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Toward a Sustainable World

What policies can lead to the changes in behavior—of individuals, industries and governments—that will allow development and growth to take place within the limits set by ecological imperatives?

by William D. Ruckelshaus

The difficulty of converting scientific findings into political action is a function of the uncertainty of the science and the pain generated by the action. Given the current uncertainties surrounding just one aspect of the global environmental crisis—the predicted rise in greenhouse gases—and the enormous technological and social effort that will be required to control that rise, it is fair to say that responding successfully to the multifaceted crisis will be a difficult political enterprise. It means trying to get a substantial proportion of the world's people to change their behavior in order to (possibly) avert threats that will otherwise (probably) affect a world most of them will not be alive to see.

The models that predict climatic change, for example, are subject to varying interpretations as to the timing, distribution and severity of the changes in store. Also, whereas models may convince scientists, who understand their assumptions and limitations, as a rule projections make poor politics. It is hard for people—hard even for the groups of people who constitute governments—to change in response to dangers that may not arise for a long time or that just might not happen at all.

How, then, can we make change happen? The previous articles in this

single-topic issue have documented the reality of the global ecological crisis and have pointed to some specific ameliorative measures. This article is about how to shape the policies, launch the programs and harness the resources that will lead to the adoption of such measures—and that will actually convince ordinary people throughout the world to start doing things differently.

Insurance is the way people ordinarily deal with potentially serious contingencies, and it is appropriate here as well. People consider it prudent to pay insurance premiums so that if catastrophe strikes, they or their survivors will be better off than if there had been no insurance. The analogy is clear. Current resources foregone or spent to prevent the buildup of greenhouse gases are a kind of premium. Moreover, as long as we are going to pay premiums, we might as well pay them in ways that will yield dividends in the form of greater efficiency, improved human health or more widely distributed prosperity. If we turn out to be wrong on greenhouse warming or ozone depletion, we still retain the dividend benefits. In any case, no one complains to the insurance company when disaster does not strike.

That is the argument for some immediate, modest actions. We can hope that if shortages or problems arise, there will turn out to be a technological fix or set of fixes, or that technology and the normal workings of the market will combine to solve the problem by product substitution. Already, for example, new refrigerants that do not have the atmospheric effects of the chlorofluorocarbons are being introduced; perhaps a cheap and non-polluting source of energy will be discovered.

It is comforting to imagine that we might arrive at a more secure tomorrow with little strain, to suppose with

Dickens's Mr. Micawber that something will turn up. Imagining is harmless, but counting on such a rescue is not. We need to face up to the fact that something enormous may be happening to our world. Our species may be pushing up against some immovable



COEXISTENCE of nature and human activity is celebrated in *Progress*, painted by Asher B. Durand in 1853. It is an im-

WILLIAM D. RUCKELSHAUS is chief executive officer of Browning Ferris Industries, Inc. He was administrator of the Environmental Protection Agency from 1970 to 1973 and again from 1983 to 1984 and was a member of the World Commission on Environment and Development. A graduate of Princeton University and Harvard Law School, he has served as deputy attorney general of Indiana and of the U.S. and as acting director of the Federal Bureau of Investigation. Ruckelshaus acknowledges the major contribution of Michael A. Gruber, a senior policy analyst at the E.P.A., in the preparation of this article.

limits on the combustion of fossil fuels and damage to ecosystems. We must at least consider the possibility that, besides those modest adjustments for the sake of prudence, we may have to prepare for far more dramatic changes, changes that will begin to shape a sustainable world economy and society.

Sustainability is the nascent doctrine that economic growth and development must take place, and be maintained over time, within the limits set by ecology in the broadest sense—by the interrelations of human beings and their works, the biosphere and the physical and chemical laws that govern it. The doctrine of sustainability holds too that the spread of a reasonable level of prosperity and security to the less developed nations is essential to protecting ecological balance and hence essential to the continued pros-

perity of the wealthy nations. It follows that environmental protection and economic development are complementary rather than antagonistic processes.

Can we move nations and people in the direction of sustainability? Such a move would be a modification of society comparable in scale to only two other changes: the agricultural revolution of the late Neolithic and the Industrial Revolution of the past two centuries. Those revolutions were gradual, spontaneous and largely unconscious. This one will have to be a fully conscious operation, guided by the best foresight that science can provide—foresight pushed to its limit. If we actually do it, the undertaking will be absolutely unique in humanity's stay on the earth.

The shape of this undertaking can-

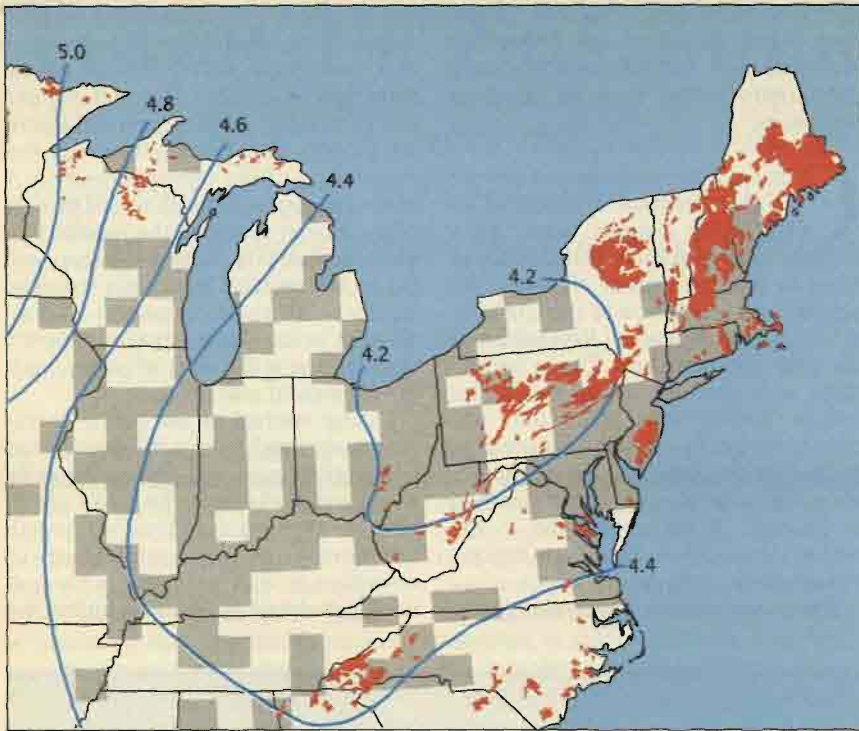
not be clearly seen from where we now stand. The conventional image is that of a crossroads: a forced choice of one direction or another that determines the future for some appreciable period. But this does not at all capture the complexity of the current situation. A more appropriate image would be that of a canoeist shooting the rapids: survival depends on continually responding to information by correct steering. In this case the information is supplied by science and economic events; the steering is the work of policy, both governmental and private.

Taking control of the future therefore means tightening the connection between science and policy. We need to understand where the rocks are in time to steer around them. Yet we will not devote the appropriate level of resources to science or accept the policies mandated by science unless we



age in which a "balanced reconciliation of nature and culture seems to have been achieved," according to the art historian Barbara Novak. Durand's 19th-century view of industrializa-

tion might well serve as a metaphor for today's vision of sustainable development. The painting is in the Warner Collection of the Gulf States Paper Corporation, in Tuscaloosa, Ala.



ACID RAIN is a political problem because industrial emissions responsible for acidic precipitation cross political borders. Regions where the density of sulfur dioxide emissions was more than 1.5 tons per square kilometer in 1980 are shown in gray; states with the largest emissions are in the Midwest and along the Ohio River. The contours show the pH of precipitation; low pH means high acidity. Within the low-pH regions, lakes and streams are at highest risk of acidification where the water's alkalinity is lowest (orange)—largely in the Adirondacks and New England. Sulfur dioxide data are from the National Acid Precipitation Assessment Program, alkalinity data from James M. Omernick of the Environmental Protection Agency and his colleagues.

do something else. We have to understand that we are all in the same canoe and that steering toward sustainability is necessary.

Sustainability was the original economy of our species. Preindustrial peoples lived sustainably because they had to; if they did not, if they expanded their populations beyond the available resource base, then sooner or later they starved or had to migrate. The sustainability of their way of life was maintained by a particular consciousness regarding nature: the people were spiritually connected to the animals and plants on which they subsisted; they were part of the landscape, or of nature, not set apart as masters.

The era of this "original sustainability" eventually came to an end. The development of cities and the maintenance of urban populations called for intensive agriculture yielding a surplus. As a population grows, it requires an expansion of production, either by conquest or colonization or improved technique. A different consciousness, also embodied in a structure of myth,

sustains this mode of life. The earth and its creatures are considered the property of humankind, a gift from the supernatural. Man stands outside of nature, which is a passive playing field that he dominates, controls and manipulates. Eventually, with industrialization, even the past is colonized: the forests of the Carboniferous are mined to support ever-expanding populations. Advanced technology gives impetus to the basic assumption that there is essentially no limit to humanity's power over nature.

This consciousness, this condition of "transitional unsustainability," is dominant today. It has two forms. In the underdeveloped, industrializing world, it is represented by the drive to develop at any environmental cost. It includes the wholesale destruction of forests, the replacement of sustainable agriculture by cash crops, the attendant exploitation of vulnerable lands by people such as cash cropping forces off good land and the creation of industrial centers that are also centers of environmental pollution.

In the industrialized world, unsustainable development has generated

wealth and relative comfort for about one fifth of humankind, and among the populations of the industrialized nations the consciousness supporting the unsustainable economy is nearly universal. With a few important exceptions, the environmental-protection movement in those nations, despite its major achievements in passing legislation and mandating pollution-control measures, has not had a substantial effect on the lives of most people. Environmentalism has been ameliorative and corrective—not a restructuring force. It is encompassed within the consciousness of unsustainability.

Although we cannot return to the sustainable economy of our distant ancestors, in principle there is no reason why we cannot create a sustainability consciousness suitable to the modern era. Such a consciousness would include the following beliefs:

1. *The human species is part of nature. Its existence depends on its ability to draw sustenance from a finite natural world; its continuance depends on its ability to abstain from destroying the natural systems that regenerate this world.* This seems to be the major lesson of the current environmental situation as well as being a direct corollary of the second law of thermodynamics.

2. *Economic activity must account for the environmental costs of production.* Environmental regulation has made a start here, albeit a small one. The market has not even begun to be mobilized to preserve the environment; as a consequence an increasing amount of the "wealth" we create is in a sense stolen from our descendants.

3. *The maintenance of a livable global environment depends on the sustainable development of the entire human family.* If 80 percent of the members of our species are poor, we can not hope to live in a world at peace; if the poor nations attempt to improve their lot by the methods we rich have pioneered, the result will eventually be world ecological damage.

This consciousness will not be attained simply because the arguments for change are good or because the alternatives are unpleasant. Nor will exhortation suffice. The central lesson of realistic policy-making is that most individuals and organizations change when it is in their interest to change, either because they derive some benefit from changing or because they incur sanctions when they do not—and the shorter the time between change (or failure to change) and benefit (or

sanction), the better. This is not mere cynicism. Although people will struggle and suffer for long periods to achieve a goal, it is not reasonable to expect people or organizations to work against their immediate interests for very long—particularly in a democratic system, where what they perceive to be their interests are so important in guiding the government.

To change interests, three things are required. First, a clear set of values consistent with the consciousness of sustainability must be articulated by leaders in both the public and the private sector. Next, motivations need to be established that will support the values. Finally, institutions must be developed that will effectively apply the motivations. The first is relatively easy, the second much harder and the third perhaps hardest of all.

Values similar to those I described above have indeed been articulated by political leaders throughout the world. In the past year the president and the secretary of state of the U.S., the leader of the Soviet Union, the prime minister of Great Britain and the presidents of France and Brazil have all made major environmental statements. In July the leaders of the Group of Seven major industrialized nations called for "the early adoption, worldwide, of policies based on sustainable development." Most industrialized nations have a structure of national environmental law that to at least some extent reflects such values, and there is even a small set of international conventions that begin to do the same thing.

Mere acceptance of a changed value structure, although it is a prerequisite, does not generate the required change in consciousness, nor does it change the environment. Although diplomats and lawyers may argue passionately over the form of words, talk is not action. In the U.S., which has a set of environmental statutes second to none in their stringency, and where for the past 15 years poll after poll has recorded the American people's desire for increased environmental protection, the majority of the population participates in the industrialized world's most wasteful and most polluting style of life. The values are there; the appropriate motivations and institutions are patently inadequate or nonexistent.

The difficulties of moving from stated values to actual motivations and institutions stem from basic characteristics of the major industrialized nations—the nations that must, be-

cause of their economic strength, pre-eminence as polluters and dominant share of the world's resources, take the lead in any changing of the present order. These nations are market-system democracies. The difficulties, ironically, are inherent in the free-market economic system on the one hand and in democracy on the other.

The economic problem is the familiar one of externalities: the environmental cost of producing a good or service is not accounted for in the price paid for it. As the economist Kenneth E. Boulding has put it: "All of nature's systems are closed loops, while economic activities are linear and assume inexhaustible resources and 'sinks' in which to throw away our refuse." In willful ignorance, and in violation of the core principle of capitalism, we often refuse to treat environmental resources as capital. We spend them as income and are as befuddled as any profligate heir when our checks start to bounce.

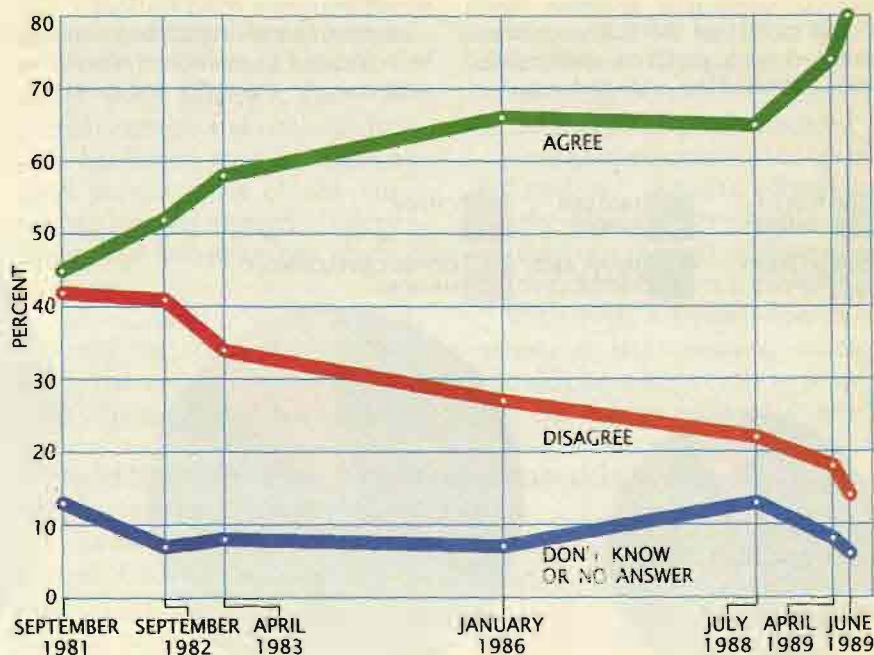
Such "commons" as the atmosphere, the seas, fisheries and goods in public ownership are particularly vulnerable to being overspent in this way, treated as either inexhaustible resources or bottomless sinks. The reason is that the incremental benefit to each user accrues exclusively to that user, and in the short term it is a gain. The environmental degradation is spread out among all users and is apparent

only in the long term, when the resource shows signs of severe stress or collapse. Some years ago the biologist Garrett Hardin called this the tragedy of the commons.

The way to avoid the tragedy of the commons—to make people pay the full cost of a resource use—is to close the loops in economic systems. The general failure to do this in the industrialized world is related to the second problem, the problem of action in a democracy. Modifying the market to reflect environmental costs is necessarily a function of government. Those adversely affected by such modifications, although they may be a tiny minority of the population, often have disproportionate influence on public policy. In general, the much injured minority proves to be a more formidable lobbyist than the slightly benefited majority.

The Clean Air Act of 1970 in the U.S., arguably the most expensive and far-reaching environmental legislation in the world, is a case in point. Parts of the act were designed not so much to cleanse the air as to protect the jobs of coal miners in high-sulfur coal regions. Utilities and other high-volume consumers were not allowed to substitute low-sulfur coal to meet regulatory requirements but instead had to install scrubbing devices.

Although the act expired seven



ENVIRONMENTAL VALUES have drawn increasing support in the U.S. In *New York Times/CBS News* polls taken since 1981, respondents were asked to react to this statement: "Protecting the environment is so important that requirements and standards cannot be too high, and continuing environmental improvements must be made regardless of cost." The two latest polls were taken after the *Exxon Valdez* spill.

years ago, Congress found it extraordinarily difficult to develop a revision, largely because of another set of contrary interests involving acid rain. The generalized national interest in reducing the environmental damage attributable to this long-range pollution had to overcome the resistance of both high-sulfur-coal mining interests and the Midwestern utilities that would incur major expenses if they were forced to control sulfur emissions. The problem of conflicting interests is exacerbated by the distance between major sources of acid rain and the regions that suffer the most damage. It is accentuated when the pollution crosses state and national boundaries: elected representatives are less likely to countenance short-term adverse effects on their constituents when the immediate beneficiaries are nonconstituents.

The question, then, is whether the industrial democracies will be able to overcome political constraints on bending the market system toward long-term sustainability. History provides some cause for optimism: a number of contingencies have led nations to accept short-term burdens in order to meet a long-term goal.

War is the obvious example. Things considered politically or economically impossible can be accomplished in a remarkably short time, given the belief that national survival is at stake. World War II mobilized the U.S. population, changed work patterns, manipulated and controlled the price and supply of

goods and reorganized the nation's industrial plant.

Another example is the Marshall Plan for reconstructing Europe after World War II. In 1947 the U.S. spent nearly 3 percent of its gross domestic product on this huge set of projects. Although the impetus for the plan came from fear that Soviet influence would expand into Western Europe, the plan did establish a precedent for massive investment in increasing the prosperity of foreign nations.

There are other examples. Feudalism was abandoned in Japan, as was slavery in the U.S., in the 19th century; this century has seen the retreat of imperialism and the creation of the European Economic Community. In each case important interests gave way to new national goals.

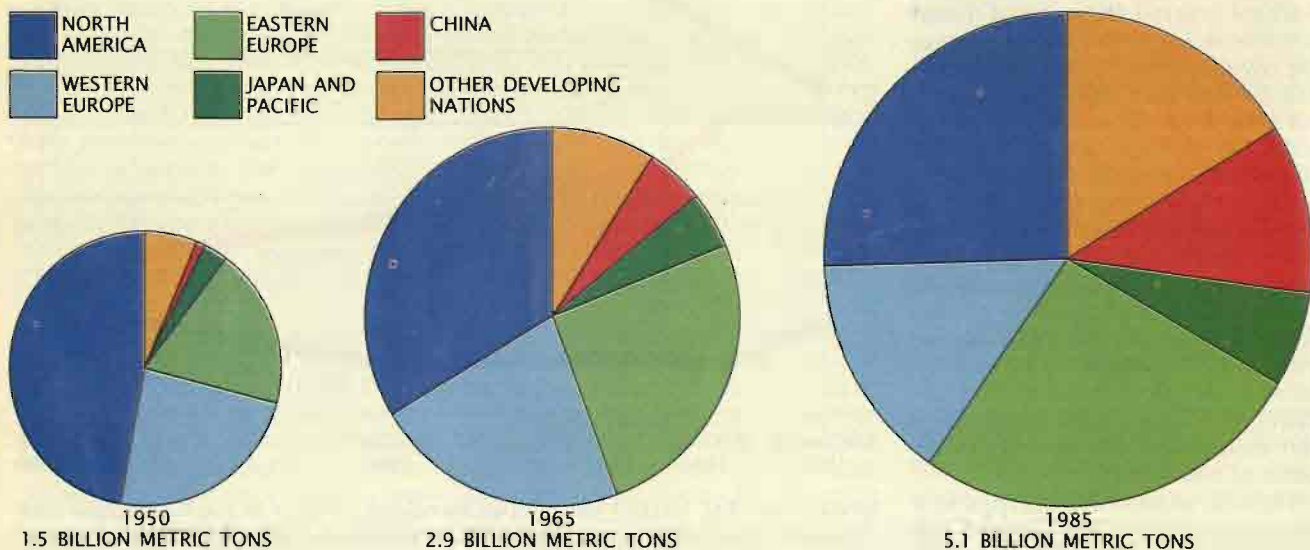
If it is possible to change, how do we begin to motivate change? Clearly, government policy must lead the way, since market prices of commodities typically do not reflect the environmental costs of extracting and replacing them, nor do the prices of energy from fossil fuels reflect the risks of climatic change. Pricing policy is the most direct means of ensuring that the full environmental cost of goods and services is accounted for. When government owns a resource, or supplies it directly, the price charged can be made to reflect the true cost of the product. The market will adjust to this as it does to true scarcity: by product substitution and conservation.

Environmental regulation should be refocused to mobilize rather than suppress the ingenuity and creativity

of industry. For example, additional gains in pollution control should be sought not simply by increasing the stringency or technical specificity of command-and-control regulation but also by implementing incentive-based systems. Such systems magnify public-sector decisions by tens of thousands of individual and corporate decisions. To be sure, incentive systems are not a panacea. For some environmental problems, such as the use of unacceptably dangerous chemicals, definitive regulatory measures will always be required. Effective policies will include a mixture of incentive-based and regulatory approaches.

Yet market-based approaches will be a necessary part of any attempt to reduce the greenhouse effect. Here the most attractive options involve the encouragement of energy efficiency. Improving efficiency meets the double-benefit standard of insurance: it is good in itself, and it combats global warming by reducing carbon dioxide emissions. If the world were to improve energy efficiency by 2 percent a year, the global average temperature could be kept within one degree Celsius of present levels. Many industrialized nations have maintained a rate of improvement close to that over the past 15 years.

Promoting energy efficiency is also relatively painless. The U.S. reduced the energy intensity of its domestic product by 23 percent between 1973 and 1985 without much notice. Substantial improvement in efficiency is available even with existing technol-



DEVELOPED NATIONS are responsible for far more industrial emission of carbon dioxide, a major greenhouse gas, than are the developing nations. Total emissions have increased sharply since 1950. Data are from the World Resources Institute.

No More Wishful Thinking

For too long, wishful thinking has dominated energy policy. The wishful thinkers assume our nation will always have the electricity it needs "somehow." They tell us we don't need to build more power plants. They figure if we ever run short, we can simply use less.

They're dangerously wrong. Signs point to an energy crisis coming. First, electricity demand is growing faster than new supplies are being added because of our continued economic growth. In some parts of the country, electric reliability is already threatened.

Second, to meet increased energy demand, we're increasing our dependence on foreign oil and, in the process, gambling with our energy independence and our national security.

Third, there is a growing concern about "greenhouse" gases. It's time to drop the wishful thinking and look at the facts.

GNP Growth Depends on Electricity

Since the 1973 oil embargo, the U.S. has made great strides in efficiency of energy use. But over this same period, demand for electricity has grown about 50 percent—roughly parallel with GNP growth. Clearly, electricity has fueled much of the growth in the U.S. economy. If our economy is to continue to grow, we must have additional, reliable, affordable supplies of electricity.

Yet, for many reasons—most of them beyond the electric industry's control—construction of new power plants is at a 15-year low. New generating capacity

planned over the next 10 years will support growth in electric sales of only 1 percent per year. That is one-fourth the growth rate we've experienced over the last six years.

Using Oil for Electricity Presents Big Problems

Building new power plants is only part of the solution. We must also ask ourselves: what kind of power plants should be built?

Oil is one option (over 25 percent of U.S. electric capacity is fueled by oil and natural gas), but it's expensive and it presents other big problems, including environmental ones.

The U.S. is already dangerously dependent on foreign oil. Nearly half the oil we use is imported, causing one-third of our trade deficit. And it's getting worse.

Because electricity from oil-fired plants is costly, electric utilities try to reserve that capacity for times of very high demand. If we don't meet rising electric demand with domestic fuels—like nuclear energy and coal—utilities will be forced to use those oil-fired plants more of the time, worsening our foreign oil dependence and boosting our electricity costs.

Unfortunately, we're already moving in that direction. In 1988, the use of imported oil by utility companies increased 24 percent, and it's still growing. By the mid-1990s, utilities will be burning about 2 million barrels per day—almost all of it imported. Our nation is so dependent on foreign oil for other uses, such as transportation, we sim-

ply cannot afford to make the situation worse by using foreign oil to generate electricity.

Nuclear Energy—the Clean, Secure Solution

For generating electricity, nuclear energy has inherent advantages: It's a clean, secure, domestic source. And it helps preserve valuable natural resources for future generations.

Nuclear energy is our second largest source of electricity, after coal. Our nuclear plants have cut consumer electricity costs by over \$50 billion since the 1973 oil embargo. The spent fuel from all our commercial nuclear plants has been managed scrupulously at carefully controlled sites. And our plants have operated safely.

We learned much from the Three Mile Island accident. The jolt it gave the industry's confidence led to substantial improvements in operation and design. The Nuclear Regulatory Commission and the Institute of Nuclear Power Operations report steady improvement in all areas of nuclear plant performance.

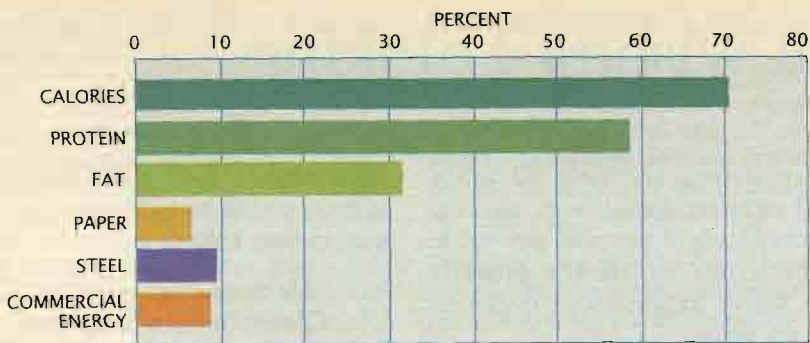
Finally, our nuclear plants have reduced oil imports, displacing nearly 4 billion barrels of oil and cutting our foreign oil payments by over \$114 billion since 1973.

With such a record, there's no question that nuclear energy should play a larger role in supplying our future electricity needs. These are facts. Wishful thinking cannot deliver so well.

For more information on nuclear energy, write to the U.S. Council for Energy Awareness, 1776 I Street N.W., Suite 400, Washington, D.C. 20006-2495.

U.S. COUNCIL FOR ENERGY AWARENESS

Nuclear energy means more energy independence.



DEVELOPED NATIONS consume far more of the world's goods than do the developing nations—which have some 75 percent of the world's population. Per capita consumption in the developing nations is shown as a percent of that in the developed nations. Data are estimates by the World Commission on Environment and Development.

ogy. Something as simple as bringing all U.S. buildings up to the best world standards could save enormous amounts of energy. Right now more energy passes through the windows of buildings in the U.S. than flows through the Alaska pipeline.

Efficiency gains may nevertheless have to be promoted by special market incentives, because energy prices tend to lag behind increases in income. A "climate protection" tax of \$1 per million Btu's on coal and 60 cents per million Btu's on oil is an example of such an incentive. It would raise gasoline prices by 11 cents a gallon and the cost of electricity an average of 10 percent, and it would yield \$53 billion annually.

Direct regulation by the setting of

standards is cumbersome, but it may be necessary when implicit market signals are not effective. Examples are the mileage standards set in the U.S. for automobiles and the efficiency standards for appliances that were adopted in 1986. The appliance standards will save \$28 billion in energy costs by the year 2000 and keep 342 million tons of carbon out of the atmosphere.

Over the long term it is likely that some form of emissions-trading program will be necessary—and on a much larger scale than has been the case heretofore. (Indeed, the President's new Clean Air Act proposal includes a strengthened system of tradeable permits.) In such a pro-



ENVIRONMENTAL ISSUES look different to people and governments in the rich and in the poor nations. The cartoon was drawn by Scott Willis of the *San Jose Mercury News*.

gram all major emitters of pollutants would be issued permits specifying an allowable emission level. Firms that decide to reduce emissions below the specified level—for example, by investing in efficiency—could sell their excess "pollution rights" to other firms. Those that find it prohibitively costly to retrofit old plants or build new ones could buy such rights or could close down their least efficient plants and sell the unneeded rights.

Another kind of emissions trading might reduce the impact of carbon dioxide emissions. Companies responsible for new greenhouse-gas emissions could be required to offset them by improving overall efficiency or closing down plants, or by planting or preserving forests that would help absorb the emissions. Once the system is established, progress toward further reduction of emissions would be achieved by progressively cranking down the total allowable levels of various pollutants, on both a national and a permit-by-permit basis.

The kinds of programs I have just described will need to be supported by research providing a scientific basis for new environmental-protection strategies. Research into safe, nonpolluting energy sources and more energy-efficient technologies would seem to be particularly good bets. An example: in the mid-1970's the U.S. Department of Energy developed a number of improved-efficiency technologies at a cost of \$16 million; among them were a design for compact fluorescent lamps that could replace incandescent bulbs, and window coatings that save energy during both heating and cooling seasons. At current rates of implementation, the new technologies should generate \$63 billion in energy savings by the year 2010.

The motivation of change toward sustainability will have to go far beyond the reduction of pollution and waste in the developed countries, and it cannot be left entirely to the environmental agencies in those countries. The agencies whose goals are economic development, exploitation of resources and international trade—and indeed foreign policy in general—must also adopt sustainable development as a central goal. This is a formidable challenge, for it touches the heart of numerous special interests. Considerable political skill will be required to achieve for environmental protection the policy preeminence that only economic issues and national security (in the military sense) have commanded.

But it is in relations with the devel-

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SUBSTITUTION is one route to the reduction of pollution. Substitution of methanol (already available at some gas stations in Los Angeles) for gasoline would cut down emissions of nitrogen oxides.

oping world that the industrialized nations will face their greatest challenges. Aid is both an answer and a perpetual problem. Total official development assistance from the developed to the developing world stands at around \$35 billion a year. This is not much money. The annual foreign-aid expenditure of the U.S. alone would be \$127 billion if it spent the same proportion of its gross national product on foreign aid as it did during the peak years of the Marshall Plan.

There is no point, of course, in even thinking about the adequacy of aid to the undeveloped nations until the debt issue is resolved. The World Bank has reported that in 1988 the 17 most indebted countries paid the industrialized nations and multilateral agencies \$31.1 billion more than they received in aid. This obviously cannot go on. Debt-for-nature swapping has taken place between such major lenders as Citicorp and a number of countries in South America: the bank forgives loans in exchange for the placing of land in conservation areas or parks. This is admirable, but it will not in itself solve the problem. Basic international trading relations will have to be redesigned in order to eliminate, among other things, the ill effects on the undeveloped world of agricultural

subsidies and tariff barriers in the industrialized world.

A prosperous rural society based on sustainable agriculture must be the prelude to future development in much of the developing world, and governments there will have to focus on what motivates people to live in an environmentally responsible manner. Farmers will not grow crops when governments subsidize urban populations by keeping prices to farmers low. People will not stop having too many children if the labor of children is the only economic asset they have. Farmers will not improve the land if they do not own it; it is clear that land-tenure reform will have to be instituted.

Negative sanctions against abusing the environment are also missing throughout much of the undeveloped world; to help remedy this situation, substantial amounts of foreign aid could be focused directly on improving the status of the environmental ministries in developing nations. These ministries are typically impoverished and ineffective, particularly in comparison with their countries' economic-development and military ministries. To cite one small example: the game wardens of Tanzania receive an annual salary equivalent to the price paid to poachers for two elephant tusks—one reason the nation has lost two thirds of its elephant population to the ivory trade in the past decade.

To articulate the values and devise the motivations favoring a sustainable world economy, existing institutions will need to change and new ones will have to be established. These will be difficult tasks, because institutions are powerful to the extent that they support powerful interests—which usually implies support of the status quo.

The important international institutions in today's world are those concerned with money, with trade and with national defense. Those who despair of environmental concerns ever reaching a comparable level of importance should remember that current institutions (for example, NATO, the World Bank, multinational corporations) have fairly short histories. They were formed out of pressing concerns about acquiring and expanding wealth and maintaining national sovereignty. If concern for the environment becomes comparably pressing, comparable institutions will be developed.

To further this goal, three things are wanted. The first is money. The annual budget of the United Nations Environment Program (UNEP) is \$30 million, a

derisory amount considering its responsibilities. If nations are serious about sustainability, they will provide this central environmental organization with serious money, preferably money derived from an independent source in order to reduce its political vulnerability. A tax on certain uses of common world resources has been suggested as a means to this end.

The second thing wanted is information. We require strong international institutions to collect, analyze and report on environmental trends and risks. The Earthwatch program run by the UNEP is a beginning, but there is need for an authoritative source of scientific information and advice that is independent of national governments. There are many nongovernmental or quasi-governmental organizations capable of filling this role; they need to be pulled together into a cooperative network. We need a global institution capable of answering questions of global importance.

The third thing wanted is integration of effort. The world cannot afford a multiplication of conflicting efforts to solve common problems. On the aid front in particular, this can be tragically absurd: Africa alone is currently served by 82 international donors and more than 1,700 private organizations. In 1980, in the tiny African nation Burkina Faso (population about eight million) 340 independent aid projects were under way. We need to form and strengthen coordinating institutions that combine the separate strengths of nongovernmental organizations, international bodies and industrial groups and to focus their efforts on specific problems.

Finally, in creating the consciousness of advanced sustainability, we shall have to redefine our concepts of political and economic feasibility. These concepts are, after all, simply human constructs; they were different in the past, and they will surely change in the future. But the earth is real, and we are obliged by the fact of our utter dependence on it to listen more closely than we have to its messages.

FURTHER READING

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