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Accelerating the Transition

At a 1999 conference of corporate leaders and bankers, Robert Nef, the head of a Swiss research institute, shared with me a thoughtful definition of technology. “Technology,” he said, “is nature’s experiment with man.” At issue for us today is how this experiment will turn out.¹

Earlier chapters described the dimensions of the restructuring needed to build an eco-economy. The scale of the change needed is matched only by its urgency. Time is running out. The central question facing our generation is whether we can reverse environmental deterioration before it spirals out of control, leading to global economic decline.

We would like to think that such a tragedy cannot happen in the modern age, but we need only look at Africa to see what happens when governments delay in responding to a threat—in this case, the spread of HIV. Nearly 40 million Africans have now been infected with the virus that causes AIDS. Several countries, including Botswana, Zimbabwe, and South Africa, could lose one fifth to one third of their adult populations by 2010. Africa’s AIDS fatalities during this decade may eclipse all fatalities during World War II.²

Just as the governments of Africa let the AIDS virus spread, so the governments of India and China are letting water tables fall.

Since the ability to pump water from underground faster than nature replenishes it has evolved only during the last century, the world has little experience in dealing with aquifer depletion. We do know that failing to address the issue early on risks an even more catastrophic result when the aquifer is depleted and the rate of pumping is reduced to the rate of recharge.

Even while African governments let HIV spread and Asian governments let water tables fall, the United States is letting atmospheric carbon dioxide (CO₂) levels rise. The one country that is capable of single-handedly disrupting the earth's climate is doing so. The United States could reduce its carbon emissions by the modest amount called for in the Kyoto Protocol by 2010 and make a profit doing so, but it chooses not to.

Other governments are watching as populations grow, doing little to facilitate family planning and the shift to smaller families. After nearly half a century of rapid population growth, farms already divided once are now being divided again as another generation comes of age. Shrinking plots of land are driving hundreds of millions of people either into nearby cities or across national borders in search of a job.

As water scarcity and land hunger spread, people become desperate. It is this quiet desperation of trying to survive that drives them across national borders. In some cases, it drives them to their deaths, as tragically seen in the bodies of Mexicans who regularly perish trying to enter the United States by crossing the Arizona desert, and in the bodies of Africans washing ashore in Spain when their fragile watercraft come apart as they try to cross the Mediterranean. The combination of land hunger, water scarcity, soil erosion, desertification, and rising sea level all coming at once is a recipe for human migration on a scale that has no precedent.

Unless we can build an eco-economy, the world that we leave our children will be a troubled one indeed. Restructuring the economy depends on restructuring taxes. (See Chapter 11.) If we fail to restructure the tax system, we will almost certainly fail to reverse the trends that are undermining our future. If this effort is not actively supported by all segments of society—not only governments, but also the communications media, corporations, non-governmental organizations (NGOs), and individuals, we will fail. Building an eco-economy is not a spectator sport. Everyone has a role to play.

United Nations Leadership

In an age when so many environmental issues are binational, multinational, or global in scale, countries often look to the United Nations for leadership. The first international environmental treaty completed after the founding of this world body was the International Convention for the Regulation of Whales. Negotiated by delegates from 57 countries, it was signed in Washington, D.C., in 1946. During the half-century since then, the United Nations has played a key role in negotiating 240 international environmental treaties ranging from the preservation of migratory birds to the protection of the stratospheric ozone layer.³

Over the decades, the United Nations has dealt with numerous threats to the earth's health. In May 1985, scientists reported a "hole" in the stratospheric ozone layer over Antarctica. This alarmed the international scientific community because the stratospheric ozone layer protects life on earth from harmful ultraviolet radiation. Two years later, the U.N. Environment Programme (UNEP) assembled delegates from 150 countries in Montreal to negotiate the Protocol on Substances That Deplete the Ozone Layer. This international agreement set the stage for phasing out the widespread use of chlorofluorocarbons (CFCs), the family of chemicals primarily responsible for ozone layer depletion, reducing their use by more than 90 percent over the next 13 years. The negotiation of the Montreal Protocol and its implementation represent one of the finest hours of the United Nations.⁴

Another landmark treaty, the Convention on International Trade on Endangered Species of Wild Fauna and Flora (CITES), was negotiated in 1973. This set the stage for active U.N. intercession in protecting endangered species. In 2001 this entailed trying to save Caspian Sea sturgeon. The catch of this fish, the source of world-renowned caviar, had fallen precipitously as illegal harvesting spread out of control. The United Nations convened a meeting of the countries involved—Russia, Kazakhstan, Azerbaijan, and Turkmenistan. Iran, which was managing the sturgeon on its coastal waters responsibly, was not called to the conference. Using its enforcement authority, CITES threatened to impose an embargo on trade in caviar if the countries did not work together to protect the sturgeon from extinction. In an early indication of the influence CITES now has, Russia announced in July 2001 that it was suspending commercial fishing for sturgeon.⁵

Another of the many environmental contributions by the United Nations is the Law of the Sea Treaty, which established off-shore limits of up to 200 miles. Individual countries were given the responsibility for managing their own fisheries. This treaty gives national governments the authority they need to protect their coastal fisheries and to manage them for maximum sustainable yield.

The United Nations also plays a prominent role on the climate front. It has mobilized 2,600 of the world's leading scientists to work in the Intergovernmental Panel on Climate Change (IPCC). This group, which contains numerous working groups, publishes a report every few years that provides the latest findings on climate change. The IPCC research and projections underpin international negotiations on climate stabilization.⁶

Despite the 240 international environmental treaties negotiated over the last half-century, degradation of the global environment continues. Although the United Nations has recorded numerous successes on the environmental front, the gap between what needs to be done and what is being done to ensure a sustainable future is widening. In the end, the United Nations cannot move any faster than its member governments will permit.

When the United Nations convened the first conference on the environment in Stockholm in 1972, it gave the fledgling international environmental movement a legitimacy it had lacked. When it convened the Earth Summit in Rio de Janeiro in 1992, its principal product was Agenda 21, a voluminous work on sustainable development. Although this consisted of bits and pieces of a sustainable future, it did not deal with the systemic economic change needed to create a sustainable future.

In September 2002, the United Nations will convene the World Summit on Sustainable Development in Johannesburg, South Africa. In many ways, this conference will be a test of whether the international community is ready to take the steps needed to reverse the earth's environmental deterioration before time runs out. Recognizing this, U.N. Secretary General Kofi Annan said in a 2001 commencement address at Tufts University, "We must stop being so economically defensive and start being more politically courageous."⁷

New Responsibility of Governments

Building an eco-economy depends on a shared global vision and a broad understanding of the fiscal restructuring needed to realize the vision. It is up to governments to foster the national vision of an eco-economy and to adopt the ecologically defined economic policies needed to build it. This will require a systematic effort to incorporate input from ecologists in economic policy formulation, especially in restructuring taxes and subsidies to help the market reflect the ecological truth.

Building public support for change of this scale will not be easy because it involves challenging vested economic interests. A sustainable economy will not emerge by accident, but only as a result of concerted, intelligent effort by an informed citizenry supporting strong political leaders. There is no substitute for political leadership in building an eco-economy.

It is up to national governments to develop long-term plans of where we want to go and how we plan to get there. The basic components of this plan are rather straightforward. They include reestablishing a balance between carbon emissions and carbon fixation, between aquifer withdrawals and aquifer recharge, between trees cut and trees planted, between soil loss and soil regeneration, and between human births and deaths.

The issue is not whether these balances will eventually be established. The only question is how. If societies do not achieve a balance between births and deaths by reducing births, nature eventually will do so by raising deaths. With aquifers, the choice is whether to balance pumping and recharge soon—while there is time to adjust—or to delay until the aquifer is depleted and the resulting fall in food production leads to potentially catastrophic food shortages.

Formidable though the effort to build a sustainable economy appears to be, almost all the component goals have been achieved by at least one country. China, for example, has reduced its fertility rate to below two children per woman and is thus headed for population stability within a few decades. Denmark has banned the construction of coal-fired power plants. Israel has pioneered new technologies to raise water productivity. South Korea has covered its hills and mountains with trees. Costa Rica has a national energy plan to shift entirely to renewable sources to meet its future energy needs. Germany is leading the way in a major tax-shifting exercise

to reduce income taxes and to offset this with an increase in energy taxes. Iceland is planning the world's first hydrogen-based economy. The United States has cut soil erosion by nearly 40 percent since 1982. The Dutch are showing the world how to build urban transport systems that give the bicycle a central role in increasing urban mobility and improving the quality of urban life. And Finland has banned the use of nonrefillable beverage containers. The challenge now is for each country to put all the pieces of an eco-economy together.⁸

Conveying the information needed to help people understand the imperative for change means collecting and disseminating information on key environmental indicators on a regular basis. For example, governments publish economic data on such trends as new housing starts, employment levels, labor productivity, and international trade balances each month. There is now a need for governments to systematically gather and publish the environmental data on such trends as carbon emissions, tree planting, water productivity, recycling rates, ice melting, and wind turbine installations, so we can measure progress on the environmental front.

An ideal way to transmit this information is through regular governmental press briefings that would relate these trends to the evolution of an eco-economy. Doing so could raise public understanding to where people will not only accept change, but actively work for it. This could include, for example, a press conference on melting glaciers and ice caps and the consequences for the country of resulting rises in sea level. In countries where population continues to grow, regularly assessing the future effect on the water supply and cropland availability per person could help build public support for stabilizing population.

Making the shift from a carbon-based to a hydrogen-based energy economy will require a major government effort to lead and inform. While many environmentalists and professionals in the energy industry understand the need for this, few understand the technologies that will be involved or the incentives needed to ensure that this fundamental shift proceeds on schedule. There is also a need for national annual reports on progress toward an eco-economy. The role of government, always important, is now even more so.

New Role for the Media

Building an eco-economy quickly depends on a broad change in our public priorities and our private behavior, not only as consumers but, more important, as eco-economy activists. People change their behavior because of new information or new experiences. Our goal is to realize the needed changes in the economy through providing new information, for if this fails, the inevitable adjustment could be painful.

When thinking of the scale of the educational challenge, it is tempting to rely too heavily on the formal education system. But the generational time lags from teacher to student to eventual decisionmakers mean this approach is too slow on its own to facilitate a massive economic restructuring in time. Given this constraint of time, the world is necessarily dependent on the communications media to raise public awareness. Only the media have the capacity to disseminate the needed information in the time available.

The communications media have an extraordinary ability to raise public understanding of issues if they wish to—witness their role in raising awareness of smoking and health issues in recent decades. A global environmental educational effort would rely heavily on the world's major news organizations, including such wire services as Associated Press and Reuters in English, Deutsche Press Agency in German, Agence France Presse in French, Kyodo News Service in Japanese, the Press Trust of India in English and local languages, Tass in Russian, EFE in Spanish, and Xinhua in Chinese. The global electronic news organizations, such as the British Broadcasting Corporation, Voice of America, and Cable News Network (CNN), also have a pivotal role to play. At the national level, television networks, news magazines, and newspapers are key players.

One media shortcoming is the failure to convey the big picture. A newspaper might report that ice is melting in Alaska or on Mount Kilimanjaro, but fail to observe that ice is melting almost everywhere. A research report of a particular glacier or ice cap melting is news, to be sure, but the bigger story is not being well covered.

The same can be said about fish farming. There are occasionally stories of salmon farming in Norway, catfish farming in the southern United States, or fish farming in China. But the typical reader would have no way of knowing from newspaper coverage

that fish farming expanded by 11 percent a year during the 1990s and is on track to overtake world beef production by the end of this decade. That is the story. It is not being told.⁹

One reason for this information gap is that news media are not organized to deal with global issues and trends. A major news organization typically has a national desk and a foreign desk. The latter includes reporters based abroad, operating at the country or regional level. But a foreign desk is not a global desk, regularly assigning global stories. These often go uncovered, falling through the cracks in an outmoded organizational structure. In the past, when virtually all news was local, when there were no perceptible climate changes, ozone layer depletion, or collapsing oceanic fisheries, there was no need for global coverage. Today the key stories are global in scope, but there is no global desk to deal with them systematically.

Despite occasional weaknesses, some news organizations have provided exemplary coverage of environmental issues. In the United States, *Time* magazine stands out. It moved to the forefront a decade ago when, instead of selecting a “man of the year” as it usually does in the first issue of each year, it surprised readers by selecting Earth as “planet of the year,” devoting the issue to an analysis of the environmental issues facing humanity.¹⁰

Then in the fall of 1997, under the leadership of Charles Alexander, *Time* produced a special issue of its international edition entitled “Our Precious Planet: Why Saving the Environment Will be the Next Century’s Biggest Challenge.” The issue recognized, in a way that few major news organizations have, the extraordinary dimensions of the challenge facing humanity as we try to sustain economic progress in the face of continuing environmental deterioration.¹¹

After President Bush shocked the world by abandoning the Kyoto Protocol, *Time* devoted an issue to the President’s decision and its consequences, with 16 pages of discussion of the basic science and evidence of climate change. This issue also included the results of a CNN/*Time* poll showing that the majority of Americans are concerned about global warming, and a statement by 10 eminent global citizens, including Jimmy Carter and Mikhail Gorbachev, calling for the President to support the Kyoto Protocol.¹²

Also at the front of the media pack is *Nihon Kezai Shimbun*,

Japan's premier business newspaper, which has a larger circulation than the *Wall Street Journal*. Under the leadership of editorial page director Tadahiro Mitsuhashi, this business newspaper has published numerous cutting-edge articles and editorials on environmental issues, including support of zero emissions as a goal for industry.¹³

At the international level, CNN under Ted Turner's leadership has been a consistent leader in covering environmental issues. In addition to regular weekly programs, CNN has carried numerous specials on the environment.

One of the strengths of large news organizations is that they can draw global attention to local environmental issues, often before they escalate into global issues. Media coverage of the ozone hole discovered over Antarctica in 1985 played a key role in mobilizing worldwide public support for phasing out CFCs. The media can also share with the world successful local responses to environmental issues, which would help in replicating them elsewhere.¹⁴

The bottom line is that disseminating information on the scale needed to build an eco-economy in the time available is not likely to succeed unless the communications media can raise public understanding to the point where people will support these changes. This is not a responsibility that editors and reporters have asked for or, indeed, that most would want to assume. But there is no alternative. We are facing a situation so totally different from any that our modern civilization has faced before that entirely new initiatives are required.

The Corporate Interest

Like the rest of society, corporations have a stake in building an eco-economy. Profits do not fare well when an economy is declining or threatening to collapse. The stakes are particularly high in the energy sector, which is affected much more than, for example, the food sector. To become sustainable, the latter needs to be modified, but the former needs to be fundamentally restructured.

There are essentially two approaches that fossil fuel firms can take. They can try to defend the status quo or they can see climate stabilization as the greatest investment opportunity in history. In the United States, the Global Climate Coalition (GCC)—an industry group—was formed by those who wanted to resist the restructuring of the global energy economy. In opposition to the Kyoto

agreement, the GCC engaged in a massive disinformation campaign, one designed to confuse the American public about the urgent problem of climate change.¹⁵

The first break in the united front presented by the fossil fuel industry came in a speech by John Browne, the head of BP, at Stanford University in May 1997. (See Chapter 5.) He acknowledged that climate change was a potentially serious threat and announced that BP was no longer an oil company, but an energy company. Browne's talk sent shock waves of distress through the oil community and ripples of excitement through the environmental community. A major oil company had broken ranks.¹⁶

Browne's speech set the stage for change. He announced that BP was withdrawing from the Global Climate Coalition. Dupont had already left. The following year, Royal Dutch Shell announced that it, too, was leaving. Its corporate goals, like those of BP and Dupont, no longer meshed with those of the GCC. Like BP, it no longer viewed itself as an oil company, but as an energy company.¹⁷

In 1999, the Ford Motor Company withdrew from the GCC. In rapid succession in the early months of 2000, DaimlerChrysler, Texaco, and General Motors (GM) announced that they too were leaving the coalition. With the departure of GM, the world's largest automobile company, the die was cast. A spokesman for the Sierra Club quipped, "Maybe it is time to ask the last one out to turn out the lights."¹⁸

Some major corporations are not only visualizing an eco-economy, but are starting to build it. As described in Chapter 5, Royal Dutch Shell and DaimlerChrysler are leading a consortium of corporations that is working with the Icelandic government to make that country the world's first hydrogen-powered economy. And in June 2000, ABB, the Swiss-based giant in the global power industry, with an annual turnover of \$24 billion, announced a major restructuring. It indicated that henceforth it would be emphasizing alternative energy sources, such as wind. It announced that its engineers had designed a new wind turbine called the Wind Former, a machine that reduces generating costs by 20 percent below the most efficient turbines now in use.¹⁹

ABB is abandoning its traditionally dominant role in the construction of large-scale thermal power plants, including those powered by coal, oil, gas, and nuclear energy. In 1999, ABB sold off its large-scale power generating business, with the principal units go-

ing to Alston, of France, and to British Nuclear Fuels. It was thus repositioning itself for a major push in the development of small-scale, renewable energy generation. A company with a vision of the new energy economy, ABB is planning to concentrate on developing wind and small-scale combined-cycle heat and power, as well as fuel cells. It plans to use information technology to integrate these distributed sources into a single grid.²⁰

Looking to the future, ABB sees 755 million households in the world without electricity. The overwhelming majority of these households do not even have access to an electricity grid. For them, ABB believes it will be cheaper to install small-scale power than to invest in large thermal power plants and building a grid, both of which are costly. In its vision of the new energy economy, ABB suggests, for example, that “a small town might be supplied by a mix of combined heat and power, generating facilities, wind power, fuel cells, and photovoltaic energy with output from individual sources being adjusted via a micro-grid to compensate for seasonal variations in wind speeds and sunshine.”²¹

Many companies have set their own goals for reducing carbon emissions—and they substantially exceed the goals of the Kyoto Protocol. For example, Dupont, measuring its goals in terms of CO₂ equivalent emissions, plans to reduce greenhouse gas emissions 65 percent from 1990 levels.²²

Firms in some other industries are going even further in setting environmental goals. Among these are Interface, a manufacturer of industrial carpet based in Atlanta, Georgia, and STMicroelectronics, an Italian-based semiconductor manufacturer. Ray Anderson, the CEO of Interface, became an avid environmentalist in 1994 after reading *The Ecology of Commerce* by Paul Hawkins. Since his conversion, he has become an enthusiastic advocate of building an eco-economy. In *Fortune* magazine, he described plans for his firm: “Interface of Atlanta, my company, is changing course to become sustainable—to grow without damaging the earth and to manufacture without pollution, waste, or fossil fuels. If we get it right, our company and our supply chain will never have to take another drop of oil.”²³

The Interface plan is to generate no waste and no carbon emissions—to be totally sustainable. Instead of selling carpet to companies, Anderson wants to sell carpeting services, an arrangement whereby Interface agrees to maintain a certain style and level of

carpeting in a company's offices for, say, 10 years. Worn carpet will be returned to the factory, melted down, and respun into new fiber. This new carpet then goes on the floor. "Our goal," Anderson says, "is not to lose a single molecule of carpeting material." This system, which requires no raw materials and sends nothing to the landfill, closes the loop.²⁴

Interface's zero carbon emissions goal is being achieved by turning to solar cells and wind energy to power its plants. For energy uses that cannot be covered by these renewable sources, the company plans to offset carbon emissions by planting trees.²⁵

STMicroelectronics, one of the world's largest manufacturer of semiconductors, is also committed to an environmentally sustainable operation. Pasquale Pistorio, president and CEO, matches the fervor of Ray Anderson. After being ranked first in eco-efficiency among 14 semiconductor companies worldwide, Pistorio said that "none of ST's environmental initiatives have taken more than three years to pay back, while our reputation as the semiconductor industry's 'green leader' helps us to attract the young, talented engineers that are essential to sustain our growth and keep us at the leading edge of the industry that is transforming the world."²⁶

Like Anderson, Pistorio also wants to build an environmentally neutral corporation, and to do it by 2010. The company plans to reduce carbon emissions by shifting to an energy mix for 2010 that relies on cogeneration for 65 percent of its energy, conventional sources for 30 percent, and renewables for 5 percent. This will still leave it with a net contribution of CO₂ into the atmosphere, which it plans to offset by planting enough trees to sequester roughly 1 million tons of carbon emissions per year. The company's net revenues in 1999 exceeded \$5 billion, with net earnings of \$547 million; in 2000, net revenues were estimated at \$6.7 billion, with earnings of \$1.3 billion.²⁷

Pistorio dates his environmental conversion to reading *State of the World 1994* from the Worldwatch Institute. Since then, he not only has begun to reshape his company, but each year he distributes English, Italian, and French editions of *State of the World* to his senior staff and to European political and business leaders.²⁸

These two firms are models of future corporations, the companies that will make up the eco-economy. Both CEOs support a restructuring of the tax system, one that reduces income taxes and increases taxes on environmentally destructive activities, including

the carbon emissions that are disrupting the earth's climate. These two firms, in different industries and from different cultures, have identical goals. Each wants to build a corporation that meets human needs, provides generous profits to stockholders, and does it in a way that is environmentally neutral. Their CEOs have reached this point for the same reasons. They understand that the economy depends entirely on the earth's natural support systems. If these deteriorate, the deterioration of the economy cannot be far behind. In the end, their interest is not altruism, it is self-interest.

Both emphasize that being "green" pays. This is perhaps not surprising, since more-enlightened managers are more aware of environmental issues. Those clinging to the past, always trying to defend the status quo, are by definition not likely to be the more talented managers. As Ray Anderson has "greened" his firm since 1994, sales have surged 77 percent, profits are up 81 percent, and the stock price is up 70 percent. Amory Lovins, a longtime energy efficiency advocate who has served as a consultant to Anderson, notes that the sales representatives adopt the CEO's vision and become eco-crusaders as they pitch their carpeting with renewed fervor. Lovins observes, "This happens a lot in green companies. Freeing up the contradictions between making a living and doing it in a way that your kids can be proud of you causes an implosion of energy."²⁹

NGOs and Individuals

Few areas of human activity have been so dominated by NGOs as the environmental movement. Broadly speaking, NGOs evolve to fill gaps left by government and the business sector. Literally thousands of such groups have been formed in both industrial and developing societies. Most NGOs are public interest groups as opposed to special interest groups.

Environmental groups are sometimes local, single-issue organizations with a handful of members. Others are full-spectrum groups that are global in their membership and orientation. Membership may vary from a handful of people to several million. The World Wide Fund for Nature (WWF), for example, with a worldwide membership that climbed from 570,000 in 1985 to 5.2 million in 1995, has an influence on environmental policy that exceeds that of many governments. Environmental groups play a major educational role through their press releases, magazines, newsletters, Web

sites, and electronic mailing lists. When coalitions mobilize to focus on a single issue, they can become a formidable political force.³⁰

Using the Internet to mobilize political support for environmental actions is a valuable new asset in the effort to build an eco-economy. Thousands of environmental NGOs have Web sites and electronic mailing lists that provide information on key issues. Concerned individuals can develop their own electronic mailing lists, distributing environmental information to hundreds, if not thousands, of friends and associates.

Research by environmental groups provides information to guide environmental activists. The Worldwatch Institute, founded in 1974 in Washington, D.C., was the first such global environmental research group, followed by the World Resources Institute (WRI) in 1982, also in Washington, and the Wuppertal Institute in Germany. Research by these and other groups underpinned much of the discussion at the Earth Summit in Rio de Janeiro in 1992.

The annual *State of the World* report launched by Worldwatch in 1984 was designed to fill the gap in the series of U.N. annual reports. For example, the World Health Organization produces *The State of the World's Health*, the U.N. Food and Agriculture Organization publishes *The State of Food and Agriculture*, and the U.N. Population Fund, *The State of the World's Population*. But until UNEP launched a comprehensive *Global Environmental Outlook* report, the United Nations had failed to produce a regular state of the environment report. As evidence of the hunger for environmental information, Worldwatch Institute's annual *State of the World* report has been translated into more than 30 languages.

The World Resources Institute is anchoring a worldwide collaborative effort on a "Millennium Ecosystem Assessment." This project, in which WRI has involved the World Bank, UNEP, and the U.N. Development Programme, is by far the most ambitious, detailed assessment of global ecosystems ever undertaken. Involving major scientific bodies and hundreds of scientists, this project is designed to provide information on the present and likely future condition of the world's ecosystems to guide future ecosystem management.³¹

At the other end of the environmental spectrum is Greenpeace, an activist organization. It shares the same goals as the research institutes, but whereas they rely on analysis and information to bring about change, Greenpeace relies primarily on political con-

frontation and media events that can rally public opinion. Even the threat of a boycott of a company product can induce changes in corporate policy. This was perhaps most dramatically displayed in 1996, when Shell was planning to dispose of a wornout oil rig, the Brent Spar, by simply dumping it in the North Sea. Greenpeace's attack on Shell over this plan took the form of a boycott of service stations in Germany. In the face of declining gasoline sales, Shell acquiesced and developed another means of disposal.³²

NGOs have greatly strengthened their role at the international level as a result of advances in communication, including the fax machine, e-mail, and the cell phone. In 1998, for example, governments of 29 of the more affluent countries entered into closed-door negotiations on a multilateral agreement on investment. NGOs mounted a worldwide challenge to this secretive process and aroused so much public concern that they were able to bring it to a halt. The groups that objected to these negotiations were concerned that this agreement on investment would lead to a downward spiral in both environmental standards and wages—in the words of one analyst, “a race to the cellar.”³³

In late 1999, the World Trade Organization (WTO), which was founded in 1995 as the successor to the General Agreement on Tariffs and Trade, convened a meeting in Seattle to develop the agenda for a new round of trade talks—the Millennium Round. Although only a few years old, the WTO had gained a reputation for recognizing only bottom-line economic issues. It seemed more or less oblivious to environmental and social issues affected by trade policy decisions. In virtually every case involving conflicts between trade expansion and environmental protection, the WTO had ruled in favor of trade expansion.³⁴

The WTO had set off alarm bells for those in environmental groups, in organized labor, and in developing countries, which often came out on the wrong end of trade liberalization negotiations. The Seattle meeting was attended by some 5,000 delegates and political leaders, including environment and trade ministers, from more than 150 countries. But there were also 50,000 protesters who used civil disobedience to disrupt transportation and the convening and progress of the talks. The U.S. National Guard intervened, using tear gas and arresting hundreds of protesters in a response reminiscent of anti-war demonstrations of the early 1970s. A dusk-to-dawn curfew was imposed. Fifty square blocks in down-

town Seattle were set aside as a “no protest zone.”³⁵

In the end, the talks collapsed largely because of public criticism of the failure to consider environment and poverty adequately. WTO officials were in a state of shock and may never be the same again. Nor should they be. If they were not aware of environmental and social issues before the protests in Seattle, they are now. Most U.N. agencies, the World Bank, and national governments now recognize that NGOs are stakeholders, that they often represent societal interests even more effectively than do elected politicians, who are sometimes corrupted by the political process. NGOs have acquired experience, expertise, and skill in analyzing issues and in confronting governments that they believe are behaving irresponsibly. They are now treated less as mere critics on the sidelines and more as partners in negotiations and in developing agendas for international conferences.

From time to time, a government or group of governments sides with NGOs on an issue. In 1997, for example, Taiwan announced a plan to dispose of nuclear waste in North Korea. Unwilling or unable to dispose of it within its boundaries, the government was taking advantage of the abysmal poverty in North Korea to buy a place to dump the waste from nuclear power plants. The government of South Korea and the powerful Korean Federation of Environmental Movement combined forces in opposition to this plan. In the end, they succeeded.³⁶

In 1997, a loose array of some 400 NGOs and the Canadian government launched an effort to ban the use of landmines. Although the United States was opposed to the effort, the NGOs mobilized enough public opinion to get the signatures of 122 governments on the landmine-banning treaty. By now, 117 countries have ratified the accord, which went into force on 1 March 1999. New communications technologies played a central role in mobilizing worldwide political support in support of the ban.³⁷

Individuals also play an important role in the global environmental movement. Indeed, Rachel Carson, who wrote *Silent Spring*, is widely credited with being the founder of the modern environmental movement. Her book, which dealt with the use of pesticides, such as DDT, that were threatening bird populations, filled a gap because the U.S. government was not responding to this threat.

Ted Turner, founder of CNN, set the standard for individual philanthropy when in 1997 he announced his gift of \$1 billion to

the United Nations to support work on population stabilization, environmental protection, and the provision of health care. He created the UN Foundation to serve as a vehicle through which the resources could be transferred. Turner could have waited, leaving a bequest to set up the foundation after his death. But given the urgency of the situation, he argued that billionaires needed to respond now to the world's most pressing problems before they spin out of control, becoming unmanageable. It is quite likely that Turner's initiative affected Bill Gates of Microsoft and other newly minted billionaires. Gates himself has now set up the world's largest foundation and is allocating sums of money that dwarf the resources of many governments in an effort to improve health and stabilize population in developing countries.³⁸

At the grassroots level, Wangari Maathai, who has organized women in Kenya to plant trees, serves as a model for environmentalists everywhere. She wants to reforest Kenya and restore its environmental health. Because she often challenges corrupt political leaders, she has been beaten and threatened numerous times. Similarly, Chico Mendes organized rubber tappers in the Amazon who depend on the trees for their livelihoods. They opposed the large ranchers who wanted to convert these forested regions to rangeland. Although Mendes paid the ultimate price when he was gunned down by killers hired by the ranchers, the movement he started continues.³⁹

NGOs and individuals have been instrumental in bringing about many basic changes, playing a leading role in bringing the growth of nuclear power to a halt, in raising public awareness of climate change, and in putting water scarcity on the global agenda. The challenge to environmental groups now is to broaden their agendas so they can promote a shared vision of an eco-economy and can work together to make it a reality.

Crossing the Threshold

Students of social change often think in terms of thresholds of change. A threshold, a concept widely used in ecology in reference to the sustainable yield of natural systems, is a point that when crossed can bring rapid and sometimes unpredictable change in a trend. In the social world, the thresholds of sudden change are no less real, though they may be more difficult to identify and anticipate. Among the more dramatic recent threshold crossings is the

one that led to the political revolution in Eastern Europe in 1989 and 1990, the year the Berlin Wall came down, as well as the one that led to the dramatic decline in cigarette smoking in the United States.

The political change in Eastern Europe came with no apparent warning. It almost seems as if one morning people woke up and realized that the great socialist experiment, with its one-party political system and centrally planned economy, was over. Even those in power realized this, which was why it was essentially a bloodless political revolution. Interestingly, no articles in political science journals during the 1980s forecast this fundamental change in governance. Although we do not understand the process well, we do know that at some point in Eastern Europe a critical mass had been reached—that a time came when so many people were convinced of the need for change that the process achieved an irresistible momentum.

A similar scenario unfolded with smoking in the United States. In the early 1960s, smoking was increasingly popular among Americans—a habit that was aggressively promoted by the cigarette manufacturers. Then in 1964 the U.S. Surgeon General released a report on the relationship between smoking and health, the first in a series that has appeared almost every year since then. These reports, and media coverage of the thousands of research projects the reports spawned, fundamentally altered the way people think not only about their own smoking but also about secondhand smoke from the cigarettes of others.

So strong was this shift in thinking that in November 1998 the tobacco industry, after arguing under oath for decades that there was no proof of a link between smoking and health, agreed to reimburse state governments for the past Medicare costs of treating smoking-related illness. This settlement with 46 state governments, plus separate agreements reached earlier with the other four states, totaled \$251 billion. (See also Chapter 11.) If anyone had forecast in, say, 1995 that the tobacco industry would cave in and agree to this massive reimbursement, it would have been hard to believe. At that time the tobacco industry was still hiring “medical experts” to testify before congressional committees that there was no proof of a link between smoking and health.⁴⁰

This revolution in attitudes has reversed the trend in cigarette smoking in the United States, dropping it from a high of 2,810

cigarettes per person in 1980 to 1,633 in 1999—a decline of 42 percent. It has also spread to other countries, leading to a worldwide decline in cigarettes smoked per person of 11 percent from the historical peak reached in 1990. The number of cigarettes smoked per person has dropped 19 percent in France since peaking in 1985, 8 percent in China since 1990, and 4 percent in Japan since 1992.⁴¹

Emboldened by this effort and the realization that an estimated 4 million people die prematurely each year from smoking cigarettes, the World Health Organization under the leadership of Gro Harlem Brundtland, former Prime Minister of Norway, is now putting together a worldwide campaign to eradicate cigarette smoking. The global effort to reverse the worldwide smoking trend began with a research and information dissemination initiative by a national government. The information in the countless reports on smoking and health over the decades was regularly disseminated by news organizations and used by NGOs to mobilize support for restrictions on smoking.⁴²

An earlier, much more abrupt shift in thinking in the United States may be even more relevant to the economic restructuring needed today. In 1940 and 1941, there was a vigorous debate in the United States about whether the country should become involved in the war in Europe. Although most Americans were strongly opposed to U.S. entrance into the war, President Franklin Roosevelt felt that U.S. involvement was inevitable. But the majority of the American people did not want to be pulled into Europe's internal conflicts again, arguing that 160,000 young American men had died in World War I without being able to establish a lasting peace.

Then came the Japanese attack on Pearl Harbor on December 7, 1941, which crippled the U.S. Pacific fleet. The debate was over. The United States declared war and began to mobilize. Things changed rapidly. One day men were working in factories and offices. The next they were in military training camps. Women who had been working at home suddenly found themselves on assembly lines. One day Chrysler was making cars. The next it was making tanks. Consumption of gasoline, rubber, and sugar was rationed. The entire U.S. economy was restructured almost overnight in what was referred to as the “war effort.” The attack on Pearl Harbor had lifted the United States past a threshold.

Now as we face the need for a wholesale restructuring of the global economy, for a Copernican-scale shift in economic thinking, we need to be lifted past a similar threshold. The ecological trends of recent years are driving a paradigm shift toward an eco-economy. For years, these trends were marginalized by policymakers as “special interest” topics, but as developments have come to impinge more and more directly on people’s lives, this has begun to change.

We see these changes occurring with energy, for example. Most leaders in the energy economy now realize that shifting from a carbon-based to a hydrogen-based energy economy is almost inevitable. Attitudes toward various energy sources are changing. Coal, which fueled the early Industrial Revolution, is now seen as a villain among fuels. Natural gas is the fossil fuel of choice.

And attitudes toward nuclear power have changed. The destructive explosion at the Chernobyl nuclear reactor in the Soviet Ukraine in early April 1986 did what hundreds of studies assessing the risks of nuclear power could never have done: it made the dangers real. Fresh vegetables were declared unfit for human consumption in northern Italy. Polish authorities launched an emergency effort to administer iodine tablets to children. The livelihood of the Lapps in northern Scandinavia was threatened when reindeer became too radioactive to bring to market. In the Soviet Union itself, 100,000 people in the vicinity of the reactor were forced to abandon their homes.⁴³

More fundamentally, nuclear power is no longer an economically viable energy source. Wherever markets for electricity have been opened to competition, as in the United States, no one is investing in nuclear reactors. When the costs of decommissioning nuclear power plants, which may rival those of construction, and the costs of disposing of nuclear waste are incorporated into cost calculations, it seems clear that nuclear power has no economic future.

Meanwhile, in sharp contrast, wind power is gaining rapidly in public favor. In the United States, where the modern wind energy industry was born in the early 1980s, four trends are converging to create a potentially explosive growth in wind energy use. One, the cost of generating electricity from wind is falling fast. (See Chapter 5.) Two, there is a growing realization of the worldwide abundance of wind energy. Three, as farmers and ranchers realize that

they own most of the wind rights in the country, a new agricultural lobby is emerging in support of wind power, joining the environmental lobby that has been supporting it for years.

The fourth trend that is spurring the growth in wind power is the requirement by more and more state utility commissions that utilities offer their customers a “green power” option. (See Chapter 11.) This is enabling individuals, companies, and local governments to vote with their pocketbooks. And they are doing so in growing numbers. The convergence of these four trends is creating a situation where wind electric generation is likely to soon become a major U.S. energy source.

Changes are also under way in other sectors, such as the forest products industry. The United States appears to be crossing the threshold for responsible forest management as the principles of ecology replace basic economics in shaping the management of national forests. After several decades of building roads with taxpayers’ money to help logging companies clearcut publicly owned forests, the Forest Service announced in early 1999 that it was imposing a moratorium on road building. For decades the goal of the forest management system, which had built some 600,000 kilometers (400,000 miles) of roads to facilitate clearcutting, had been to maximize the timber harvest in the short run.⁴⁴

But in 1998, Forest Service chief Michael Dombeck, responding to a major shift in public opinion, introduced a new management system—one designed to maintain the integrity of the ecosystem and to be governed by ecology, by a complete cost accounting that includes both the goods and the services that forests provide. Henceforth, the 78 million hectares of national forests—more than the area planted to grain in the United States—will be managed with several goals in mind. For example, the system will recognize the need to manage the forest so as to eliminate the excessive flooding, soil erosion, silting of rivers, and destruction of fisheries associated with the now-banned practice of clearcutting. Under the new policy, the timber harvest from national forests, which reached an all-time high of 12 billion board feet per year during the 1980s, has been reduced to 3 billion board feet.⁴⁵

The United States is not the only country to institute a radical change in forest management. In mid-August 1998, after several weeks of near-record flooding in the Yangtze river basin, Beijing acknowledged for the first time that the flooding was not merely

an act of nature but was exacerbated by the deforestation of the upper reaches of the watershed. Premier Zhu Rongji, recognizing the water storage and flood control capacity of forests, personally ordered not only a halt to the tree cutting in that area, but also the conversion of some state timbering firms into tree-planting firms. (See Chapter 3.) Another key threshold was crossed.⁴⁶

A chastened tobacco industry, oil companies investing in hydrogen, reformed forest management in the United States and China—these are just some of the signs that the world may be approaching a paradigm shift on the scale described in Chapter 1. Across a spectrum of activities, places, and institutions, attitudes toward the environment have changed markedly in just the last few years. Among giant corporations that could once be counted on to mount a monolithic opposition to serious environmental reform, a growing number of high-profile CEOs have begun to sound more like environmentalists than representatives of the bastions of global capitalism.

If the evidence of a global environmental awakening were limited to only government initiatives or a few corporate initiatives, it might be dubious. But with the evidence of growing momentum now coming on both fronts, the prospect that we are approaching the threshold of a major transformation becomes more convincing. The question is, Will it happen soon enough? Will it happen before the deterioration of natural support systems leads to economic decline?

Is There Enough Time?

Can we do what needs to be done fast enough? We know that social change often takes time. In Eastern Europe, it was fully four decades from the imposition of socialism until its demise. Thirty-four years passed between the first U.S. Surgeon General's report on smoking and health and the landmark agreement between the tobacco industry and state governments. Thirty-eight years have passed since biologist Rachel Carson published *Silent Spring*, the wakeup call that gave rise to the modern environmental movement.

Sometimes things move much faster, especially when the magnitude of the threat is understood and the nature of the response is obvious, such as the U.S. response to the attack on Pearl Harbor. Within one year, the U.S. economy had largely been restructured. In less than four years, the war was over.

Accelerating the transition to a sustainable future means overcoming the inertia of both individuals and institutions. In some ways, inertia is our worst enemy. As individuals we often resist change. When we are grouped into large organizations, we resist it even more.

At the institutional level, we are looking for massive changes in industry, especially in energy. We are looking for changes in the material economy, shifting from a throwaway mentality to a closed loop/recycle mindset. If future food needs are to be satisfied adequately, we need a worldwide effort to reforest the land, conserve soil, and raise water productivity. Stabilizing population means quite literally a revolution in human reproductive behavior, one that recognizes that a sustainable future is possible only if we average two children per couple. This is not a debatable point. It is a mathematical reality.

The big remaining challenge is on the educational front: how can we help literally billions of people in the world understand not only the need for change, but how that change can bring a life far better than they have today?

I am frequently asked if it is too late. My response is, Too late for what? Is it too late to save the Aral Sea? Yes, the Aral Sea is dead. Its fish have died; its fisheries have collapsed. Is it too late to save the glaciers in Glacier National Park in the United States? Most likely. They are already half gone and it would be virtually impossible now to reverse the rise in temperature in time to save them. Is it too late to avoid a rise in temperature from the buildup in greenhouse gases? Yes. A greenhouse gas-induced rise in temperature is apparently already under way. But is it too late to avoid runaway climate change? Perhaps not, if we quickly restructure the energy economy.

For many specifics, the answer is, Yes, it is too late. But there is a broader, more fundamental question: Is it too late to reverse the trends that will eventually lead to economic decline? Here I think the answer is no, not if we move quickly.

Perhaps the biggest single challenge we face is shifting from a carbon-based to a hydrogen-based energy economy, basically moving from fossil fuels to renewable sources of energy, such as solar, wind, and geothermal. How fast can we make this change? Can it be done before we trigger irreversible damage, such as a disastrous rise in sea level? We know from the U.S. response to the attack on

Pearl Harbor that economic restructuring can occur at an incredible pace if a society is convinced of the need for it.

We study the archeological sites of civilizations that moved onto economic paths that were environmentally destructive and could not make the needed course corrections in time. We face the same risk.

There is no middle path. Do we join together to build an economy that is sustainable? Or do we stay with our environmentally unsustainable economy until it declines? It is not a goal that can be compromised. One way or another, the choice will be made by our generation. But it will affect life on earth for all generations to come.