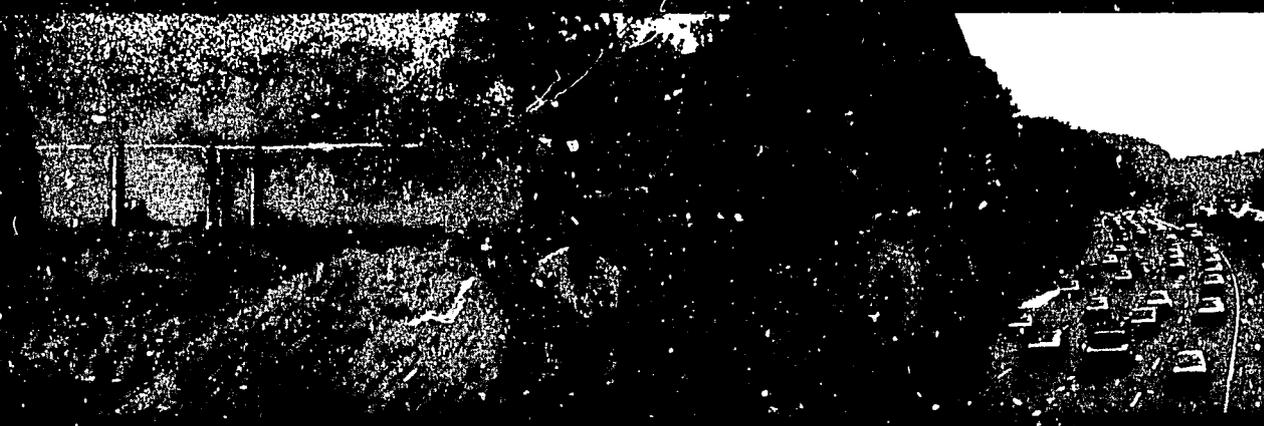


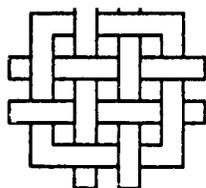
PN-ABM-163



THE CRUCIAL DECADE:

THE 1990s AND
THE GLOBAL ENVIRONMENTAL CHALLENGE

THE CRUCIAL DECADE: The 1990s and The Global Environmental Challenge



WORLD RESOURCES INSTITUTE
A Center for Policy Research

January 1989

Kathleen Courrier
Publications Director

D.A. Strandberg
Marketing Manager

Hyacinth Billings
Production Supervisor

Each World Resources Institute Report represents a timely, scientific treatment of a subject of public concern. WRI takes responsibility for choosing the study topics and guaranteeing its authors and researchers freedom of inquiry. It also solicits and responds to the guidance of advisory panels and expert reviewers. Unless otherwise stated, however, all the interpretation and findings set forth in WRI publications are those of the authors.

Copyright © 1989 World Resources Institute. All rights reserved.
ISBN 0-915825-37-6

CONTENTS

	PAGE
FOREWORD	iii
I. THE GLOBAL ENVIRONMENTAL CHALLENGE	1
II. AN AGENDA FOR THE PRESIDENT AND THE CONGRESS	3
1. The Greenhouse Effect	3
2. Ozone Layer Depletion	3
3. Energy Policy	3
4. Acid Rain	3
5. Tropical Forests and Biodiversity	4
6. Environment and Development Assistance	4
7. Population and Health	4
8. Designing New Solutions	4
9. Global Environmental Policy Act	4
10. Administration Leadership	5
III. SLOWING THE GREENHOUSE WARMING	7
IV. PROTECTING THE EARTH'S OZONE SHIELD	9
V. CURBING ACID RAIN AND OXIDANTS	11
VI. FORGING NEW ENERGY STRATEGIES	13
VII. CONSERVING TROPICAL FORESTS AND BIOLOGICAL DIVERSITY	15
VIII. HALTING ENVIRONMENTAL DETERIORATION IN DEVELOPING COUNTRIES	17
SELECTED READINGS	21

FOREWORD

Twenty years ago, the United States responded vigorously to the serious environmental concerns then emerging. New national policies were declared, new agencies created, and major pollution clean-up and resource management initiatives launched.

Today, as we enter the 1990s, the Bush Administration and the 101st Congress face a new agenda of environmental concerns that are more serious and challenging than the problems of the 1970s.

The buildup of carbon dioxide and other gases in the atmosphere threatens far-reaching climate changes, while one class of these gases—the chlorofluorocarbons—are depleting the earth's ozone layer, which shields us from the sun's ultraviolet radiation. Here at home, air pollutants are escaping our urban-industrial areas and invading the countryside, seriously damaging aquatic life, forests, and crops.

In the developing world, pressures on natural resources intensify daily. The deserts expand while the forests, with their immense wealth of life forms, retreat. Hundreds of millions of people live in absolute poverty, destroying the resources on which their future depends because no alternative is open to them.

These concerns are not the ones to which the United States addressed itself when environmental concerns emerged forcefully twenty years ago. They present us with new policy challenges that are more global in scope and international in implication.

The 1990s will be the crucial decade for action on these pressing concerns. If major national and international efforts are not pursued in this period, irreparable damage will be done to the world's environment, and the problems will prove increasingly intractable, expensive, and dominated by crises.

Our hope must be that the Bush Administration and the new Congress will rise to this occasion, just as American leaders rose to meet the environmental challenges of twenty years ago.

To assist in this effort, the World Resources Institute has brought together in this publication brief descriptions of critical world environmental problems and a checklist of measures to deal with

them. Rather than fully describe all measures needed to address America's environmental challenges, this report focuses on priority initiatives needed to deal with the two principal threats to the global environment—large-scale atmospheric deterioration and biological impoverishment. Additional discussions and analysis of most of the initiatives suggested here can be found in the readings noted at the end of this report.

In developing these recommendations, the WRI staff has followed these precepts:

- rely on the market mechanism whenever possible, in part by ensuring environmentally accurate prices;
- speed the application of existing and new solution-oriented technologies that promote environmentally sustainable development;
- attack pollution at the source by shifting from "pollution control" to waste and pollution minimization; and
- focus U.S. efforts in developing countries where they are most needed: on generating environmentally sustainable livelihoods for the poor, on enhancing the long-term productivity of the resource sectors, and on slowing population growth.

WRI offers these recommendations in the spirit of hope and optimism. Tropical deforestation can be arrested and disappearing species saved; poverty can be alleviated and human populations stabilized; soils can be conserved and more food provided; climate change can be contained; regional and global pollution can be reduced.

These and other things can be done with means within our grasp. But success hinges on a concerted effort made with some urgency to change many current policies, to strengthen and multiply successful programs, and to launch bold initiatives where they are needed.

There are ample grounds in the experience of the last two decades for both optimistic and pessimistic assumptions about the future. The gaps between success and failure in addressing resource,

environmental and population problems have been enormous. The good news is that these divergent outcomes are primarily the result of differences in policies and programs pursued by governments, the private sector, and others. In short, leadership and new initiatives can make a world of difference.

James Gustave Speth
President
World Resources Institute

I. THE GLOBAL ENVIRONMENTAL CHALLENGE

Writing recently in *Foreign Affairs*, George F. Kennan observed that "our world is at present faced with two unprecedented and supreme dangers": any major war at all among great industrial powers and "the devastating effect of modern industrialization and overpopulation on the world's natural environment."

The deterioration of the global environment to which Kennan refers has a scale that encompasses the great life-supporting systems of the planet's biosphere. It includes the alteration of the earth's climate and biogeochemical cycles, the accumulation of wastes, the exhaustion of soils, loss of forests, and the decline of ecological communities.

Since World War II, growth in human population and economic activity has been unprecedented. The world's population has doubled and now exceeds five billion, and another billion will be added by the year 2000. The gross world product has increased fourfold since 1950. With these increases in population and economic activity have come large increases in both pollution and pressure on natural resources.

Air pollution today poses problems for all countries. As use of fossil fuels has increased, so have emissions of sulfur and nitrogen oxides and other harmful gases. Acid rain, ozone, and other ills born of this pollution are now damaging public health and harming forests, fish, and crops over large areas of the globe.

Another gas emitted when fossil fuels burn is carbon dioxide, the chief culprit among the greenhouse gases, which trap heat in the atmosphere. If the buildup of greenhouse gases in the atmosphere is not halted, the global warming now apparently under way will bring major climate changes. Regional impacts are difficult to predict exactly, but rainfall and monsoon patterns could shift, disrupting agriculture in many areas. Sea levels could rise, flooding coastal areas. Ocean currents could shift, further altering the climate and fisheries. Fewer plant and animal species could survive as favorable habitats are reduced. Heatwaves, droughts, and other weather anomalies could harm susceptible people, crops, and forests.

Depletion of the stratosphere's ozone layer also threatens human health and natural systems. The 1987 international treaty negotiated to address this

problem by reducing the use of chlorofluorocarbons (CFCs) is already considered inadequate since scientists recently discovered more ozone depletion than expected.

These interrelated atmospheric issues constitute the most serious pollution threat in history. Simultaneous and gradual, their effects will be hard to reverse. Because pollutants react with other substances, with each other, and with the sun's energy, a well-planned response has to take all these factors into account. These air pollution issues are also linked to the use of fossil fuels. In the future, energy policy and environmental policy should be made together.

**“
These interrelated atmospheric
issues constitute the most
serious pollution threat in
history.
”**

The United States can take some pride in actions to improve air quality. But our country still emits about 15 percent of the world's sulfur dioxide, about 25 percent of all nitrogen oxides, and 25 percent of the carbon dioxide, and it still manufactures about 30 percent of all CFCs.

Improvements in U.S. energy efficiency have been considerable. Per capita energy use dropped by 12 percent between 1973 and 1985—a period when per capita gross domestic product grew 17 percent. Yet, the United States is still consuming one fourth of the world's energy annually and producing only half as much GNP per unit of energy as its world market competitors such as West Germany or Japan.

Our national concern for the atmosphere must be matched by a growing awareness of the steady deterioration of forests, soils, and water in much of the developing world. The U.N. Food and Agriculture Organization predicts that, without corrective action, irrigated croplands in the Third World will become 30 percent less productive by the end of the century because the soil is depleted or eroded. In developing countries, ten trees are cut down for every

one replanted—30 trees for one in Africa—and every minute about 54 acres of tropical forests disappear, as do uncounted species that inhabit them. Fuel-wood shortages affect an estimated 1.5 billion people in 63 countries. Most people lack access to basic sanitary facilities, and 80 percent of all illness is due to unsafe water supplies. Third World people now rank high among those exposed to toxic chemicals—from lead in Mexico to DDT in China.

“

Our country still emits about 15 percent of the world's sulfur dioxide, about 25 percent of all nitrogen oxides, and 25 percent of the carbon dioxide, and it still manufactures about 30 percent of all CFCs.

”

Last year, the World Commission on Environment and Development articulated a new consensus, supported by nations North and South. The old notion that environmental loss was the price of economic progress was rejected. Far from bringing about broad-based development, overexploitation or mismanagement of natural resources has contributed to famines and floods, dams that silt up within a decade, irrigation schemes that salt the soil, and the conversion of grasslands and tropical forests into unproductive wastelands. The report of the Commission, *Our Common Future*, stated:

Many forms of development erode the natural resources upon which they must be based, and environmental degradation can undermine economic development. Poverty is a major cause and effect of global environmental problems.

Fighting poverty requires diffusing the underlying pressures on the world's resource base. While many complex factors are involved, the Third World must deal with:

- Rapid population growth. Of the one billion people to be added to the world's population

by the year 2000, 9 out of 10 will be born in the developing countries.

- Shortsighted economic policies pursued by governments of both industrial and developing countries. These include direct and indirect subsidies that encourage the wasteful use of energy, water, and forests, and policies that favor city dwellers over the rural poor.
- Misguided development and aid programs. Many large-scale development projects have neglected environmental factors and local needs.

The United States is directly affected by these Third World concerns. Twenty percent of the carbon dioxide contributing to the greenhouse effect is estimated to come from tropical deforestation. A wide range of biological resources—species yet to be analyzed for their agricultural, industrial, or pharmaceutical value—is being lost.

The growth of developing economies expands U.S. trade and job opportunities at home; already more than a third of U.S. trade is with the Third World. With economic recovery, the developing countries could absorb up to half of all U.S. exports by the year 2000. But sustained growth in much of the developing world requires better management of natural resources.

“Sustainable development” is the widely accepted answer—development that meets today's needs without compromising the ability of future generations to meet theirs. U.S. leadership in applying this approach requires both vigorous evaluation of environmental consequences of development assistance programs and also support for national development strategies that conserve and restore the land's productive capacity. It means helping developing countries invest in reforestation, agroforestry, water conservation, and energy efficiency. It also means reducing debt and other pressures that force Third World countries to cash in their natural resources to earn foreign exchange. Family planning, primary health services, and better sanitation all deserve a high priority since they reduce child mortality and slow birth rates.

In the 1990s, industrialized and developing countries will have to face these challenges together. Nations North and South, East and West must act in concert to sustain the earth and its people. In this effort, U.S. leadership could not be more important.

II. AN AGENDA FOR THE PRESIDENT AND THE CONGRESS

To respond to these global environmental challenges, ten areas stand in need of vigorous leadership by the President and the Congress. They are closely linked one to another; initiatives in these areas should be seen as elements of an integrated package.

THE GREENHOUSE EFFECT

1. The President and the Congress should declare protection of the global atmosphere a priority national objective. The United States should call for a high-level international meeting, perhaps convened jointly with the Soviet Union, to develop the initiatives needed to address the greenhouse effect, global climate change, and the destruction of the stratospheric ozone layer. Topics high on the list for discussions at this summit meeting should be: (1) how to achieve a complete phase-out of the chlorofluorocarbons (CFCs) that are contributing to the greenhouse effect and damaging the earth's protective ozone shield, (2) how to promote international agreement on preventing further global warming by reducing world emissions of carbon dioxide and other greenhouse gases, and (3) how to develop concerted international action to move from net deforestation globally to net afforestation. In preparation for this international meeting, federal officials should carry out an intensive review of the "carbon dioxide emissions charge" proposal, which would reduce carbon dioxide emissions by promoting more efficient use of fossil fuels and providing incentives to energy sources that produce less or no carbon dioxide, the principal greenhouse gas.

OZONE LAYER DEPLETION

2. The President and the Congress should give strong support to strengthening the treaty protecting the earth's stratospheric ozone layer. The U.S. goal should be the complete phase-out of offending chlorofluorocarbons by 2000. At the national level, the United

States should set an international example by minimizing chlorofluorocarbon releases during the phase-out period.

**“
The President and the Congress should declare protection of the global atmosphere a priority national objective.
”**

ENERGY POLICY

3. The President and the Congress should call for the development of a new energy strategy for the United States, one that gives balanced attention to adequate and affordable energy supply, national security, and environmental protection, including the need to reduce emissions of carbon dioxide and other greenhouse gases. The cornerstone of this new policy should be large, steady gains in U.S. energy efficiency, with the goal of matching the performance of Europe and Japan. Both energy price reform and regulatory requirements will be needed. One important element of the new U.S. energy policy should be a gradually rising tax on gasoline.

ACID RAIN

4. The President and the Congress should work together to develop a new approach to "acid rain" control. Unlike some previous proposals, however, this new approach should address in a coordinated fashion all the principal pollutants that are causing damage to aquatic systems, forests and agricultural crops, and it should allow cost-effective, flexible means to achieve pollution reduction, including energy efficiency improvements, fuel switching, transportation and land use policies, and new combustion and pollution control technologies.

TROPICAL FORESTS AND BIODIVERSITY

5. In cooperation with other nations, the Bush Administration and the Congress should promote national and international initiatives aimed at halting the destruction of the world's remaining tropical forests and the extinction of countless plant and animal species. U.S. development assistance, trade, tax, Third World debt, and other policies should all be reviewed with an eye to how they can contribute to this goal. Special consideration should be given to recent proposals that tropical forest conservation be undertaken in exchange for major debt relief, and to the proposal of the World Commission on Environment and Development that new international facilities be created to sharply increase financing for conservation projects in developing countries.

“

The Bush Administration and the Congress should launch a multi-pronged effort to make U.S. talent, expertise, technology, and resources available to help reverse the resource deterioration that is undermining development prospects in Africa and elsewhere.

”

ENVIRONMENT AND DEVELOPMENT ASSISTANCE

6. Recognizing that environmental deterioration is one of the gravest problems facing developing countries today, the Bush Administration and the Congress should launch a multi-pronged effort to make U.S. talent, expertise, technology, and resources available to help reverse the resource deterioration that is undermining development prospects in Africa and elsewhere. One important, early initiative should be to support a new Foreign Assistance Act that makes the closely linked problems of poverty, environmental decay, and rapid population growth the primary focal points for U.S. assistance and cooperation with the Third World.

POPULATION AND HEALTH

7. Rapid population growth poses one of the gravest threats to the world environment, particularly in many developing countries where the press of mass poverty on fragile resources is having alarming consequences. The Bush Administration and the Congress should encourage national and international efforts to promote the transition to a stable world population of about nine billion by the middle of the next century. New initiatives are needed by the United States and others to expand greatly the educational and employment opportunities for women in developing countries, to reduce death rates by making basic sanitary services and health care widely available, and to make family planning services available to all.

DESIGNING NEW SOLUTIONS

8. To look ahead, the President and the Congress should establish a distinguished panel from within and outside government to recommend long-term goals for meeting the following challenge: how can the major sectors of the U.S. economy—manufacturing, agriculture, transportation, housing, and energy—be redesigned in the years ahead so that they fulfill economic needs without destroying our national and global environments? To find efficient and effective solutions, and to avoid endless confrontation, environmental goals must move “upstream” and be integrated into the design of our industrial and agricultural systems. The panel would examine what America's longer term goals should be in these areas, and it would explore how “seeing the future” can be used to enhance American exports.

GLOBAL ENVIRONMENTAL POLICY ACT

9. The National Environmental Policy Act of 1969 provided a charter for the protection of our national environment. Twenty years later, the President and the Congress should work together on legislation that would provide a charter for U.S. policy and action to protect the global environment. This legislation would contain findings regarding the nature and seriousness of the principal international environmental threats; it would declare national policies on protection of the

global environment; and it would make those policies and appropriate specific measures part of the mandates of federal agencies, including those agencies responsible for economic policy, trade, international economic assistance, and scientific research. The legislation would also provide the framework for coordination within the federal government for a sustained attack on global environmental problems.

ADMINISTRATION LEADERSHIP

- 10.** In order to ensure that the President's desire to give priority attention to the global environment is effectively implemented, the President should appoint a White House counselor of Cabinet rank to develop and coordinate this overall effort. This person should have a clear mandate from the President to work with the Executive agencies and the Congress to develop concrete proposals in the areas discussed here and, once the program is developed and approved by the President, should have responsibility to monitor its implementation. Alternatively, the President, having elevated the head of

the Environmental Protection Agency to Cabinet rank, could assign this person these new responsibilities.

These initiatives and others are described more fully in the sections that follow. While policy initiatives of the types discussed here are essential if progress is to be made, they should be coordinated with increased scientific research and environmental monitoring and with greater efforts to inform the public and educators. The greenhouse effect, biodiversity, and other topics require major new research efforts in both the natural and the social sciences.

Also, this report focuses on U.S. initiatives and does not explicitly address intergovernmental institutions. But the role of the UN Environment Programme in helping governments and others come to agreement on how to cope with stratospheric ozone depletion reminds us of the critical role international bodies can play. For many of the issues discussed here, it is already clear that broad international cooperation is essential. United Nations and other international bodies afford opportunities for the United States to present new initiatives that will command international support.

III. SLOWING THE GREENHOUSE WARMING

Droughts and heat waves in 1988 gave Americans a taste of what a global warming trend could mean. Such climate changes are likely because the atmosphere's increasing concentrations of carbon dioxide and other trace gases trap the earth's infrared radiation, preventing it from escaping into space. These "greenhouse" gases are produced in the burning of coal, oil, and natural gas, by deforestation and certain agricultural activities, and through the release of various industrial chemicals.

The largest contributor to the greenhouse effect is carbon dioxide, which comes principally from fossil fuel combustion. Half of the carbon dioxide added to the atmosphere throughout human history has been added during the past 30 years. Other gases, including the same chlorofluorocarbons (CFCs) that destroy the stratospheric ozone shield, also play roles in the greenhouse effect. Some CFCs absorb infrared radiation up to 10,000 times more efficiently (per molecule) than carbon dioxide does.

In the lower atmosphere, one of the most common air pollutants, ozone, is also a greenhouse gas, as are methane and nitrous oxide. All three are linked to fossil fuel use, but methane and nitrous oxide are also released in agriculture and forestry.

Unless all these emissions are reduced, temperatures will rise in the decades to come, with potentially severe consequences. Even if all greenhouse gas emissions were stopped today, the planet would still warm by 2° to 4°F, according to current estimates. If emissions continue growing at today's rates, the average global temperature would rise by 3° to 8°F by the time today's teenagers reach retirement age.

The greenhouse effect will not register in the same way everywhere. Temperature rises will be greatest in the higher latitudes, and this uneven warming will influence the winds and ocean currents that determine climate. Some areas will have more rainfall, others less. If current predictions hold, important agricultural areas in the U.S. Midwest and Southeast would be hotter and drier during the growing season. An expansion in grasslands and deserts, a decline in forest ecosystems, along with forest fires and species losses, could accompany the warming. Some irrigation and hydroelectric projects would no longer receive adequate rainfall, while others might overflow.

Changes in the oceans can be expected too. Coastal development and wetlands would be threatened by a 1- to 4-foot rise in sea level by the middle of the next century. Storm damage to lagoons, estuaries, and coral reefs, not to mention buildings and other man-made structures, would also increase. By one recent estimate, erecting protective barriers and making other adaptations to sea-level rises would cost a medium-sized city such as Charleston, South Carolina about \$1.5 billion.

Most greenhouse gas buildup comes from fossil fuel combustion, but not all fuels contribute equally. Per unit of energy released, coal burning releases the most carbon dioxide; the same amount of energy from oil releases 30 percent less carbon dioxide; natural gas, half as much. Energy produced from nuclear or renewable resources (such as hydro power, wind, or solar technologies) releases no carbon dioxide. To the extent that people turn toward energy technologies that release less carbon dioxide, emissions would fall even if energy use did not.

Meanwhile, the cutting and burning of tropical forests contributes about 20 percent of the carbon dioxide added to the atmosphere each year. Although these forests do far more in the biosphere than store carbon, their role in regulating the greenhouse effect should not be overlooked.

The world's choice is not between preventing a temperature rise or adapting to climate changes. A certain amount of warming now appears inevitable. But action taken today can stabilize future warming and allow societies more time to adapt to unavoidable changes. The political drawback is that the costs of preventing damage must be paid now, even though the future benefits are uncertain. But if policy choices are put off, more extreme measures will be needed in the future. Almost certainly, waiting is not the best policy.

To address the greenhouse effect, several major steps need to be taken:

1. The President and Congress should make addressing the greenhouse issue a high national priority and commit the United States to action on both the national and international levels. The immediate goal should be to slow down the current rate of global warming; after this transition, the goal should be to

stabilize the concentrations of greenhouse gases and halt the greenhouse warming. Both require diligent national and international efforts to reduce greenhouse gas emissions dramatically.

“

The world's choice is not between preventing a temperature rise or adapting to climate changes. A certain amount of warming now appears inevitable. But action taken today can stabilize future warming and allow societies more time to adapt to unavoidable changes.

”

2. On the national level, our growing understanding of the greenhouse effect should become a major determinant of U.S. energy policy. The threats that global warming, air pollution, and increased dependence on foreign oil pose to the United States are all intimately linked to energy use, mainly fossil fuels. Triple-edged energy policies simultaneously addressing all these concerns should be adopted. These include: (a) improving the efficiency with which the United States uses energy; (b) switching to natural gas and other fuels that produce comparatively less carbon dioxide; and (c) developing such non-fossil sources of energy as solar power (and other “renewables”) and perhaps a new generation of nuclear power plants. *(See Section VI for additional discussion of energy issues.)*

3. On the international level, the United States should call for a high-level international meeting to begin discussing how to limit greenhouse gases and reduce global carbon dioxide emissions. Discussions should cover: (a) the timing of a total phase-out of chlorofluorocarbons (discussed in Section IV); (b) means for reducing global carbon dioxide emissions; and (c) means for slowing and then halting deforestation in tropical countries and promoting net growth of forests globally (discussed in Section VI). In addition, the United States, through its bilateral foreign assistance programs and leadership in multilateral efforts, should help developing countries slow population growth and use highly energy-efficient technologies and non-fossil energy sources. *(See Section VIII for additional discussion of these issues.)*

In preparation for this international meeting, federal officials should carry out an intensive review of the “carbon dioxide emissions charge” proposal, which would impose a fee on the suppliers of fossil fuel—coal, oil and natural gas—proportional to the carbon dioxide released when these fuels are burned. Such a charge could reduce carbon dioxide emissions by promoting more efficient use of fossil fuels and providing incentives to energy sources that produce less or no carbon dioxide, the principal greenhouse gas. Proceeds from the charge could be applied to a variety of purposes: investments that would enhance U.S. competitiveness in international markets, rebates to lower-income energy consumers, deficit reduction, and programs to promote forest conservation and reforestation globally. Alternatively, this emissions charge could be revenue neutral. Such a charge could be adopted by the United States or pursued multilaterally.

IV. PROTECTING THE EARTH'S OZONE SHIELD

Ozone can both harm and help man and the environment, depending upon where it resides in the atmosphere. Near the earth's surface, ozone and other oxidants, sometimes called smog, take a toll on human health, damage trees, and reduce crop yields. In the lower atmosphere, ozone also acts as a greenhouse gas. But in the stratosphere, it acts beneficially—filtering harmful ultraviolet radiation, forming a shield around the planet. Weakening this shield invites more skin cancers and eye disease, a reduced immune response, and harm to plant and animal life.

Fifteen years ago, scientists predicted that chlorofluorocarbons (CFCs), highly stable compounds released from aerosol cans, refrigeration systems, and blown-foam materials, would rise into the stratosphere and, through a complex chemical reaction, destroy some of the ozone, thus allowing increased amounts of ultraviolet radiation to reach the earth's surface. Theory became fact when scientists in Antarctica discovered a large "hole" in the ozone layer in October, 1985, and three years later confirmed that CFCs had caused it. In the northern hemisphere, a more widespread decrease in ozone levels of about 3 percent has been observed—a loss too large to attribute to nature.

CFCs also contribute to the greenhouse effect. Indeed, molecule for molecule, they can be 10,000 times as efficient as carbon dioxide in trapping heat in the atmosphere.

In response to ozone depletion, governments around the globe, led by the UN Environment Programme, agreed in November, 1987, to the Montreal Protocol, which would halve CFC use in the industrial countries by 1999. But given the latest evidence of damage, the Protocol is now widely viewed as insufficient to protect the ozone layer.

Two major strategies need to be pursued in order to prevent further erosion of the ozone shield:

1. The United States should support the renegotiation of the Montreal Protocol to ac-

complish a complete global phase-out of fully halogenated CFCs by the year 2000. The Protocol should also be expanded to address other ozone depleting compounds not now covered.

“

Given the latest evidence of damage, the Montreal Protocol is now widely viewed as insufficient to protect the ozone layer. The United States should support the renegotiation of the Protocol to accomplish a complete global phase-out of fully halogenated CFCs by the year 2000.

”

2. On the national level, the United States should assert the kind of leadership it assumed in halting the use of CFCs in aerosol cans by developing market and regulatory strategies that will encourage rapid replacement of CFCs with safe substitutes and reduce releases to the atmosphere. These twin goals can be met by (a) a \$5 per pound user fee on CFCs that would make safe substitutes competitive and encourage capture and reuse; (b) a deposit-return system (whereby returned CFCs in discarded appliances would be recovered and reused or destroyed); (c) regulations that would reduce leakage rates from devices such as auto air conditioners and require capture of CFCs in foam blowing and other industrial activities.

V. CURBING ACID RAIN AND OXIDANTS

Damage to public health, forest diebacks, lifeless lakes, and soured soils—these are signs that air pollutants are taking a toll. Gauging the effects of each pollutant has never been simple because air pollutants mix together, interact, and compound other environmental stresses. Yet, the planet is feeling pollution's impacts. Between 1900 and 1985, the world's annual sulfur dioxide emissions increased sixfold, while nitrogen oxide emissions increased ten times over. These gases, together with the hydrocarbons that also result from fossil fuel combustion, are the principal sources of both urban air pollution and the acid rain and oxidants that now douse the North American countryside.

The damaging effects of acid rain on aquatic life in U.S. and Canadian waters have been well documented over the last decade. But the evidence is now also convincing that air pollution is contributing to the death of forest trees and widespread losses in crop productivity in the United States. Extensive damage due to ozone and other oxidants has been documented among pines in California and in the eastern United States. And the case is strong that air pollution is an important contributor to the declines of other stricken tree species in the East, including the high-elevation red spruce in the Appalachian Mountains from Vermont to North Carolina, and Fraser fir in the Southeast.

Crop productivity is also being impaired, with ozone losses among sensitive crops ranging between 5 and 20 percent. Overall agricultural crop losses from air pollution have been estimated at up to \$5 billion annually.

Acid deposition and oxidant levels are high where tree and crop damages are occurring. Along the Appalachian Mountain chain the acidity of cloud moisture is 10 times greater than that at low elevations and about 100 times greater than that of unpolluted precipitation. The peak cloud acidity at several eastern mountains rivals that of lemon juice.

Unless strong new measures are adopted, the nation's air pollution problems are going to steadily worsen in the coming decades, leading to further forest damage, crop losses, ill health, water and soil acidification, damage to materials and losses in visibility.

The Bush Administration and the Congress should work together to accomplish the following:

1. Annual emissions of sulfur dioxide and nitrogen oxides—the pollutants primarily responsible for acid rain and ozone (oxidant) formation—should be reduced by 10 million and 5 million tons respectively. State-by-state emission caps should be adopted, and states should be given the flexibility to use a broad range of cost-effective tools to meet their goals: energy efficiency, fuel switching, new combustion technologies, transportation and land-use planning, and pollution control equipment.

**“
Annual emissions of sulfur dioxide and nitrogen oxides—the pollutants primarily responsible for acid rain and ozone (oxidant) formation—should be reduced by 10 million and 5 million tons respectively.
”**

2. Pollution from transportation—the single largest source of several important air pollutants—can be cut significantly through a combination of stricter federal emission levels for cars, buses and trucks; strengthened inspection and maintenance procedures; and the use of cleaner fuels (such as compressed natural gas) in commercial fleets and urban buses. Programs that would cut the total number of vehicle-miles traveled and improve traffic flow would help reduce transportation emissions further. Promising measures include greater use of public transit, preferred parking for car pools, and provisions for high-occupancy vehicles.
3. A sensible pollution control strategy must also recognize two other long-term energy-related problems: our increasing reliance on foreign oil and climate change. To cope with these risks, the United States must increase

the efficiency of fossil fuel use, especially in transportation, which is almost totally dependent on oil, increasingly imported. We also need to accelerate the development of non-fossil energy technologies. In practical terms, this means electric and hydrogen-

powered vehicles as well as the renewable energy technologies—solar photovoltaic cells, wind turbines, hydro power, solar hot water heaters and geothermal energy. (Energy initiatives are discussed further in Section VI.)

VI. FORGING NEW ENERGY STRATEGIES

If energy use is the yardstick, the United States currently has one of the world's least efficient economies. Japan and West Germany both now produce about twice as much GNP per unit of energy as we do. The excessive use of energy has contributed to the decline of U.S. industrial competitiveness, to a continuing balance-of-trade deficit, and to growing threats from pollution and climate change. Improving energy efficiency is thus essential to overcoming the multiple threats of energy security, air pollution, and climate change. (Climate change and the greenhouse effect are discussed in Section III; air pollution in Section V.)

Today, the United States imports 38 percent of its oil, half from OPEC nations. According to the Department of Energy, imports could reach 50 percent of supply by the mid-1990s. Some oil-industry spokesmen have indicated that the United States could be forced to import 75 percent of its supply by the turn of the century. These imports—worth over \$40 billion in 1987—seriously aggravate the trade deficit and affect U.S. foreign policy.

Currently, the United States has no comprehensive energy policy that addresses the sources of energy supply, the patterns of energy consumption, national security, and environmental protection. Such a policy should be based primarily on increased national energy efficiency and accelerated development and wider use of non-fossil energy technologies.

Three major steps are needed to forge a new U.S. energy strategy:

1. The United States should make sharp, steady improvement in energy efficiency the centerpiece of national energy policy. Federal and state initiatives should seek to realize a national goal of doubling U.S. energy efficiency by meeting the three percent annual improvements achieved earlier in this decade. This would free up capital for new investments, reduce our balance of payments deficit, improve our energy security, and reduce air pollution and carbon dioxide emissions at substantial cost savings.

In transportation, the following national measures should be adopted to spur more efficient use of vehicles:

- Phasing in a one-dollar per gallon gasoline tax over a decade;
- Applying a graduated sales tax based on the rated fuel efficiency of vehicles;
- Raising auto fuel standards to 45 miles-per-gallon by the year 2000; and
- Using efficiency standards to guide all government purchases of vehicles.

The United States should make sharp, steady improvement in energy efficiency the centerpiece of national energy policy.

States should have two transportation objectives in this area. First, with federal assistance, they should develop more efficient public transportation systems. Second, through sound land use planning, they should reduce the amount of travel required.

Efficiency in electricity generation and use should be encouraged by such measures as:

- Strengthening building codes to reduce the energy needed for heating, cooling, and lighting;
- Requiring utilities to develop least-cost energy planning that includes financial and other incentives for demand-reducing efficiency improvements; and
- Using tax credits and other measures to encourage the use of more efficient electricity production technologies (such as gas turbines with cogeneration of electricity and heat).

2. Federal policy should stimulate the use of alternative, non-fossil sources of energy and fuel switching from coal and oil to natural gas:

- Renewable energy sources are significant contributors now and will be much more important to our energy mix in the longer term. Photovoltaics, solar thermal, wind, biomass, hydropower and other renewable sources produce no net greenhouse emissions and are technologies that should be supported, developed and implemented as expeditiously as possible. Additional attention should be given to the development of closely allied technologies such as hydrogen fuels, energy storage, and electric vehicles.

- Because there are large differences among fossil fuels in the amount of carbon dioxide released when they are burned, any legislative and regulatory barriers to fuel switching should be removed. Since natural gas produces only half as much carbon dioxide as coal, fuel switching or co-burning of natural gas with coal significantly reduces

greenhouse emissions as well as other conventional pollutants.

- While nuclear power does not generate greenhouse gas emissions, many things need to be done before nuclear power can compete economically and gain public and investor support. Therefore, this technology is unlikely to make any substantial additional contribution to our energy mix in the near future. For the longer run, efforts should be directed at demonstrating safe waste management and at research on inherently safer reactor designs (without plutonium recycle). This research should be undertaken with shared financial support from the nuclear industry.

3. In general, federal policy should promote environmentally and economically honest energy prices. Appropriate measures include removal of remaining subsidies for fossil fuels and nuclear power, adoption of the gasoline tax and related measures previously mentioned, and serious consideration of the "carbon dioxide emissions charge" proposal now being studied by the Congressional Budget Office and others (*see Section III*).

VII. CONSERVING TROPICAL FORESTS AND BIOLOGICAL DIVERSITY

The world's tropical forests are being destroyed so fast at this moment—the conservative estimate is 54 acres each minute—that unprecedented global action should be taken. As these forests are cut down, thousands of plants and animals are lost forever. The planet's greatest storehouse of biological diversity is its tropical forests, and if current destruction continues, hundreds of thousands of species will become extinct by the year 2000.

Although most tropical forests are in the developing countries, the United States cannot afford to take the role of a disinterested observer. The genetic resources in these forests are important to U.S. agriculture because plant breeders must periodically return to the wild source for disease-resistant or drought-resistant genes. The forests are vital to medicine, since one fourth of all prescription drugs are derived originally from plants, and scientists have barely begun to analyze the millions of species found in tropical forests. Industries have been built on forest products, such as rubber and other extracts, resins, and dyes.

Lost genetic resources aside, forests cannot be razed without major environmental side effects. Once the forest cover is gone, nothing blunts the force of torrential rainfall, allowing erosion to strip the thin soils and to carry sediments downstream to degrade fisheries, silt up reservoirs, and clog irrigation systems.

Deforestation is also affecting the world's climate. Carbon dioxide—the principal greenhouse gas—and methane are released into the atmosphere when trees are cut and burned, or decay, adding to the heat-trapping effect. An estimated fifth of carbon dioxide emitted annually results from deforestation.

The causes of deforestation are inseparable from developing countries' major problems. Population pressures, poverty, and inequities in land tenure all lead to clearing new land, and pressure to generate foreign exchange for debt payments is seen to justify mining forests and converting forested land to cash crops and cattle ranches. Many government subsidies stimulate forest destruction at public expense.

America's concern for wildlife and endangered species now extends to the rainforests themselves and to their people. The U.S. response must thus take into account the economic aspirations of the

poor in the tropics. As the industrialized nations recognize their interest in conserving tropical forests, which poorer countries feel forced by economic circumstances to exploit, there must be a joint commitment on the part of the United States and other countries to make conservation and development part of the same process.

**“
The world's tropical forests
are being destroyed so fast at
this moment—the conserva-
tive estimate is 54 acres each
minute—that unprecedented
global action should be taken.
”**

Many actions need to be taken if the United States is going to contribute importantly to addressing these challenges:

1. Several positive initiatives currently under way within the development assistance community need to be strengthened and strongly backed by the United States. In particular:
 - United States officials should push for a swift end to development assistance projects and programs, both bilateral and multilateral, that directly or indirectly promote deforestation or damage critical areas of high biological richness.
 - Emerging efforts within the development assistance community to fund biodiversity and tropical forest conservation projects should be vigorously supported.
 - The United States should encourage the full funding and implementation of the “Tropical Forestry Action Plan,” developed by the World Bank, the U.N. Food and Agriculture Organization and others to reduce deforestation and promote the sus-

Emerging efforts within the development assistance community to fund biodiversity and tropical forest conservation projects should be vigorously supported.

tainable use of tropical forest resources. Efforts should be made to strengthen implementation of the plan in key areas: ecosystems conservation, protection of indigenous peoples, and participation of non-governmental organizations.

2. The United States should work with other countries to promote the goal that tropical hardwoods be imported only from areas where sustained yield management is practiced. The International Tropical Timber Organization could provide the framework for this cooperation and should have U.S. backing.
3. Working with developing countries directly and through multilateral agencies, the United States should seek reform of current economic policies that encourage deforestation, such as below-market timber sales and tax breaks and subsidized interest rates for development in forested areas.
4. Beyond the foregoing measures, major new initiatives will be needed if remaining tropical forests and biodiversity are to be conserved. The United States should lend its strong support to the exploration and development of the following ideas, among others:
 - In order to achieve a sharp increase in funding for biological conservation in developing countries, new financing mechanisms and facilities should be identified and tested, including expanded use of debt-for-nature swaps, the creation of new financial

intermediaries, and the establishment of new conservation funding facilities, perhaps associated with existing international organizations such as the World Bank.

- The policy agenda adopted as part of any overall or broad-based Third World debt relief or restructuring should include specific measures to conserve tropical forests and critical ecosystems.

- If efforts to save species and biological diversity are to succeed, a more coordinated, systematic, and aggressive international effort is needed. To fill this need, plans are now under way to develop a "Global Strategy for the Conservation of Biodiversity" and an international convention on biodiversity. The global biodiversity strategy will seek to galvanize interested parties in both industrial and developing countries around an agreed-upon international plan of action. U.S. agencies should play a leading role in shaping and promoting these important initiatives.

- Serious exploration should be given to the idea of an international convention to protect the world's remaining tropical forest areas. Such a convention could be the vehicle for bringing about a "global bargain" in which the national interests of the industrial countries in slowing global warming and protecting world biological resources, both promoted by halting deforestation, are reflected in relief and forgiveness of Third World external debt. A list of fifteen tropical countries in Latin American, Asia and Africa contains virtually all of the major debtor countries as well as the countries experiencing extensive deforestation. A debt-for-nature bargain among these countries and the industrial countries would promote long-term national interests North and South.

(Other initiatives that will help in the effort to conserve world biological resources are discussed in Section VIII.)

VIII. HALTING ENVIRONMENTAL DETERIORATION IN DEVELOPING COUNTRIES

Third World countries' efforts to develop, supported partly by international assistance, have brought impressive economic growth to some countries, along with substantial gains in health, life expectancy, and education. Such efforts have also brought modest industrial and agricultural increases to many countries. Yet, all around the world, poverty remains a crushing burden.

The worldwide recession and debt crisis of the 1980s have reversed economic growth in many countries, and slowed it in others. Even though the birth and death rates have dropped in most countries, in absolute numbers population continues to rise, putting heavy pressure on all natural and financial resources.

Why have many poor countries failed to grow adequately? The reasons are numerous. Wide swings in world commodity prices, currency fluctuations, weak or corrupt institutions, inadequate training, mistaken government and donor policies, inequity, and political instability are among them. But, perhaps the most underappreciated factor until recently has been the mismanagement of natural resources.

Developing countries are many times more dependent than industrial countries on their natural resource base—their soils, water, fisheries, forests and minerals. And within countries, the poor are the most dependent of all. Yet this resource base is eroding rapidly today, and development prospects are being undermined as a result.

Some development projects have had major costs. The construction of roads into the Amazon and unsustainable agricultural settlement that follows is often given as an example. More common are the effects of heavy or otherwise inappropriate uses of fragile highlands, drylands, and forests—overgrazing, overcutting, and overfarming until the resource base has eroded away. Ultimately, such overuse contributes to famine (as in Ethiopia), to devastating floods (as in Bangladesh), and similar tragedies.

To promote progress in the 1990s, the United States must apply the lessons of past decades. First, environmental damage bears high development costs. Second, to be economically sustainable, development must be environmentally sustainable. Third, development strategies must emphasize natural resources. Resource sectors—agriculture, forests,

fish and wildlife, minerals, and energy—generate at least half the gross national products of many developing countries. These sectors provide more employment and export revenues than any other, and the resources' natural limits must be respected in development plans if they are to be productive in the next century.

The United States, until this year the largest donor of development assistance, should provide international leadership in unifying environmental protection, resource use, and development. The key to an effective program is the concept of "sustainable development"—development that maintains and enhances human and physical productive capacity without damaging the underlying resource base. This approach will require refocusing bilateral aid and influencing multilateral agencies.

Important initiatives need to be taken to help reverse environmental deterioration in developing countries:

1. The time is auspicious for a thorough overhaul of U.S. international cooperation based on a new concept of burden-sharing to sustain our earth and its people. The U.S. should make the linked challenges of mass poverty and environmental decay the primary

**“
The U.S. should make the linked
challenges of mass poverty and
environmental decay the pri-
mary focal points for U.S.
cooperation and assistance in
the Third World and the pri-
mary objectives of a rewritten
Foreign Assistance Act.
”**

focal points for U.S. cooperation and assistance in the Third World and the primary objectives of a rewritten Foreign Assistance Act. The two overarching goals should be, first, to promote people-oriented development that provides sustainable, non-destructive

tive livelihoods for the rural and urban poor and, second, to promote environmental protection that conserves the resource base for long-term production, protects public health, and establishes a sound basis for international cooperation on global environmental challenges.

“

U.S. efforts should support strengthening and training personnel responsible for resource management in developing countries, working with non-governmental organizations to improve local capabilities for resource management, and developing scientific research and monitoring capabilities for resource and environmental management.

”

2. In promoting its development assistance activities through both bilateral and multilateral channels, U.S. policy and initiatives should focus on the following objectives:

Agriculture: assisting marginal farmers missed by the Green Revolution, promoting land tenure reform, reducing dependence on agricultural chemicals and encouraging biological fertilization and integrated pest management, reclaiming degraded lands, managing and maintaining irrigation systems better, promoting agroforestry as well as ecologically sound animal husbandry, and involving local farmers—including women—in the design and implementation of programs.

Forestry: supporting reforestation, restoring fuelwood supplies, combining forestry and farming (“agro-forestry”), conserving natural forest areas and promoting better management of tropical forest ecosystems, preserving forest resources for indigenous peoples, and promoting watershed rehabilitation and appropriate forest-based industries.

Energy: focusing on the energy needs of the urban and rural poor, supporting efforts to use traditional fuels more efficiently (through the development and marketing of improved cooking stoves, kilns, furnaces and boilers used in local industries), and improving the “modern” sector through more efficient generation, least-cost energy planning, and the application of such renewable resource technologies as biomass, small-scale hydro, and solar energy.

Population: substantially increasing access to family planning services and improving health care and educational opportunities, especially for women and children. The United States should resume its world leadership in promoting family planning and contraceptive research, restore its financial support to the U.N. Fund for Population Activities, and promote an international goal of a transition to a stable world population of about nine billion by the middle of the next century.

Policy reform: identifying and removing those economic subsidies in agriculture, forestry, energy and other sectors that encourage poor resource use and also impose heavy fiscal burdens on governments (*e.g.*, pesticide subsidies, heavily subsidized irrigation, tax breaks for forest clearing, and artificially low energy prices).

Capacity building: strengthening and training personnel responsible for resource management in developing countries, working with non-governmental organizations to improve local capabilities for resource management, and developing scientific research and monitoring capabilities for resource and environmental management.

3. The overall amount of U.S. aid for sustainable development should be expanded while new financial sources of investment and increased funding for programs of global environmental significance are sought. These could include:

- Developing funding mechanisms for converting commercial bank and governmental debt into conservation and other sustainable development endowments;

- Revising tax and accounting rules to make it easier for commercial banks to dominate debt for sustainable development programs;
- Providing debt relief and forgiveness for the poorest countries, including many in Africa; and,
- Redressing the imbalance between development assistance and military assistance,

which is proportionately larger today than at any time since the Vietnam War.

4. The United States should encourage the revision of current methods of national income accounting which give badly misleading reports of economic growth by failing to treat resource depletion as capital depreciation is treated.

SELECTED READINGS

The Global Environmental Challenge

World Resources Institute and International Institute for Environment and Development, *World Resources 1988-89* (Basic Books, 1988).

World Commission on Environment and Development ("Brundtland Commission"), *Our Common Future* (Oxford, 1987).

J. Speth, "Environmental Pollution: A Long-Term Perspective" (National Geographic Society and World Resources Institute, 1988).

R. Repetto (ed.), *The Global Possible: Resources, Development and the New Century* (Yale, 1986).

Slowing the Greenhouse Warming

I. Mintzer, *A Matter of Degrees: The Potential for Controlling the Greenhouse Effect* (World Resources Institute, 1987).

J. Mathews, "Global Climate Change: Toward a Greenhouse Policy," *Issues in Science and Technology*, Spring, 1987.

Environmental Protection Agency, "The Potential Effects of Global Climate Change on the United States," Draft Report to Congress, 1988.

U.N. Environment Programme, *The Greenhouse Gases* (UNEP/GEMS, 1987).

Protecting the Earth's Ozone Shield

A. Miller and I. Mintzer, *The Sky is the Limit: Strategies for Protecting the Ozone Layer* (World Resources Institute, 1986).

U.N. Environment Programme, *The Ozone Layer* (UNEP/GEMS, 1987).

Curbing Acid Rain and Oxidants

J. MacKenzie and M. El-Ashry, *Ill Winds: Airborne Pollution's Toll on Trees and Crops* (World Resources Institute, 1988).

Office of Technology Assessment, *Acid Rain and Transported Air Pollutants: Implications for Public Policy* (Government Printing Office, 1984).

Forging New Energy Strategies

J. MacKenzie, *Breathing Easier: Taking Action on Climate Change, Air Pollution and Energy Insecurity* (World Resources Institute, 1988).

Environmental and Energy Study Institute, "Energy Policy Statement: A Call to Action for the Next President and Congress" (EESI, October 5, 1988).

R. Williams, "A Low Energy Future for the United States," *Energy*, Vol. 12, No. 10/11, 1987, pp. 929-944.

M. Kosmo, *Money to Burn? The High Costs of Energy Subsidies* (World Resources Institute, 1987).

J. Goldemberg, T. Johansson, A. Reddy, and R. Williams, *Energy for a Sustainable World* (World Resources Institute, 1987).

W. Chandler, H. Geller, and M. Ledbetter, *Energy Efficiency: A New Agenda* (American Council for an Energy Efficient Economy, 1988).

Conserving Tropical Forests and Biological Diversity

Tropical Forests: A Call For Action, International Task Force of the World Resources Institute, the World Bank, and the U.N. Development Programme (1985).

Previous Page Blank

R. Repetto, *The Forest for the Trees?: Government Policies and the Misuse of Forest Resources* (World Resources Institute, 1988).

E. Wilson (ed.), *Biodiversity* (National Academy of Sciences, 1988).

Office of Technology Assessment, *Technologies to Maintain Biological Diversity* (Government Printing Office, 1987).

E. Wolf, *On the Brink of Extinction: Conserving the Diversity of Life* (Worldwatch Institute, 1987).

Halting Environmental Deterioration in Developing Countries

J. Brown, "Poverty and Environmental Degradation: Basic Concerns for U.S. Cooperation with Developing Countries" (World Resources Institute, 1988).

R. Smuckler and R. Berg, *New Challenges, New Opportunities: U.S. Cooperation for International Growth and Development in the 1990s* (Michigan State, 1988).

R. Repetto, *Skimming the Water: Rent-Seeking and the Performance of Public Irrigation Systems* (World Resources Institute, 1986).

M. El-Ashry, "Population, Resources, and Famine in Sub-Saharan Africa," *Africa in the 1990s and Beyond* (Reference Publications, Inc., 1988).

L. Brown and E. Wolf, *Reversing Africa's Decline* (Worldwatch Institute, 1985).

R. Repetto, "Population, Resources, Environment: An Uncertain Future," *Population Bulletin*, Vol. 42, No. 2 (Population Reference Bureau, 1987).

W. Reid, J. Barnes and B. Blackwelder, *Bankrolling Successes: A Portfolio of Sustainable Development Projects* (Environmental Policy Institute and National Wildlife Federation, 1988).

A. Maguire and J. Brown (eds.), *Bordering on Trouble: Resources and Politics in Latin America* (Adler & Adler, 1986).

J. Leonard, *Natural Resources and Economic Development in Central America* (Transaction Books, 1987).

World Resources Institute

1709 New York Avenue, N.W.
Washington, D.C. 20006 U.S.A.

WRI's Board of Directors:

Matthew Nimetz

Chairman

John E. Cantlon

Vice Chairman

John H. Adams

Robert O. Anderson

Robert O. Blake

John E. Bryson

Ward B. Chamberlin

Richard M. Clarke

Alice F. Emerson

John Firor

José Goldemberg

Michio Hashimoto

Curtis A. Hessler

Martin Holdgate

James A. Joseph

Ian K. MacGregor

Alan R. McFarland

Robert S. McNamara

Paulo Nogueira-Neto

Thomas R. Odhiambo

Ruth Patrick

James Gustave Speth

Maurice F. Strong

M.S. Swaminathan

Mostafa K. Tolba

Russell E. Train

Alvaro Umana

George M. Woodwell

James Gustave Speth

President

Mohamed T. El-Ashry

*Vice President for Research and Policy
Affairs*

Jessica T. Mathews

Vice President

J. Alan Brewster

*Vice President for Administration
and Finance*

Wallace Bowman

Secretary-Treasurer

The World Resources Institute (WRI) was established in 1982 to help governments, international organizations, non-governmental organizations, and private business address a fundamental question: How can societies meet basic human needs and nurture economic growth without undermining the natural resources and environmental integrity on which life, economic vitality, and international security depend?

Two dominant concerns influence WRI's choice of projects and other activities:

The destructive effects of poor resource management on economic development and the alleviation of poverty in developing countries; and

The new generation of globally important environmental and resource problems that threaten the economic and environmental interests of the United States and other industrial countries and that have not been addressed with authority in their laws.

The Institute's current areas of policy research include tropical forests, biological diversity, sustainable agriculture, energy, climate change, atmospheric pollution, economic incentives for sustainable development, and resource and environmental information.

WRI's research is aimed at providing accurate information about global resources and population, identifying emerging issues and developing politically and economically workable proposals.

In developing countries WRI provides field services and technical program support for governments and non-governmental organizations trying to manage natural resources sustainably.

WRI's work is carried out by an interdisciplinary staff of scientists and experts augmented by a network of formal advisors, collaborators, and cooperating institutions in 50 countries.

WRI is funded by private foundations, United Nations and governmental agencies, corporations, and concerned individuals.