in Geneva, Switzerland, that permit companies to be certified as meeting global environmental performance standards.

~~Sustainable Development: A Guide to the Business Case for Sustainable Development~~

³³ Stephan Schmidheiny and Federico J. L. Zorraquin, *Financing Change: The Financial Community, Eco-Efficiency, and Sustainable Development* (Cambridge, MA: MIT Press, 1997). A full list of the WBCSD's publications is available online at www.wbcd.ch.

³⁴ Matthew B. Arnold and Robert M. Day, *The Next Bottom Line: Making Sustainable Development Tangible* (Washington, DC: World Resources Institute, 1998), p. 31.

³⁵ Stephen W. Peck, "Industrial Ecology: From Theory to Practice," www.newcity.ca.

³⁶ *Building A Better Future: Industry, Technology, and Sustainable Development: A Progress Report* (World Business Council on Sustainable Development, June 2000), p. 19.

³⁷ "GlobalScan Survey of Business Leaders on Sustainable Development," www.environicsinternational.com/specialreport/GlobeScan_Biz/survey.pdf.

Key Terms

biodiversity, 242

carrying capacity, 238

commons, 232

eco-efficiency, 245

ecological footprint, 238

ecology, 232

global warming, 241

industrial ecology, 247

Kyoto Protocol, 242

life-cycle analysis, 246

limits to growth hypothesis, 239

marine ecosystems, 244
Montreal Protocol, 240
ozone, 240
sustainable □ development, 233

Internet Resources

www.ipcc.ch

www.epa.gov/docs/ozone

www.unep.org

unfccc.int

www.wbcsd.ch

Intergovernmental Panel on Climate Change

Environmental Protection Agency ozone site

United Nations Environmental Program

-United Nations Framework Convention □ on Climate Change

-World Business Council on Sustainable Development

³⁸ Stephan Schmidheiny, "The Business Logic of Sustainable Development," *Columbia Journal of World Business* 27, □ nos. 3–4 (1992), pp. 19–23.

Discussion Questions

1. What stakeholders will be helped by the Three Gorges Dam? What stakeholders will be hurt by it?
2. How does construction of a dam on the Yangtze River relate to the issues of global warming, biodiversity, and water pollution discussed in this chapter?
3. Do you agree with the decision of the Chinese government to construct the Three Gorges Dam? Why or why not?
4. What strategies do you believe would best promote economic development in China without destroying the environmental resources on which future generations depend?