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Crossing the Threshold

Early Signs of an Environmental Awakening

by Lester R. Brown

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Threshold

Early Signs of an Environmental Awakening

by Lester R. Brown

At a time when the Earth's average temperature is going off the top of the chart, when storms, floods and tropical forest fires are more damaging than ever before, and when the list of endangered species grows longer by the day, it is difficult to be optimistic about the future. Yet even as these stories of environmental disruption capture the headlines, I see signs that the world may be approaching the threshold of a sweeping change in the way we respond to environmental threats—a social threshold that, once crossed, could change our outlook as profoundly as the one that in 1989 and 1990 led to a political restructuring in Eastern Europe.

If this new threshold is crossed, changes are likely to come at a pace and in ways that we can only begin to anticipate. The overall effect could be the most profound economic transformation since the Industrial Revolution itself. If so, it will affect every facet of human existence, not only reversing the environmental declines with which we now struggle, but also bringing us a better life.

Thresholds are encountered in both the natural world and in human society. One of the most familiar natural thresholds, for example, is the freezing point of water. As water temperature falls, the water remains liquid until it reaches the threshold point of 0 degrees Celsius (32 degrees Fahrenheit). Only a modest additional drop produces dramatic change, transforming a liquid into a solid.

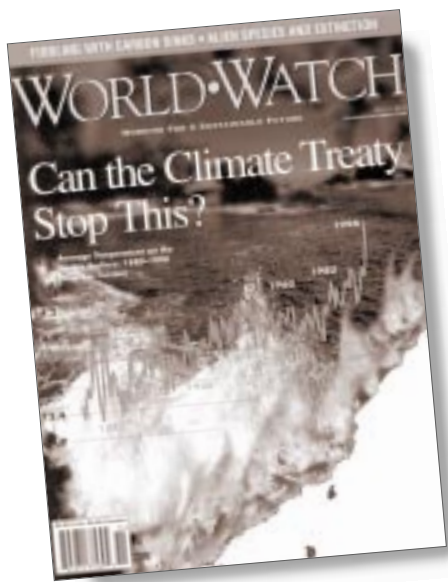
The threshold concept is widely used in ecology, in reference to the "sustainable yield threshold" of natural systems such as fisheries or forests. If the harvest from a fishery exceeds that threshold for an extended period, stocks will decline and the fishery may abruptly collapse. When the demands on a forest exceed its sustainable yield and the tree cover begins to shrink, the result can be a cascade of hundreds of changes in the ecosystem. For example, with fewer trees and less leaf litter on the forest floor, the land's

water-absorptive capacity diminishes and runoff increases—and that, in turn, may lead to unnaturally destructive flooding lower in the watershed.

In the social world, the thresholds to sudden change are no less real, though they are much more difficult to identify and anticipate. The political revolution in Eastern Europe was so sudden that with no apparent warning the era of the centrally planned economy was over, and those who had formidably defended it for half a century realized it was too late to reverse what had happened. Even the U.S. Central Intelligence Agency failed to foresee the change. And after it happened, the agency had trouble explaining it. But at some point, a critical mass had been reached, where enough people were convinced of the need to change to tip the balance and bring a cascading shift in public perceptions.

In recent months, I have become increasingly curious about such sudden shifts of perception for one compelling reason. If I look at the global environmental trends that we have been tracking since we first launched the Worldwatch Institute 25 years ago, and if I simply extrapolate these trends a few years into the next century, the outlook is alarming to say the least. It is now clear to me that if we are to turn things around in time, we need some kind of *breakthrough*. This is not to discount the many gradual improvements that we have made on the environmental front, such as increased fuel efficiency in cars or better pollution controls on factories. Those are important. But we are not moving fast enough to reverse the trends that are undermining the global economy. What we need now is a rapid shift in consciousness, a dawning awareness in people everywhere that we have to shift quickly to a sustainable economy if we want to avoid damaging our natural support systems beyond repair. The question is whether there is any evidence that we are approaching such a breakthrough.

While shifts of this kind can be shockingly sud-



New climate data drew intense media interest, as more than 100 reporters gathered for a WORLD WATCH press conference at the release of the January/February issue—and more than 2,000 newspapers carried our followup story on rising storm damages.

den, the underlying causes are not. The conditions for profound social change seem to require a long gestation period. In Eastern Europe, it was fully four decades from the resistance to socialism when it was first imposed until its demise. Roughly 35 years passed between the issuance of the first U.S. Surgeon General's report on smoking and health—and the hundreds of research reports it spawned—and the historic November 1998 \$206 billion settlement between the tobacco industry and 46 state governments. (The other four states had already settled for \$45 billion.) Thirty-seven years have passed since biologist Rachel Carson published *Silent Spring*, issuing the wake-up call that gave rise to the modern environmental movement.

Not all environmentalists will agree with me, but I believe that there are now some clear signs that the world does seem to be approaching a kind of paradigm shift in environmental consciousness. Across a spectrum of activities, places, and institutions, the atmosphere has 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 spokespersons for Greenpeace than for the bastions of global capitalism of which they are a part. More and more governments are taking revolutionary steps aimed at shoring up the Earth's long-term environmental health. Individuals the world over have established thriving new markets for products that are distinguished by their compatibility with a sustainable economy. What in the world is going on?

Thomas Kuhn, in his classic work *The Structure of Scientific Revolutions*, observes that as scientific understanding in a field advances, reaching a point where existing theory no longer explains reality, theory has to change. Perhaps history's best known example of this process is the shift from the Ptolemaic view of the world, in which people believed the sun revolved around the Earth, to the Copernican view which argued that the Earth revolved about the sun. Once the Copernican model existed, a lot of things suddenly made sense to those who studied the heavens, leading to an era of steady advances in astronomy.

We are now facing such a situation with the global economy. Although economists have long ignored the Earth's natural systems, evidence that the economy is slowly self-destructing by destroying its natural support systems can be seen on every hand. The Earth's forests are shrinking, fisheries are collapsing, water tables are falling, soils are eroding, coral reefs are dying, atmospheric CO₂ concentrations are increasing, temperatures are rising, floods are becoming more destructive, and the rate of extinction of plant and animal species may be the greatest since the dinosaurs disappeared 65 million years ago.

These ecological trends are driving analysts to a paradigm shift in their view of how the economy will have to work in the future. For years, these trends were marginalized by policymakers and the media as "special interest" topics, but as the trends have come to impinge more and more directly on people's lives, that has begun to change. The findings of these analysts are primary topics now not only for environmentalists, but for governments, corporations, and the media.

Learning From China

If changes in physical conditions are often the driving forces in perceptual shifts, one of the most powerful forces driving the current shift in our understanding of the ecological/economic relationship is the flow of startling information coming from China. Not only the world's most populous country, China since 1980 has been the world's fastest growing economy, raising incomes nearly fourfold. As such, China is in effect telescoping history, showing us what happens when large numbers of people become more affluent.

As incomes have climbed, so has consumption. If the Chinese should reach the point where they eat as much beef as Americans, the production of just that added beef will take an estimated 340 million tons of grain per year, an amount equal to the entire U.S. grain harvest. Similarly, if the Chinese were to consume oil at the American rate, the country would need 80 million barrels of oil a day—more than the entire world's current production of 67 million barrels a day.

What China is dramatizing—to its own scientists

and government and to an increasingly worried international community—is that the Western industrial development model will not work for China. And if the fossil-fuel-based, automobile-centered, throwaway economy will not work for it, then it will not work for India, with its billion people, nor for the other two billion in the developing world. And, in an increasingly integrated global economy, it will not work in the long run for the industrial economies either.

Just how powerfully events in China are beginning to sway perceptions was brought home to me at our press lunch for *State of the World 1998* when I was talking with some reporters sitting on the front row before the briefing began. A veteran reporter, rather skeptical as many seasoned reporters are, said that he had never been convinced by our argument that we need to restructure the global economy—but that the section in *State of the World* on rising affluence in China and the associated rising claims on global resources had now convinced him that we have little choice.

Fortunately, we now have a fairly clear picture of how to do that restructuring. When Worldwatch began to pioneer the concept of environmentally sustainable economic development 25 years ago, we were already aware that instead of being based on fossil fuels, the new model would be based on solar energy. Instead of having a sprawling automobile-centered urban transportation system, it would be based on more carefully designed cities, with shorter travel distances and greater reliance on rail, bicycles, and walking. Instead of a throwaway economy, it would be a reuse/recycle economy. And its population would have to be stable.

When we described our model in the early days, it sounded like pie in the sky—as the reporter’s skepticism reminded me. Now, with the subsequent advances in solar and wind technologies, gains in recycling, mounting evidence of automobile-exacerbated global warming, and the growing recognition that oil production will decline in the not-too-distant future, it suddenly becomes much more credible, a compelling alternative. Just as early astronomers were limited in how far they could go in understanding the heavens with the Ptolemaic model, so, too, we are limited in how long we can sustain economic progress with the existing economic model. As a result, in each of the four major areas of that model—renewable energy, efficient urban transport, materials recycling, and population stability—I believe public vision is shifting rapidly.

Shifting Views of Energy

A decade ago, there were plenty of avid aficionados of renewable energy, but the subject was of only marginal interest to the global public. That has

changed markedly, as escalating climate change has thrust questions about the climate-disrupting effects of burning fossil fuels into the center of public debate. In 1998, not only did the Earth’s average temperature literally go off the top of the chart we have been using to track global temperature for many years, but storm-related weather damage that year climbed to a new high of \$89 billion. This not only exceeded the previous record set in 1996 by an astonishing 48 percent, but it exceeded the weather-related damage for the entire decade of the 1980s.

When Worldwatch issued a brief report in late 1998 noting the record level of weather-related damage during the year, it was picked up by some 2,000 newspapers worldwide—an indication that energy issues were beginning to hit home, literally. Closely related to the increase in storms and floods was a dramatic rise in the number of people driven from their homes, for days or even months, as a result of more destructive storms and floods. Almost incomprehensibly, 300 million people—a number that exceeds the entire population of North America—were forced out of their homes in 1998.

If the news were only that fossil fuels are implicated in escalating damages, I’m not sure I’d see signs of a paradigm change. But along with the threats of rising damages, there were the data we released in 1998 indicating that the solutions to these threats have been coming on strong. Not only are fossil-fuel-exacerbated damages escalating, but technological alternatives—wind and solar power—are booming. While oil and coal still dominate the world energy economy, the new challengers are expanding at the kind of pace that makes venture capitalists reach for their phones. From 1990 to 1997, coal and oil use increased just over 1 percent per year, while solar cell sales, in contrast, were expanding at roughly 15 percent per year. In 1997 they jumped over 40 percent.

An estimated 500,000 homes, most of them in remote third world villages not linked to an electrical grid, now get their electricity from solar cells. The use of photovoltaic cells to supply electricity has recently gotten a big boost from the new solar roofing tiles developed in Japan. These “solar shingles,” which enable the roof of a building to become its own power plant, promise to revolutionize electricity generation worldwide, making it easier to forget fossil fuels.

The growth in wind power has been even more impressive, a striking 26 percent per year since 1990. If you are an energy investor and are interested in growth, it is in wind, not oil (see “Bull Market in Wind Energy,” page 24). The U.S. Department of Energy’s Wind Resource Inventory indicates that three states—North Dakota, South Dakota, and Texas—have enough harnessable wind energy to satisfy national electricity needs. And China could double its current electricity generation with wind alone.

Shifting Views of Urban Transport

In Bangkok, the average motorist last year sat in his car going nowhere for the equivalent of 44 working days. And in London, the average speed of a car today is little better than that of a horse-drawn carriage a century ago. Clearly, the automobiles that once provided much-needed mobility for rural societies cannot do the same for a society that will soon be largely urban. As a result, more and more national and city governments are beginning to confront the inherent conflict between the automobile and the city—a sign that we may be approaching a threshold of revolutionary change in how we view the very nature of urban life.

While the automobile industry still promotes the vision of a world with a car in every garage, some national and many city governments are emphasizing alternatives to the automobile, ones that center on better public rail transport and the bicycle. This movement in Europe is led by the Netherlands and Denmark, where bicycles account for 30 percent and 20 percent respectively of daily trips in cities. In Germany, policies encouraging bicycle use have raised the share of urban trips by bike nationwide from 8 percent in 1972 to 12 percent in 1995.

In Beijing, where air pollution is a health issue and where traffic conditions worsen by the month, the official enthusiasm for the car-dominant model of a few years ago seems to have cooled. A group of eminent scientists in China have directly challenged the government's plans to develop a Western-style, automobile-cen-

tered transportation system. They observe that China does not have enough land both to feed its people and to build the roads, highways, and parking lots needed for the automobile. They also argue that the automobile will increase traffic congestion, worsen urban air pollution—already the worst in the world—and force a growing dependence on imported oil.

The Chinese scientists argue that the country should develop “a public transportation network that is convenient, complete, and radiating in all directions.” The effort to convince Party leaders to reverse their policy is being led by one of China's most venerated scientists, physicist He Zuoxiu, who worked on the country's first atomic bomb. He says that China “just simply cannot sustain the development of a car economy.”

In the United States, scores of cities are begin-



NGO power is growing fast. In Korea, Lester Brown met with Yul Choi of the 50,000-member Korean Federation for Environmental Movement—one of hundreds of such groups taking root around the world.

ning to develop more bicycle-friendly transportation systems. More than 300 U.S. cities now have part of their police force on bicycles. Not long ago I found myself standing on a street corner in downtown Washington, D.C., next to a police officer on a bicycle. As we waited for the light to change, I asked him why there were now so many officers on bicycles. He indicated that it was largely a matter of efficiency, since an officer on a bike can respond to some 50 percent more calls in a day than one in a squad car. The fiscal benefits are obvious. He also indicated that the bicycle police make many more arrests, because they are both more mobile and less conspicuous.

Bicycle transport, like solar or wind power, may still seem to many to be a marginal indicator. But I see the same kind of signs of quiet, revolutionary change in the bicycle as in the modern wind turbine:

the unthinkable consequences of continuing the existing system, combined with recent sales trends. Bicycle use is growing much faster than automobile use, not only because it is more affordable but because it has a range of environmental and social advantages: it uses far less land (a key consideration in a world where the cropland area has shrunk to barely one-half acre per person); it does not contribute to pollution; it helps reduce traffic congestion; it does not contribute to CO₂ emissions; and, for an increasingly desk-bound workforce, it offers much needed exercise. Indeed, during the past three decades, in which annual car sales worldwide increased from 23 million to 37 million, the number of bicycles sold jumped from 25 million to 106 million.

If cars were used in a future world of 10 billion people at

the rate they are currently used in the United States (one car for every two people), that would mean a global fleet of 5 billion cars—10 times the existing, already dangerously burdensome, number. That prospect is inconceivable. Although the automobile industry is not abandoning its global dream of a car in every garage, it is *this* dream that now has a distinctly pie-in-the-sky feel.

Shifting Views of Materials Use

There are few areas in which individuals have participated so actively as in the effort to convert the throwaway economy into a reuse/recycle economy. At the individual level, efforts are concentrated on recycling paper, glass, and aluminum. But there are also important shifts coming in basic industries. For example, in the United States, not always a global leader in recycling, 56 percent of the steel produced now comes from scrap. Steel mills built in recent years are no longer located in western Pennsylvania, where coal and iron ore are in close proximity, but are scattered about the country—in North Carolina, Nebraska, or California—feeding on local supplies of scrap. These new electric arc steel furnaces produce steel with much less energy and far less pollution than that produced in the old steel mills from virgin iron ore.

A similar shift has taken place in the recycling of paper. At one time, paper mills were built almost exclusively in heavily forested areas, such as the northwestern United States, western Canada, or Maine, but now they are often built near cities, feeding on the local supply of scrap paper. The shift in *where* these industries are may prefigure a shift in our understanding of *what* they are.

This new economic model can be seen in the densely populated U.S. state of New Jersey where there are now 13 paper mills running only on waste paper. There are also eight steel mini-mills using electric arc furnaces to manufacture steel largely from scrap. These two industries, with a combined annual output in excess of \$1 billion, have developed in a state that has little forest cover and no iron mines. They operate almost entirely on material already in the system, providing a glimpse of what the reuse/recycle economy of the future looks like.

Shifting Views of Population

No economic system is sustainable with continual population growth, or with continual population declines either. Fortunately, some 32 countries containing 14 percent of the world's people have achieved population stability. All but one (Japan) are in Europe. In another group of some 40 countries, which includes the United States and China, fertility



has dropped below two children per woman, which means that these countries are also headed for population stability over the next few decades—assuming, of course, that those fertility trends don't reverse.



Family planning services—such as the simple expedient of making condoms readily available—are gaining ground in much of the world despite concerted campaigns to suppress them.

Unfortunately, many developing countries are facing huge population increases. Pakistan, Nigeria, and Ethiopia are projected to at least double their populations over the next half-century. India, with a population expected to reach 1 billion this August, is projected to add another 500 million people by 2050. If these countries do not stabilize their populations soon enough by reducing fertility, they will inevitably face a rise in mortality, simply because they will not be able to cope with new threats such as HIV or water and food shortages.

What is new here is that as more people are crowded onto the planet, far more are becoming alarmed about the potentially disastrous consequences of that crowding. In India, for example, the *Hindustan Times*, one of India's leading newspapers, recently commented on the fast-deteriorating water situation, where water tables are falling almost everywhere and wells are going dry by the thousands: "If our population continues to grow as it is now...it is certain that a major part of the country would be in the grip of a severe water famine in 10 to 15 years." The article goes on to reflect an emerging sense of desperation: "Only a bitter dose of compulsory family planning can save the coming generation from the fast-approaching Malthusian catastrophe." Among

other things, this comment appears to implicitly recognize the emerging conflict between the reproductive rights of the current generation and the survival rights of the next generation.

Corporate Converts

Corporations have been endorsing environmental goals for some three decades, but their efforts have been too often centered in the public relations office, not in corporate planning. Now this is beginning to change, as the better informed, more prescient CEOs recognize that the shift from the old industrial model to the new environmentally sustainable model of economic progress represents the greatest investment opportunity in history. In May 1997, for example, British Petroleum CEO John Browne broke ranks with the other oil companies on the climate issue when he said, "The time to consider the policy dimensions of climate change is not when the link between greenhouse gases and climate change is conclusively proven, but when the possibility cannot be discounted and is taken seriously by the society of which we are a part. We in BP have reached that point."

Browne then went on to announce a \$1 billion investment by BP in the development of wind and solar energy. In effect he was saying, "we are no longer an oil company; we are now an energy company." Within a matter of weeks Royal Dutch Shell announced that it was committing \$500 million to development of renewable energy sources. And in early 1998, Shell announced that it was leaving the Global Climate Coalition, an industry-supported group in Washington, D.C. that manages a disinformation campaign designed to create public confusion about climate change.

These commitments to renewable energy by BP and Shell are small compared with the continuing investment of vast sums in oil exploration and development, but they are investments in energy sources that cannot be depleted, while those made in oil fields can supply energy only for a relatively short time. In addition, knowing that world oil production likely will peak and begin to decline within the next 5 to 20 years, oil companies are beginning to look at the alternatives. This knowledge, combined with mounting concern about global warming, helps explain why the more forward-looking oil companies are now investing in wind and solar cells, the cornerstones of the new energy economy.

Ken Lay, the head of Enron, a large Texas-based national gas supplier with annual sales of \$20 billion that is fast becoming a worldwide energy firm, sees his company, and more broadly the natural gas industry, playing a central role in the conversion from a fossil-fuel-based energy economy to a solar/hydrogen energy economy. As the cost of wind power falls,

for example, cheap electricity from wind at wind-rich sites can be used to electrolyze water, producing hydrogen, a convenient means of both storing and transporting wind energy or other renewable energy resources. The pipeline network and storage facilities used for natural gas can also be used for hydrogen. George H.B. Verberg, the managing director of Gasunie in the Netherlands, has publicly outlined a similar role for his organization with its well developed natural gas infrastructure.

In the effort to convert our throwaway economy into a reuse/recycle economy, too, I see signs that new initiatives are coming not just from eco-activists but from industry. In Atlanta, Ray Anderson, the head of Interface, a leading world carpet manufacturer with sales in 106 countries, is starting to shift his firm from the sale of carpets to the sale of carpeting services. With the latter approach, Interface contracts to provide carpeting service to a firm for its offices for say a 10-year period. This service involves installing the carpet, cleaning, repairing and otherwise maintaining the quality of carpeting desired by the client. The advantage of this system is that when the carpet wears out, Interface simply takes it back to one of its plants and recycles it in its entirety into new carpeting. The Interface approach requires no virgin raw material to make carpets, and it leaves nothing for the landfill.

Perhaps one of the most surprising—and significant—signs of impending change came last year from the once notorious MacMillan Bloedel, a giant forest products firm operating in Canada's western-most province of British Columbia. "MacBlo," as it is called, startled the world—and other logging firms—when it announced that it was giving up the standard forest industry practice of clear-cutting. Under the leadership of a new chief executive, Tom Stevens, the company affirmed that clear-cutting will be replaced by selective cutting, leaving trees to check runoff and soil erosion, to provide wildlife habitat, and to help regenerate the forest. In doing so, it acknowledged the growing reach of the environmental movement. MacMillan Bloedel was not only being pressured by local groups, but it also had been the primary target of a Greenpeace campaign to ban clear-cutting everywhere.

Governments Catching On

At the national level, too, there are signs of major changes. Six countries in Europe—Denmark, Finland, the Netherlands, Sweden, Spain, and the United Kingdom—began restructuring their taxes during the 1990s in a process known as tax shifting—reducing income taxes while offsetting these cuts with higher taxes on environmentally destructive activities such as fossil fuel burning, the generation of garbage, the use of pesticides, and the production of toxic wastes. Although the reduction in income taxes does

not yet exceed 3 percent in any of these countries, the basic concept is widely accepted. Public opinion polls on both sides of the Atlantic show 70 percent of the public supporting tax shifting.

In mid 1998, the new government taking over in Germany, a coalition of Social Democrats and Greens, announced a massive restructuring of the tax system, one that would simultaneously reduce taxes on wages and raise taxes on CO₂ emissions. This shift, the largest yet contemplated by any government, was taken unilaterally, not bogging down in the politics of the global climate treaty, or contingent on steps taken elsewhere. The framers of the new tax structure argued that this tax restructuring would help strengthen the German economy by creating additional jobs and at the same time reducing air pollution, oil imports, and the rise in atmospheric CO₂—the principal threat to climate stability. With Germany taking this bold initiative unilaterally, other countries may follow.

Over the past generation, the world has relied heavily on regulation to achieve environmental goals, but in most instances using tax policy to restructure the economy is far more likely to be successful because it permits the market to operate, thus taking advantage of its inherent efficiency in linking producers and consumers. Restructuring taxes to achieve environmental goals also minimizes the need for regulation.

In effect, the governments moving toward tax shifting have decided that the emphasis on taxing wages and income from investments discourages both work and saving, activities that should be encouraged, not discouraged. They believe we should be discouraging environmentally destructive activities by taxing them instead. Since tax shifting does not necessarily change the overall level of taxation, and thus does not materially alter a country's competitive position in the world market, it can be undertaken unilaterally.

Environmental leadership does not always come from large countries. At the December 1997 Kyoto conference on climate, President José Maria Figueres of Costa Rica announced that by the year 2010, his country planned to get all of its electricity from renewable sources. In Copenhagen, the Danish government has banned the construction of coal-fired power plants.

In the U.S. government, no longer a leader on the environmental front, there are signs of a breakthrough in at least some quarters. The Forest Service announced in early 1998 that after several decades of building roads in the national forests to help logging companies remove timber, it was imposing an 18-month moratorium on road building. Restricting this huge public subsidy, which had built some 380,000 miles of roads to facilitate clear-cutting on public

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Foreword

November 1997

This report summarizes a MEDEA Special Study exploring prospects for future grain production. Specifically, it was motivated by Lester Brown's analysis suggesting that China would be in a future to feed its increasingly affluent and growing population with domestic sources. A shortfall would severely stress the world's ability to supply the deficit. In response to a request from the National Science Foundation, the study was conducted to obtain a more accurate estimate of future grain production.

CIA investigation following up on Lester Brown's *WORLD WATCH* analysis signified that intelligence agencies are taking environmental threats more seriously now.

lands, signals a fundamental shift in the management of national forests. The new chief of the Forest Service, Michael Dombeck, responding to a major shift in public opinion and no longer intimidated by the "wise-use" movement of the early Clinton years, said the service was focusing on the use of national forests for recreation, for wildlife protection, to supply clean water, and as a means of promoting tourism as well as supplying timber. The shift in opinion seems to reflect a growing public recognition of the environmental consequences of clear-cutting, including more destructive flooding, soil erosion, silting of rivers, and in the Northwest, the destruction of salmon fisheries.

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 that it had been greatly exacerbated by the deforestation of the upper reaches of the watershed. Premier Zhu Rongji personally issued orders to not only halt the tree-cutting in the upper reaches of the Yangtze basin and elsewhere in China, but also to convert some state timbering firms into tree-planting firms. The official view in Beijing now is that trees are worth three times as much standing as they are cut, simply because of the water storage and flood retention capacity of forests.

Meanwhile, back in Washington, even the U.S. intelligence community is beginning to realize that environmental trends can adversely affect the global economy on a scale that could lead to political instability. The National Intelligence Council, the organizational umbrella over the CIA, DIA, and other U.S. intelligence agencies, was provoked by the article, "Who Will Feed China?" that I published in *WORLD WATCH* in 1994. It was concerned that projected losses of cropland and irrigation water in China could lead to soaring grain imports, rising world grain prices and, ultimately, to widespread political instability in

third world cities. In response, the Council assembled a team of prominent U.S. scientists to undertake an exhaustive interdisciplinary analysis of China's long-term food prospect.

This analysis, completed in late 1997, showed horrendous water deficits emerging in the water basins of the northern half of China, deficits that could decimate the grain harvest in some regions even as the demand for grain continues to climb. It concluded that China will likely need to import 175 million tons of grain by 2025, an amount that approaches current world grain exports of 200 million tons. When the U.S. intelligence community, which was for half a century fixated on the Communist threat, now raises an alarm about an environmental threat in a Communist country—that is indeed a sign that we are approaching a new threshold.

NGOs as Catalysts

Among the signs that new perceptions are overtaking old institutions is the robust proliferation of nongovernmental organizations (NGOs). The formation of environmental NGOs is a response of civil society to the immobility of existing institutions and specifically to their lack of a timely response to spreading environmental destruction. The new economic model outlined earlier originated not in the halls of academe or in the councils of government but within the research groups among the environmental NGOs. There are hundreds of international and national environmental groups and literally thousands of local single-issue groups.

At the international level, groups like Greenpeace, the International Union for Conservation of Nature, and the Worldwide Fund for Nature have become as influential in shaping environmental policies as national governments. The budgets of some of the individual environmental groups, such as the 1.2 million-member U.S. World Wildlife Fund (\$82 mil-

lion) or Greenpeace International (\$60 million), begin to approach the \$105 million budget of the United Nations Environment Programme, the U.N. agency responsible for environmental matters. In fact, much of the impetus toward a global consciousness of environmental threats—and much of the hard work of establishing the new mechanisms needed to build an environmentally sustainable economy—have come from NGOs. The research that underpinned the UN-sponsored Earth Summit in Rio de Janeiro in 1992, notably, came largely from organizations like the Wuppertal Institute in Germany and the U.S.-based World Resources Institute and Worldwatch Institute.

Almost every industrialized country now has a number of national environmental groups, many with memberships measured in the hundreds of thousands. Some developing countries, too, now have strong environmental groups. In Korea, for example, the Korean Federation for Environmental Movement, a group with a membership that recently passed 50,000 and a full-time staff of 60, has become a force to be reckoned with by the government.

At the grassroots, thousands of local single-issue groups work on objectives ranging from preventing construction of a nuclear power plant in Japan's Niigata prefecture to protecting the Amazonian rainforest from burning by cattle ranchers so that the forest products can continue to be harvested by local people. The little-heralded work of small groups like this on every continent is quietly helping to move us within reach of a major shift in public awareness.

Approaching the Threshold

One reason more people are aware of the environmental underpinnings of their lives now is that many more have been directly affected by environmental disruptions. And even when events don't impinge directly, media coverage is more likely to expose the damage now than a decade ago. Among the events that are mobilizing public concern, and therefore support for restructuring the economy, are fishery collapses, water shortages, rainforests burning uncontrollably, sudden die-offs of birds, dolphins, and fish, record heat waves, and storms of unprecedented destructiveness.

Weather-related damages are now so extensive that insurance companies can no longer use linear models from the past to calculate risks in the future. When the cost of insuring property rises sharply in the future, as now seems inevitable, millions of people may take notice—including many who have not before.

Are we indeed moving toward a social threshold which, once crossed, will lead to a dizzying rate of environmentally shaped economic change, on a scale that we may not now even imagine? No one knows

for sure, but some of the preconditions are clearly here. An effective response to any threat depends on a recognition of that threat, which is broad enough to support the response. There is now a growing worldwide recognition outside the environmental community that the economy we now have cannot take us where we want to go. Three decades ago, it was only environmental activists who were speaking out on the need for change, but the ranks of activists have now broadened to include CEOs of major corporations, government ministers, prominent scientists, and even intelligence agencies.

Getting from here to there quickly is the challenge. But at least we have a clear sense of what has to be done. The key to restructuring the global economy, as noted earlier, is restructuring the tax system. Seven European countries, led by Germany, are advancing on this front.

New institutional initiatives, too, are helping set the stage for the economic restructuring. For example, ecological labeling of consumer products is being implemented as a means of raising awareness—and shifting purchasing priorities—in several industries. Consumers who want to protect forests from irresponsible logging practices now have the option of buying only products that come from those forests that are being managed in a certifiably responsible way. In the United States, even electric power can now be purchased from "green" sources in some areas, if the consumer so chooses. Public awareness of the differences among energy sources is raised significantly, as each power purchaser is confronted with the available options.

Another institutional means for expressing public preferences is government procurement policy. If national or local governments decide to buy only paper that has a high recycled content, for example, they provide market support for economic restructuring. And governments, like individual users, can become "green" consumers by opting for climate-benign sources of electricity.

Trying times require bold responses, and we are beginning to see some, such as the decision by Ted Turner, the founder of Turner Broadcasting and Cable News Network (CNN), now part of the Time Warner complex, to contribute \$1 billion to the United Nations to be made available at \$100 million per year over the next ten years. Not only is Turner committing a large part of his personal fortune to dealing with some of the world's most pressing population, environmental, and humanitarian problems, but he is also urging other billionaires, of whom there are now more than 600 in the world, not to wait until their deaths to put money in foundations that might work on these issues. He argues, quite rightly, that time is of the essence, that right now we are losing the war to save the future.

In a world where the economy has expanded from \$6 trillion in output in 1950 to \$39 trillion in 1998, new collisions between the expanding economy as now structured and its environmental support systems are occurring somewhere almost daily. Time is running out. The Aral Sea has died. Its fisheries are gone. The deterioration of Indonesia's rainforests may have reached the point of no return. We may not be able to save the glaciers in Glacier National Park.

The key to quickly gaining acceptance of the new economic model is to accelerate the flow of information about how the old model is now destroying its natural support systems. Some governments are now doing this. For example, beginning in late summer of 1997, the Clinton White House began holding press briefings, regularly reporting new climate findings. On June 8, 1998, Vice President Al Gore held a press conference announcing that for the world 1997 "was the warmest year on record and we've set new temperature records every month since January." He went on to say, "This is a reminder once again that global warming is real and that unless we act, we can expect more extreme weather in the year ahead."

Even China is taking steps toward more open dissemination of information. In early 1998, Beijing became the 39th Chinese city to start issuing weekly air quality reports since the beginning of 1997. These reports, providing data on such indicators as the levels of nitrous oxides from car exhaust and particulate matter from coal burning, reveal that Chinese urban dwellers breathe some of the world's most polluted air. Air pollution is estimated to cause 178,000 premature deaths per year, more than four times the number of automobile fatalities in the United States. "Who Will Feed China?," initially banned in China, is now being promoted on Central Television. This new openness by the government is expected to enhance public support for taking the steps needed to control air pollution, whether it be restricting automobile traffic, closing the most polluting factories, or shifting to clean sources of energy. Information on how the inefficient use of water could lead to food shortages can boost support for water pricing.

Media coverage of environmental trends and events is also increasing, indicating a rising appreciation of their importance. One could cite thousands of examples, but let me mention just two. First is the media coverage given to the 1997/98 El Niño, the periodic rise in the surface temperature of water in the eastern Pacific that affects climate patterns worldwide. This is not a new phenomenon. It has occurred periodically for as far back as climate records exist. But the difference is in the coverage. In 1982/83 there was an El Niño of similar intensity, but it did

not become a household word. In 1997/98, it did largely because a more enlightened community of television meteorologists who report daily weather events understood better how El Niño was affecting local climate. Public recognition of the importance of El Niño was perhaps most amusingly demonstrated for me last winter, when a large automobile dealer in my area advertised that it was having an "El Niño" sale. It was going to be a big one!

At a more specific level, in the fall of 1997, *Time* magazine produced a special issue of its international edition under the headline "Our Precious Planet: Why Saving the Environment Will be the Next Century's Biggest Challenge." As the title implies, the issue recognized—in a way few major news organizations have in the past—the extraordinary dimensions of the challenge facing humanity as we try to sustain economic progress in the next century.

More and more people in both the corporate and political worlds are now beginning to share a common vision of what an environmentally sustainable economy will look like. If the evidence of a global awakening were limited to one particular indicator, such as growing membership in environmental groups, it might be dubious. But with the evidence of growing momentum now coming from a range of key indicators simultaneously, the prospect that we are approaching the threshold of a major transformation becomes more convincing. The question is, if it does come, whether it will come soon enough to prevent the destruction of natural support systems on a scale that will undermine the economy.

As we prepare to enter the new century, no challenge looms greater than that of transforming the economy into one that is environmentally sustainable. This Environmental Revolution is comparable in scale to the Agricultural Revolution and the Industrial Revolution. The big difference is in the time available. The Agricultural Revolution was spread over thousands of years. The Industrial Revolution has been underway for two centuries. The Environmental Revolution, if it succeeds, will be compressed into a few decades. We study the archeological sites of civilizations that moved onto economic paths that were environmentally destructive and could not make the needed course corrections either because they did not understand what was happening or could not summon the needed political will. We *do* know what is happening. The question for us is whether our global society can cross the threshold that will enable us to restructure the global economy before environmental deterioration leads to economic decline.

Lester Brown is president of Worldwatch Institute.