Global Future: Time To Act

January 1981

Report to the President on Global Resources, Environment and Population

Council on Environmental Quality

United States Department of State

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PREFACE

The Global 2000 Report to the President, issued July 24, 1980, after a 3-year interagency study, was the U.S. government's analysis of probable changes in world population, resources, and environment through the end of the century. The Report indicated the potential for progressive impoverishment of world resources and degradation of the global environment -- if present trends and policies continue. Unless nations of the world take prompt, decisive action to alter the trends, the Report concluded, the next 20 years may see a decline in the earth's capacity to support life while rapid population growth continues; a steady loss of croplands, fisheries, forests, and plant and animal species; and degradation of the earth's water and atmosphere.

The Global 2000 Report to the President identified the problems; it did not attempt to find solutions. The President then directed agencies of the government to undertake the next step -- to look at present government programs related to these long-term global issues, assess their effectiveness, and recommend improvements. One of us, Gus Speth, Chairman of the Council on Environmental Quality (CEQ), chaired this effort.

The report that follows, prepared by the Council on Environmental Quality and the Department of State, responds

to the President's charge. In accordance with the President's direction, it is based on a selection by the federal agencies of problem areas needing priority attention; the chapters in the report correspond to those subject areas. Interagency working groups drawn from 19 federal agencies analyzed these areas and formulated recommendations in each of the subjects. Valuable suggestions and contributions were also received from several hundred citizens and private organizations.

The report presents a collection of considered assessments and new ideas for actions the United States could take, in concert with other nations, for a vigorous response to urgent global problems. It does not represent an official U.S. government program or a set of final proposals by CEQ and the Department of State. The merits of the recommendations have not been compared with one another or with those of other government programs that must compete for limited budgetary resources. The goal of the report is to further public discussion of these important issues and to offer our best thinking to government leaders who will be developing U.S. policy in the years ahead.

This report is only the beginning of a process the United States and other countries across the globe must engage in over the next few years. We must change the way in which we address and resolve long-range global problems, issues of critical importance to our common future. The Global 2000

Report has been described as a reconnaissance of the future. It describes what might be, if action is not taken. It is within the power of this country, working with other countries, to alter the future. The resources exist. The solutions can be found. The will to act must be summoned.

Nicholas C. Yost, on leave from his regular post as CEQ General Counsel, was director of the effort to prepare this report. Mr. Yost, his assistant directors, Khristine L. Hall and R. Michael Wright, and staff from CEQ and the Department of State performed the indispensable tasks of eliciting contributions from hundreds of public and private sources, sifting and pulling together the recommendations, and writing this report. Katherine Gillman of CEQ was editor-in-chief. All of them have our heartfelt admiration and thanks.

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Chairman, Council on
Environmental Quality

Edmund Muskie
Secretary of State

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INTRODUCTION AND SUMMARY

A. The Global Challenge

Throughout the past decade, a number of reports -- from the United Nations, the World Bank, the International Union for the Conservation of Nature and Natural Resources, the Worldwatch Institute, and many other organizations -- have sounded a persistent warning. Severe stresses on the earth's resources and environment are apparent. With the persistence of human poverty and misery, the staggering growth of human population, and ever increasing human demands, the possibilities of further stress and permanent damage to the planet's resource base are very real. To reverse the present trends, to restore and protect the earth's capacity to support life and meet human needs, is an enormous challenge.

The most recent of the warnings was issued in July of this year by the Council on Environmental Quality and the U.S. State Department in The Global 2000 Report to the President. The report is the result of a 3-year effort by more than a dozen agencies of the U.S. government to make long-term projections of world population, resources, and environment through the end of the century. Its projections are based on the assumption that the policies of governments and private companies stay much as they are today; that technological advance continues at the same rate as in recent years, with no

revolutionary breakthroughs; and that major wars and other catastrophes do not intervene.

The Global 2000 Report depicted a world "more crowded, more polluted, less stable ecologically, and more vulnerable to disruption than the world we live in now." It projected that world population would increase from 4 billion to 6.35 billion in just one-quarter of a century; that the gap between rich nations and poor would widen; that per capita food consumption would rise somewhat worldwide -- but would not improve materially in the poor countries of South Asia and the Middle East, and would decline disastrously in Sub-Saharan Africa; that the real cost of food would rise everywhere; that the real cost of fuels would also rise everywhere and that fuelwood would fall far short of need; that many currently productive grasslands and croplands would turn to desert-like conditions; that as much as 40 percent of the world's remaining tropical forests would be lost; and that as many as 20 percent of the species of plants and animals now inhabiting the earth could be extinct -- all by the end of the century.

The Report noted that the burning of fossil fuels is already causing damaging increases in the acidity of rain and snowfall, and it is raising the concentration of carbon dioxide in the earth's atmosphere. Continued into the next century, rising CO_2 levels could cause a warming of the earth sufficient to alter substantially the world climate -- with

possible serious disruption of human activities, especially agriculture.

To each of these findings and conclusions there is an important caveat. They are a description of what may be expected if present trends continue. They are not predictions of what will occur, but projections of what could occur if the nations and people of the world do not respond to their warnings.

Resource impoverishment, environmental degradation, and soaring population growth have not just been discovered for the first time as global problems. The United States and other nations have long recognized them and made serious efforts to deal with them. What the recent reports do emphasize in a new way are the accelerating pace and scale of the problems and their interrelationships -- the web of causes and effects that bind them together.

Another fresh insight is the degree to which the earth's renewable resources are under threat. In the past decade, a great deal of international attention has fastened on whether global supplies of finite nonrenewable resources, especially oil and gas, can meet the growing needs of an expanding world population. At least as important, the recent reports tell us, is to maintain the productivity of the earth's systems -- the air and water, the forests, the land -- that yield food, shelter, and the other necessities of life. These resources

are renewable if they are kept in a condition of health. But they are susceptible to disruption, contamination, and destruction.

In some areas, such as sub-Saharan Africa, a vicious cycle of poverty, accelerating population growth, and erosion of the resource base is visible. Here, the earth's capacity to support life is being seriously damaged by the efforts of present populations to meet desperate immediate needs, and the damage threatens to become worse. People who have no other choice for getting their living plant crops on poor soils that will soon wash away, graze their stock on land that is turning to desert from overuse, cut trees that are needed to stabilize soils and water supplies, burn dung needed to fertilize and condition agricultural soils. According to the World Bank, some 800 million people today are trapped in conditions of "absolute poverty," their lives dominated by hunger, ill health, and the absence of hope. So long as their situation does not improve, trends toward impoverishment of the earth's renewable resource base are likely to worsen, making the plight of the poor even more desperate.

These stresses, while most acute in the developing countries, are not confined to them. For example, in recent years the United States has been losing about 3 million acres of rural land annually -- including 1 million acres of prime agricultural land -- due to the spread of housing developments,

highways, shopping malls, and the like. Each year we are also losing the equivalent, in production capability, of as much as 1 million more acres due to soil degradation -- erosion and salinization. The Global 2000 Report emphasized the serious worldwide nature -- in rich countries as well as poor -- of the degradation and loss of agricultural land. Pollution of water supplies by toxic chemicals and the physical destruction or pollution of essential habitat for fisheries are also common threats to natural systems throughout the world.

Recent reports of the multiple, increasing stresses on the earth's resources and the increasingly precarious condition of these resources lead to one more firm conclusion: these changes affect all of humanity. There are hardheaded, selfish reasons as well as ethical ones for people of all nations, rich and poor, to concern themselves with conservation of the earth's resources and protection of the global environment.

B. U.S. Interests

Why, indeed, should the United States or other comfortable countries, with a seeming wealth of resources at their command, take an urgent interest in global resource impoverishment and environmental degradation? First, the resulting poverty and misery for hundreds of millions of people is a matter of serious moral concern. Then, there is a profound human interest in protecting the earth's resources for

generations to come. Finally, there are impelling reasons of national self-interest. U.S. political and economic security, broadly defined, is already being affected by global resource, environment, and population problems -- more so than is commonly understood. The effects will become far greater with time, if present trends continue.

The dimension of U.S. national security related to global resources, population, and environment includes, first of all, political stability. A downward spiral of poverty and resource degradation and a growing disparity between rich and poor could increase the possibilities for frustration and resentment from those on the short end of the wealth equation, making them more susceptible to exploitation by others and incitement to violence. Such developments can contribute to political instability that can threaten the security of all nations, including our own.

Other key elements related to U.S. national security include:

Availability and prices of renewable natural resources. The United States, to a most unusual degree for a highly industrialized nation, provides most of its own food, fiber, fish, and forest products. However, we are not totally self-sufficient; for example, we rely on Southeast Asian forests for specialty hardwoods, and we import considerable quantities of meat and produce. The real worry, however, is not the

possible loss to the United States of these particular imports, but a general decline in the availability of global resources following continued degradation of the resource base. In common with the rest of the world, we will have to pay soaring food prices if world agricultural lands and water are lost or degraded and population continues its enormous growth. The same is true for fuelwood, building materials, and paper if rapid losses of world forests continue and for a host of other materials that natural systems provide.

Conservation of the U.S. renewable resource base. The United States benefits greatly from exports of farm and forest products; for example, agricultural exports pay for about 60 percent of our oil imports. Yet it is not hard to foresee that if food production capacity declines elsewhere in the world, the pressures will be great to overuse and abuse America's agricultural and other renewable resources. The incentives could be very powerful, for instance, to plow up natural grasslands in the semi-arid Great Plains, deplete groundwater, and degrade the land to nonproductive desert-like condition.

Migration from areas of resource impoverishment. To the tides of political and economic refugees of the 20th century must be added a new category: ecological refugees. In many parts of the world, from wornout cropland, barren rangeland, and degraded forestland, migration is rapidly accelerating.

Waves of immigrants are moving both within nations (often from impoverished countryside to shanty towns in crowded cities) and from one nation to the next (as from deforested, eroded Haiti to the United States). Political barriers may be erected to contain the migration, but they are hard to enforce. The impulse to move from environmentally degraded, resource-poor lands is a powerful one.

Disputes over water and other resources. The Global 2000 Report points out the high potential for conflict over fresh water, with 148 of the world's important river basins shared by two or more countries. Competing demands for limited supplies or deterioration in water quality could both give rise to conflict. The United States is not immune to these problems; we have shared problems of water quality and availability with Canada and Mexico. Competing national demands for resources other than water, such as fisheries and nonfuel minerals, could also lead to international disputes and tensions.

Energy availability. Escalating oil prices -- already ruinously high for poorer countries -- and the global scramble for supplies whenever oil production drops in the Middle East highlight the importance of reducing world oil demand and developing more diverse, reliable, and renewable sources of energy. In the case of energy, the interdependence of nations is especially plain. For heavy energy users, like the United

States, conservation -- getting more out of each barrel of oil and ton of coal -- can be the cheapest and safest available source of the benefits we seek from energy -- comfort, mobility, jobs, economic growth; at the same time, it frees more oil for the world market. In many of the poorer countries, replanting of forests for fuelwood, development of other local and renewable energy sources, and conservation can contribute greatly to economic development while lessening demands on the world oil market and reducing needs for financial aid to buy oil.

Trade. International trade is forging ever more important links among all countries, rich and poor. The United States benefits greatly from trade with the developing nations. More than one-third of U.S. exports are now bought by developing countries, and by the end of the century their share will probably be higher. Some 800,000 jobs in U.S. manufacturing alone depend on exports to developing countries, and well over one-half of our agricultural exports go to them. As nations develop and achieve larger incomes and growing economies, they are likely to be still better trading partners.

Conservation of genetic resources. The earth's diversity of plant and animal life is an essential storehouse of genetic material for meeting human needs. In particular, the development of new medicinal drugs and new crop varieties depends on

genetic materials found in wild species or locally cultivated strains. In the future, new foods, fibers, fuels, building materials, and biological controls for pests could be drawn from these same sources. Entire natural ecosystems also perform valuable services for mankind, and all humanity will suffer from the massive loss of species expected over the next 20 years if present trends continue.

Climate change and pollution of the global atmosphere. The problems of rising CO_2 levels in the world's atmosphere and depletion of ozone in the stratosphere are especially hard to manage because they are truly global in scope and require concerted international action for effective control. Acid rain problems often cross several international borders. The United States has a strong interest in achieving international understanding of the risks involved in these climate and atmosphere changes and in taking common action to reduce the risks.

The United States has not been blind to the concerns described above. We are strongly committed to protecting and enhancing environmental quality at home. Internationally, in our development assistance programs; in international organizations, conferences, and treaties; and in our relations with neighboring countries, we are leaders in support of wise management of resources, control of population growth, and care for the environment. Other nations are also taking

action on these problems.

Valuable -- indeed indispensable -- as these efforts are, they are clearly not enough. To respond adequately to the enormous and urgent challenges before us will require an unprecedented degree of global cooperation and commitment. The United States itself can take important steps -- such as continued and strengthened efforts to conserve our soil, farmlands, and energy resources. But beyond that, we must expand our collaboration with the rest of the world in a spirit of generosity and justice as well as enlighted self-interest.

C. Shaping U.S. Response

In July 1980, with the release of The Global 2000 Report, President Carter asked for a review of U.S. government programs related to the most serious issues identified in the study and for recommendations for needed changes. This report was prepared with the assistance of a score of government agencies, many institutions outside the government, and hundreds of intensely concerned individuals. Its recommendations are presented in the spirit not of a fixed or final program but as a body of good ideas for the first round of an effective response to the immensely challenging problems before us. Based on the thoughtful efforts of a great many experienced, knowledgeable people within and outside the U.S. government, the report is intended to suggest answers and options -- to

open a fruitful discussion involving both the public and the government leaders who will develop and execute U.S. policy in the coming years.

The recommendations are for both fresh starts and continuing efforts in the areas identified as needing priority attention. They emphasize our special strengths -- especially scientific and technical -- and they look to others for leadership in their areas of special strength.

The report stresses that international cooperation is imperative in maintaining a productive and habitable earth. No one nation can tackle the problems alone. The success of intensified U.S. efforts will depend on strong efforts by other countries and international organizations as well. Our objective is to focus new international attention on the problems, to strengthen our contributions in ways best suited to our own talents, and to manage our own resources and environment in an exemplary manner.

In thinking about ways to meet the global challenge, those working on this effort kept in mind several basic guiding ideas. One of them is the urgent need for sustainable economic development. Such development is essential to interrupt the cycle of poverty, population growth, and environmental degradation that is putting unsupportable pressures on croplands, pastures, forests, and fisheries in much of the less developed world. It is not realistic to expect people

living at the margin of existence, struggling for their day-to-day survival, to think about the long-term survival of the planet. Economic development of a sustainable nature, far from being antagonistic to protection of global resources and the environment, is absolutely necessary to its success.

This report concludes: "Only a concerted attack on the socioeconomic roots of extreme poverty, one that provides people with the opportunity to earn a decent livelihood in a nondestructive manner, will permit protection of the world's natural systems. Nor will development and economic reforms have lasting success unless they are suffused with concern for ecological stability and wise management of resources." The key concept here is sustainable development. Economic development, if it is to be successful over the long term, must proceed in a way that protects the natural resource base of the developing nations.

There are many opportunities to shape development in ways that protect renewable resources for long-term productivity -- opportunities that are open to both rich and poor countries. For example, dams or new industries can be better planned to avoid adverse impacts on croplands or fisheries. Transportation systems may be developed that, unlike the auto highway system, do not encourage sprawl and are not solely dependent on petroleum. Agricultural systems can be built on a more sustainable resource-conserving basis, which makes use of

organic as well as chemical fertilizer, interplanting of legumes or development of new nitrogen-fixing crops, use of farm machinery that is the right size to fit the job, and pest control methods that use natural predators and selective pesticides rather than broad-scale application of persistent, destructive chemicals.

There are many ways in which the United States, other developed countries, and international organizations can contribute to sustainable economic development in the Third World. One of them is international development assistance. Foreign aid is only a part of the complex of trade and monetary issues, domestic policies, and availability of investment capital from many sources that influence economic growth in developing countries. Nonetheless, it is a vital element in the mix. A sustained commitment to development assistance by the richer nations, including the oil-rich nations, is critical to breaking this cycle of hunger, misery, and resource degradation in the Third World.

Several industrialized countries contribute to development assistance the amount proposed as reasonable and necessary by the United Nations -- 0.7 percent of annual gross national product. Contrary to a widely shared public impression, the United States no longer leads in giving aid for development. Although we do make the largest contributions in absolute amounts, in terms of share of GNP contributed we are

15th out of 17 industrialized nations -- just ahead of Austria and Italy.

This report recommends a substantially increased U.S. commitment to development assistance programs. Far from simply "throwing money at problems," this report's proposals would single out programs that are strategically well-planned where the U.S. contribution is meshed with those of other countries and international organizations and where recipient countries both need the assistance and are able to use it effectively. An example is the World Bank's 5-year fuelwood-forestry program which would double the present rate of tree planting in low income developing countries. Another example is the proposed doubling of resources available to population assistance worldwide. Today there are more demands for family planning services than can be filled -- even in countries that formerly seemed unresponsive to population programs.

Direct financial assistance for development projects is just one way to encourage sustainable economic growth. Another is the provision of technical assistance, not only to the neediest countries that are recipients of foreign aid but also to middle or higher income developing countries.

Many of the recommendations in this report emphasize tapping U.S. scientific and technical know-how, using our experience in inventory and assessment of natural resources, resource management, and institution-building and training --

as well as our scientific research skills. Promising ideas for applied scientific research are to be found throughout the report. Energy, tropical forests, biological diversity, and pollution control are particular examples of the emphasis on sharing U.S. technical expertise. Private as well as public institutions have much to contribute. For example, the report recommends a partnership between government and industry in tropical forest resource management and calls attention to a demonstration project for reforestation in Southeast Asia, proposed by U.S. forest industry leaders.

Many of the federal agencies contributing ideas to this report noted the frustration felt by highly competent technical people -- U.S. government foresters, land use planners, wildlife managers, pollution control engineers -- who cannot easily respond to foreign countries' requests for technical assistance in resource management and environmental protection. Several institutional impediments stand in the way. Chapter 10, Institutional Changes, discusses possible remedies, including a special budget process by which technical assistance programs of many agencies would be considered together and a total budget allocation parceled out among them.

Indeed, in the hundreds of letters and comments offering suggestions for a U.S. response to global resource, environment, and population problems, the most frequent recommenda-

tion, by an overwhelming margin, was for institutional changes to assure enduring, effective attention to these long-term global issues. The same concern was strongly expressed in The Global 2000 Report. That Report documented in detail our government's present inability to anticipate and evaluate global problems. To muster a coordinated response is still more difficult.

Among the dozens of suggestions for developing institutions and laws that will assure steadfast, adequate attention to global issues, two stand out. One is to centralize authority for fostering the development of an integrated U.S. strategy on global resources, environment, and population in one single government institution. The other is to establish a hybrid public-private institute to supplement the government effort, to stimulate independent analysis, and to involve private groups -- industry, labor, environmental, population, academic, and others -- in a creative dialogue with the government.

This central government body would cope with a gamut of needs from data collection and analysis to policy development. As this report repeatedly points out, some of the critical information needed for analysis of global resource and environment problems simply does not exist. A central coordinating body should stimulate global data collection and provide for easy access. It should also project trends and analyze the

probable results of different responses to global problems. The weaknesses in the government's modeling abilities, described in The Global 2000 Report, can be cured only by a more holistic approach, achieved through better coordination.

Finally, coordinated development of policy is absolutely essential. All the pieces must be evaluated and brought together in a coherent whole -- a job attempted in this report for the first round, but one that must be continued, expanded, and made a permanent, high priority part of government operations.

The ideas and work summed up in this report are a beginning. Some of the recommendations rest on a very comprehensive body of work. For example, the chapter on Tropical Forests distills recommendations that grew out of a 2-year effort -- led by the Departments of State and Agriculture -- to devise a comprehensive U.S. strategy for protection and wise management of the world's tropical forests. This effort evaluated national and international activities, public and private; identified the most urgent needs; and looked for the best ways to use American talents.

In other areas of priority concern, our understanding is far less sophisticated. This report calls for efforts similar to the one completed for tropical forests in three major areas of concern: world agricultural lands and soils, biological diversity, and global water resources. These strategy studies

will lay the basis for better informed and more refined recommendations for action in these areas.

In general, the recommendations in the report are initial steps, the first increments in what needs to be done, efforts which must be duplicated, enhanced, repeated, and expanded upon many times over by other nations and international organizations, by private institutions, by business, and by industries. A guiding hand at the center of the U.S. government's share of the response is critical -- not only for coordination but for staying power.

Americans -- and citizens of other nations throughout the world -- must make a commitment and stick with it. Global population, resource, and environment problems will not be solved tomorrow, or even in 10 years or 20. Yet it is essential to act promply, to begin to bring these problems down to manageable size.

With each year of inaction, the problems become harder to cure. The opportunity to stablize the world's population below 10 billion, for example, is slipping away; the longer it takes the world to reach replacement fertility levels, the greater the ultimately stablized world population will probably be.

Provided we manage the earth's resources wisely, future generations will not be faced with a crisis in which our planet will cease to support the number of people living on

it. But that specter is now visible. To restore and protect the earth as an ecologically and politically stable habitat for the human race may be the most serious task of the last 20 years of this century.

D. Summary of Recommendations

1. Population

Problem: Between now and the year 2000, almost 2 billion more people will be added to the present world population of 4.5 billion. Ninety percent of the growth will occur in low income countries, where populations are predominantly young and have their childbearing years ahead of them. At the very least, explosive population growth makes the provision of decent conditions for the world's people more difficult. In some areas, it is already overwhelming efforts to educate, house, and employ the population. And the attempts of growing numbers of people to wrest a living from the land is undermining the very soil, water, and forest resources on which long-term stability and improvements in standard of living depend. Population growth in richer countries, though much slower, is also of concern, because consumption of resources per capita (especially commercial energy and other nonrenewable resources) is very much higher.

U.S. interests: Unless population growth can be brought under control, the world's efforts to solve a broad range of environmental, resource, and economic problems will be under-

cut. Thus, the many important interests the United States has in solving these problems -- reducing the potential for social unrest, political instability, international conflict over control of land and resources, massive migration of "ecological refugees," and deterioration of world prosperity and trade -- are at stake.

U.S. strategy: The United States is by far the world's leader in international population assistance, providing more than one-half of total governmental aid. However, overall international population assistance (including U.S. assistance) has declined in real terms during this decade. At the same time, there is mounting evidence that population programs and demands for family planning are growing. U.S. strategy should be based on cooperation with other nations and international organizations to raise population assistance substantially, encouraging others to increase their contributions, increasing international awareness of population problems, improving understanding of relationships between population growth and national security, and strengthening research into more effective population control measures. It must also be recognized that overall economic development -- especially better nutrition and health, lowered infant mortality, and better education and employment opportunities -- plays an essential role in lowering fertility rates.

Recommendations: The United States should:

- Together with other donors and international organizations, launch a program aimed at significantly increasing family planning over the next decade by doubling resources available and improving maternal and child health care. (p. 7)
- Expand government assistance for research in more effective contraception methods suited to the needs of recipient countries. (p. 10)
- Develop a U.S. national population policy that includes attention to issues such as population stabilization; availability of family planning programs; just, consistent, and workable immigration laws; improved information needs; and institutions to ensure continued attention to domestic population issues. (p. 11)

2. Food and Agriculture

Problem: Population increases will place great stress on world food supply. Although food production may expand 90 percent (under optimistic assumptions) by the year 2000, the increase will be less than 15 percent on a per capita basis. And this global estimate disguises regional disparities; food availability and nutrition levels may scarcely improve in South Asia and the Middle East and may actually decline in the poorer parts of Africa. Of particular concern is the ability to improve world agricultural yields in the face of pressures

leading to degradation of agricultural soil and water resources and the conversion of some of the best cropland to other uses.

U.S. interests: The potential for political and social instability in a world with large numbers of hungry and starving people is well known. Under such conditions, the demand for food assistance from the United States, the world's largest bread basket, is likely to grow. This means difficult policy and economic decisions about expansion of U.S. food aid to poor nations on concessional terms. Further, protection of the agricultural resource base is one of the global problems the United States directly shares with other countries. Our own croplands are already under heavy pressure, with erosion, loss of soil fertility, and conversion to nonagricultural uses. If food production capacity declines elsewhere in the world, U.S. trade may prosper (in good times); yet the pressures will also be great to overuse and abuse U.S. agricultural resources.

U.S. strategy: The U.S. approach in recent years has been to assist other nations to expand food production through giving high priority to agriculture in the U.S. development assistance program. The United States has also tried to strengthen international bodies (e.g., the Food and Agriculture Organization) in this area and has maintained the world's largest food relief program. The proposed U.S. strategy calls

for a continuation of these efforts, but also for special attention to a new dimension of the world food problem: the deterioration of the productive capacity of the world's agricultural resource base. Moreoever, while helping to build the capabilities of food-deficit nations for self-sufficiency, we must at the same time maintain our own production capacities. U.S. studies already underway or now concluding -- the National Agricultural Lands Study and the appraisal of the nation's soil and water resources under the Resources Conservation Act -- provide the basis for a strengthened domestic program.

Recommendations: The United States should:

- Expand significantly U.S. development assistance to the crucial food sector in low income countries. (pp. 18-19)
- Establish an Interagency Task Force on World Agricultural Lands (on the model of the Interagency Task Force on Tropical Forests) to assess world agricultural lands and trends affecting their productivity, review current national and international responses, recommend a coordinated U.S. strategy as part of international efforts to address the problem, and provide the foundation for proposals for an international plan of action. (pp.25-26)
- Lead by example in protection and wise management of U.S. agricultural lands; elements in the program should include:

- Federal technical and financial assistance to state and local governments wishing to develop land preservation policies and soil and water conservation programs.
- An Agricultural Land Conservation Fund to help finance state and local conservation programs.
- Financial incentives to help preserve farmland.
- Examination by federal agencies of programs affecting agricultural lands (e.g., federal loan and loan guarantee programs, sewer, water, and highway programs) to ensure that their actions do not unnecessarily encourage farmland conversion.
- Examination and use by state and local governments of growth management tools to discourage farmland conversions.
- New initiatives to improve soil conservation. (pp.27-29)

o Propose an international technical conference on conversion of agricultural lands. (p. 29)

o Strengthen national and international programs to preserve crop germ plasm. (pp. 33-34)

o Through assistance, cooperation, and research programs, domestic and international, encourage the use of sustainable agricultural management techniques, including integrated pest management, more efficient use of commercial fertilizer, and biological fixation of nitrogen. (pp. 36-40)

- o Work actively toward a better international food reserve system. (p. 41)

3. Renewable Energy Resources and Conservation

Problem: While most of the world, rich and poor, is having to adjust to soaring oil prices, the developing countries without their own oil resources are hardest hit. They are now spending $50 billion per year to buy oil -- almost twice the amount they receive collectively from all outside sources for development assistance. At the same time, the world's poorest half, most of whom rely mainly on traditional fuels such as firewood and agricultural waste, face another energy crisis: dwindling supplies of firewood. This combination is aggravating already severe economic and ecological problems and adding to the difficulties of achieving economic growth.

U.S. interests: The link between U.S. national interests and those of other countries -- especially the developing countries -- is nowhere more obvious than in energy. Greater use of energy conservation and development of renewable energy resources can benefit rich and poor nations alike. Success in these areas would ease pressures on the world oil market and give the world a longer time to make the transition from overdependence on oil. Greater use of conservation and renewable energy in developing countries can contribute greatly to sustainable economic growth of the Third World, in which the

United States has broad foreign policy and national security interests. Moreover, the United States and other developed countries are interested in reducing demands for financial aid because of high oil prices and in reducing pressures for expensive high technology energy alternatives such as nuclear power. Use by developing countries of new renewable energy and conservation technologies can directly benefit U.S. research, development, and demonstration efforts -- and vice versa.

U.S. strategy: A broad effort, including energy conservation and increased efficiency; accelerated production from nonrenewable commercial sources, such as oil, gas, coal, and hydropower; and expanded and sustained production of energy from renewable sources is needed to meet developing country -- and indeed global -- energy needs. A U.S. strategy to promote energy conservation and renewable energy sources both at home and abroad is just one element in that broad program, but a key element. Long-term environmental and natural resource constraints point to the need for sustained priority attention to renewable sources and conservation. The strategy proposed here includes a boost in U.S. development assistance for energy, principally for a share in a coordinated international program to plant trees for fuelwood. It also includes strengthened technical assistance to a broad range of developing countries -- rising middle income nations, as well as

the low income developing countries in which the Agency for International Development (AID) efforts are concentrated.

Recommendations: The United States should;

- o Support recent World Bank proposals for a major increase in assistance for fuelwood growing and conservation. (pp.48-49) As our part of the effort, AID should substantially increase its assistance for fuelwood planting. The program should be designed according to ecologically sound principles.
- o Encourage the World Bank to accelerate lending for renewable energy and conservation activities and support the idea of a new World Bank energy facility. (pp. 51,58)
- o Develop mechanisms for easier access by developing countries to new energy technologies developed by the U.S. government and also, so far as possible, to privately owned technologies. (pp. 52-53)
- o Study ways to make U.S. government technical experts in renewable energy and conservation more readily available to a broad range of developing countries, including a voluntary program of short-term technical assistance that would tap the abilities of the private sector. (p. 55)
- o Participate actively in the 1981 UN Conference on New and Renewable Sources of Energy. (p. 60)
- o Establish an interagency task force to develop a realistic strategy for achieving the goal of 20 percent of U.S. energy from renewable sources by 2000. (p. 63)

4. Tropical Forests

Problem: The conversion of forested land to agricultural use and the demand for fuelwood and forest products are depleting the world's forests at an alarming rate -- as much as 18-20 million hectares annually, an area one-half the size of California. Most of the loss is in the tropical regions of developing nations where some 40 percent of the remaining forests may disappear by 2000. Hundreds of millions of people are already directly affected by this extremely serious and growing global environmental problem.

U.S. interests: The loss of wood products and forest-derived drugs and pharmaceuticals, the unprecedented extinction of plant and animal species with loss of tropical forest habitat, and the potential risk of large-scale climate change argue strongly for U.S. concern and involvement. In addition, accelerated erosion and siltation from deforested watersheds are undercutting development assistance investments in agriculture and water supply projects, many financed by the United States. U.S. and international disaster relief is increasingly in demand to cope with floods and droughts directly tied to tropical deforestation. Humanitarian concerns also argue strongly for U.S. assistance for the many millions of people suffering from floods, drought, deteriorating agriculture, and diminishing supplies of firewood due to loss of tropical forests.

U.S. strategy: The United States has taken the lead in the past 2 years to bring the deforestation problem to international attention in the United Nations and elsewhere. World awareness of the problem and commitments to action are increasing, and the first steps toward a coordinated global plan of action (based on a U.S. initiative) have been taken. Domestically, U.S. government and private institutions are beginning to mount new efforts. The U.S. Interagency Task Force on Tropical Forests reported to the President in July on a comprehensive "Policy, Strategy, and Program for the United States." The proposed near-term strategy for the United States is to continue to promote international awareness and action; selectively to support key international organizations that would play lead roles in a worldwide attack on the problem; to strengthen the capabilities of U.S. public and private sector institutions to contribute; and to insure that the limited tropical forests of the United States are properly managed.

Recommendations: The United States should:

- Press for adoption by the international community of a "global plan of action" on tropical deforestation. (p.71)
- Provide financial and technical assistance to enable the FAO to fulfill the international leadership role. (p. 72)
- Coordinate U.S. programs closely with the FAO and World Bank to optimize use of resources. (pp. 73-74)

- o Designate and support the Forest Service's Institute of Tropical Forestry (Puerto Rico) and Institute of Pacific Islands Forestry (Hawaii) as "national centers" for tropical forest research, education, and training.(p.76)
- o Call upon the World Bank to design and support an international cooperative program on reforestation of large watersheds. (p. 81)
- o Expand the tropical forest management capabilities of AID and the Peace Corps. (p. 79)
- o Pursue, through the Interagency Task Force, a new partnership of government and private industry to broaden the base of U.S. planning and to improve U.S. technical contributions to international programs. (pp. 77-78)

5. Biological Diversity

Problem: The accelerating destruction and pollution of habitat for wild animals and plants threaten extinction of species in the next 20 years on an unprecedented scale. As much as 15-20 percent of all species on earth could be lost in the next 20 years, about one-half because of the loss and degradation of tropical forests and the rest principally in fresh water, coastal, and reef ecosystems. Estimates of species loss often include only mammals a .d birds or all vertebrate animals. The estimate here also includes insects, other invertebrates, and plants.

U.S. interests: The U.S. interest in preserving biolog-

ical diversity is truly global and long term. A great many of the species under threat have not even been classified or given scientific names, much less studied for their possible benefits. The potential for new pharmaceuticals is extremely significant; about one-half the commercial drugs now on the world market were originally derived from living organisms. Wild plants and animals provide a wealth of materials and chemicals, such as woods, fibers, oils, resins, and dyes. The locally cultivated varieties and wild relatives of the world's major food crops are sources of genetic traits essential to improving crop yields and resistance to pests and diseases. Wild plants and local cultivars and wild animals may also prove invaluable sources of new foods.

U.S. strategy: The United States has long been a leader, domestically and internationally, in the conservation of wild living resources and biological diversity. State wildlife conservation laws, the U.S. Endangered Species Act, the Convention on International Trade in Endangered Species of Wild Fauna and Flora, the International Whaling Convention, and many other laws and treaties bespeak this concern. The proposed strategy would continue these efforts and add to them an emphasis on cooperative international action toward selection of priority areas worldwide for conservation of ecosystems and habitat of wild plants and animals; and toward multiple use of natural ecosystems to serve human purposes, to conserve the

fauna and flora of the ecosystems, and to maintain their continued functioning as well.

Recommendations: The United States should:

- o Establish a federal Interagency Task Force on Conservation of Biological Diversity to develop a comprehensive long-term strategy to maintain biological diversity, integrating national and international programs. (p. 89)
- o Examine and select for increased U.S. support existing international programs to identify priority areas for protection of biological diversity. (pp. 91-92)
- o Consider proposing the establishment of an international fund to help developing countries protect and manage critical ecological reserves and habitat, especially in tropical forests. (p. 93)
- o Increase support of national and international efforts to inventory the world's flora and fauna and to collect species and germ plasm. (pp. 92,94)
- o Increase U.S. assistance for training wildlife management and conservation professionals of developing countries, especially at selected institutions in those countries. (pp.97-98)
- o Expand our ability to offer U.S. technical expertise in conservation of biological diversity to other countries. (p.100)

6. Coastal and Marine Resources

Problem: Growing threats to coastal and marine ecosystems come from urban and industrial development and destruc-

tion of productive coastal wetlands and reefs; pollutants washed from the land, dumped or discharged into the ocean, or deposited from the atmosphere; and uncontrolled exploitation of world fisheries. The worldwide harvest of fish -- a major component of the world's food supply -- has leveled off and by the year 2000 may contribute less to the world's nutrition, on a per capita basis, than it does today. A special concern is the lack of data regarding the degree of pollution and disturbance and the longevity of impact in the open oceans.

U.S. Interests: Increased pressure on traditional fisheries may lead to collapse of major sources of protein. Conversion and pollution of coastal wetlands in the United States and throughout the world undermine the resource base of fisheries and wildlife. They can also destroy the ability of wetlands to assimilate waste and cleanse water and to buffer coasts from adverse weather conditions.

U.S. strategy: The United States should improve management of its own fisheries on an ecologically sound basis and share this expertise with other countries. Similarly, U.S. programs to inventory, monitor and protect coastal resources should be improved and the results shared internationally. Common action with other nations is the only means for achieving protection of many ocean resources, such as migrating species -- especially the great whales. Antarctica represents a special opportunity for international cooperation for

ecologically sensitive management; the United States should continue to provide strong leadership toward that objective.

Recommendations: The United States should:

- Prepare for a U.S. technical conference to review and improve ecologically sound fisheries management. (p.106)
- Expand support of fisheries management in developing countries bilaterally and by means of increased funding to the FAO. (p. 107)
- Inventory and map coastal resources and assess the inputs and impacts of major pollutants into coastal and marine areas from land-based sources; cooperate with other countries to do likewise. (pp. 111-112)
- Expand efforts to establish marine sanctuaries and seek international agreement on the protection of habitat of migrating species. (pp. 114-115)
- Continue to support a moratorium on all commercial whaling until the continued survival of whales can be assured. (p. 115)
- Undertake research needed to implement the Antarctic Living Resources Treaty; continue efforts to assure that exploitation of Antarctic mineral resources will not take place until a decision has been made -- on the basis of sufficient information -- that such development is acceptable. (pp. 108,117)

7. Water Resources

Problem: Human needs for water will greatly increase over the next 20 years; in one-half the countries of the world, population growth alone will cause demands to double. Data on water availability and quality are exceptionally poor, but it is clear that problems of water supply will be serious in many regions. Parts of the world, especially the Third World, are already suffering severe water shortages and drought, and water-borne disease is endemic in many areas. Without concerted efforts to the contrary, reliable water supplies will be disrupted increasingly because of damage to watersheds, and contamination is likely to increase in the future.

U.S. interests: Unless water supplies are managed successfully, U.S. development assistance efforts will be undercut, need for drought relief will increase, and pressures for mass migration will mount. With 148 of the world's major river basins shared by two or more countries, the United States must anticipate an increasing number of conflicts among countries over competing uses of water. International cooperation and information exchange on water management techniques can directly benefit the United States because there is much to learn from other countries on the management and conservation of water resources.

U.S. stragegy: A major U.S. goal is to heighten aware-

ness of water management issues. This goal in turn requires the development of an adequate data base - now simply unavailable -- and subsequently a coherent strategy on world water needs by region. The U.S. contribution to global water problems should emphasize U.S. strengths in data collection and monitoring, pollution control, environmental assessment of water resource development projects, nonstructural alternatives to such projects, and water conservation.

Recommedations: The United States should:

- Establish an Interagency Committee on Global Water Supply and Management to assess data and monitoring of world water availability and needs, identify potential areas of conflict over water resources, and propose ways for the United States to cooperate with other nations in this area by sharing expertise and knowledge. (p. 121)
- Improve U.S. bilateral technical assistance in water resource management and increase financial support of the FAO for training in water management. (p. 122)
- Increase research efforts to reduce water needs for irrigation. (p. 123)
- Participate actively in international efforts to assure safe drinking water as a major development goal. (p. 124)
- Encourage the creation of conflict resolution arrangements to anticipate and help resolve international disputes over water supply or quality. (pp. 124-125)

8. Global Pollution

Problem: The earth's life support systems are threatened by certain byproducts of economic development and industrial growth. Contamination from hazardous substances and nuclear waste, man-induced climate modification from the buildup of CO_2, damage to the stratospheric ozone layer, and acid precipitation could adversely affect virtually every aspect of the earth's ecosystems and resource base and, ultimately, mankind.

U.S. interests: As one of the world's most industrialized countries, the United States has already felt the effects of contamination from domestic sources of hazardous substances and from acid precipitation. With increasing trade and industrialization in other countries, contamination is increasingly global in nature. The U.S. interest in protecting and maintaining the health of agricultural systems, natural ecosystems, and human populations in our own country and globally dictates increasing cooperation on the international front. In addition, as one of the largest sources of polluting byproducts, the United States has a special obligation to help prevent pollution in other countries. To act responsibly in this manner protects the reputation and foreign policy interests of the United States.

U.S. strategy: The United States has worked actively over the past several years to build an international consensus on the seriousness of certain global pollution problems.

This effort should continue as well as efforts to involve and support international organizations, to work toward bilateral agreements, and to institute domestic controls as appropriate.

Recommendations: The United States should:

- Work toward improving international agreements to control hazardous substances and waste. (pp. 128-129)
- Improve the U.S. system for notifying recipient countries of the export of hazardous substances that are banned for all or most uses in the United States, and, in exceptional cases of extremely hazardous banned substances, provide for control over their export. (p. 130)
- Improve U.S. ability to handle hazardous wastes. (pp. 130-131)
- Develop procedures for regulating the export of hazardous wastes. (p. 132)
- Take national and international measures to reduce amounts of nuclear waste and control their disposal and to protect the global commons from radioactive material. (pp. 135-137)
- Analyze alternative global energy futures with special emphasis on CO_2 buildup and work toward an international consensus on action to reduce CO_2 buildup. (pp. 138-139)
- Support further research on acid precipitation, continue bilateral work with Canada on transboundary air pollution, and intensify legal efforts to control acid deposition. (pp. 141-142)

- o Support more research on ozone depletion, encourage action by international organizations, and move toward more effective action to protect the stratospheric ozone layer. (p. 140)
- o Improve national and international climate programs.(pp.143-144

9. Sustainable Development

Problem: Many of the world's most severe environmental problems are in part a consequence of extreme poverty: deprived people are forced to undermine the productivity of the land on which they live in their necessary quest for food, fuel, and shelter. People who have no other choice for getting their living plant crops on poor, erodible soils, graze their stock on marginal land that turns to desert from overuse, cut trees that are needed to stabilize soils and water supplies, burn dung needed to fertilize and condition agricultural soils.

U.S. interests: The U.S. government has long recognized the importance to U.S. national interests of global economic progress and protection of the global environment. Increasing poverty and misery in large parts of the world add to the potential for political instability, depress trade (one-third of U.S. exports are now bought by developing countries), and increase pressures for mass migration. Moreover, if degradation of the earth's renewable resource base continues, the United States, like the rest of the world, will be faced with

higher prices for food, building materials, and a host of other materials natural systems provide.

U.S. strategy: The United States is committed to measures that will improve prospects for economic growth in developing countries, including an open international trading system, international financial assistance for poorer countries hard hit by oil price rises, and international development assistance. The close relation between sustainable economic growth and protection of the global environment is added reason for a strengthened long-term U.S. commitment. The proposed U.S. strategy is, first, to increase considerably our present level of development assistance, targeting the increase to the key needs of food, energy, and population and health and carefully coordinating the whole program with programs of international organizations and other countries. A second strategic element is to concentrate our technical assistance in areas where we are strongest: scientific and technical know-how, resource management, and institution building. Private sector as well as government talents should be put to better use. Finally, U.S. and international development assistance should be explicitly planned to contribute to long-term sustainable use of the natural resource base of developing nations.

Recommendations: The United States should:

o Make up its overdue obligations to the World Bank and

other development funds and contribute its share to the World Bank's general capital increase. (p. 149)

- o Provide a major expansion in U.S. development assistance targeted to food, energy, population and health and coordinated with programs of other countries and international organizations. (p. 152)
- o Urge the World Bank and other international organizations to integrate resource and environmental considerations more fully into their planning. (p. 151)
- o Increase resource management expertise in AID programs and encourage all U.S. agencies with significant activities abroad to integrate resource and environmental considerations further into their decisionmaking. (p.154-155)
- o Develop ways to use the scientific, technical, resource management, and environmental expertise of U.S. government agencies more effectively, both in AID programs and in other international cooperation programs. (p. 155)

10. Institutional Changes: Improving Our National Capacity To Respond

Problem: The U.S. government currently lacks the capacity adequately to project and evaluate future trends; take global population, resource, and environmental considerations into account in its programs and decisionmaking; and work with other countries to develop transnational solutions to these problems.

U.S. interests: As detailed in previous chapters, global population, resource, and environment problems have the potential for serious adverse impacts on the domestic and international interests of the United States. As a large consumer of world resources and, at the same time, repository of scientific know-how, the United States should act in concert with other countries to resolve future problems. To do so effectively, the U.S. government must have the capacity to project long-term global problems and to act on them.

U.S. strategy: To date, U.S. strategy on long-term global population, resources, and environment problems has been formulated largely on an ad hoc basis. The proposed U.S. strategy is to create a stronger capability in the federal government to: project and analyze global trends, coordinate policymaking on long-term global issues, put into place action-forcing mechanisms such as budget review procedures, encourage involvement of the private sector, and increase public awareness.

Recommendations: The United States should:

- Establish a government center as coordinator to insure adequate data collection and modeling capability as the basis for policy analysis on long-term global population, resource, and environment issues. (pp. 160-161)
- Improve the quality of data collection and modeling for global issues and promote wider access to data and

models. (pp. 162-163)

- Establish a Federal Coordinating Unit, preferably in the Executive Office of the President, to develop federal policy and coordinate ongoing federal programs concerning global population, resource, and environment issues. Activities should include coordinating data and modeling efforts described above; issuing biennial reports; assessing global population, resource, and environment problems; and serving as a focal point for development of policy on long-term global issues. (p. 168)
- Adopt action-forcing devices, such as budget review procedures, a Presidential message, creation of a blue-ribbon commission, establishing an office in each federal agency to deal with long-term global issues, or passage of legislation formalizing a mandate to federal agencies to address long-term global issues and creating a federal coordinating unit and hybrid public-private institute. (p. 173)
- Create the Global Population, Resources, and Environment Analysis Institute, a hybrid public-private institution, to strengthen and supplement federal government efforts on long-term global analyses. (p. 179)
- Improve the budget process to make technical expertise of U.S. agencies more readily available to other countries. (p. 175)

- Assure environmental review of major U.S. government actions significantly affecting natural or ecological resources of global importance; designate tropical forests, croplands, and coastal wetland-estuarine and reef ecosystems as globally important resources. (p.177)
- Continue to raise global population, resource, and environment issues in appropriate international forums; work with and support appropriate international organizations and other countries in formulating solutions. (pp.181,182,185)
- Enlist the business community in formulating responses to long-term global problems. (pp. 187,192)
- Increase public awareness of global population, resource, and environment issues. (pp. 189, 191)

CHAPTER 1

POPULATION

The next several decades are likely to see unprecedented population growth. It took mankind tens of thousands of years to reach the first billion about 1800. A century was needed for the second billion, one-half that for the third billion, less than half that for the fourth. Between now and the year 2000, mankind will add almost 2 billion more people. Three-quarters of the people who have ever lived are alive today. Even allowing for continued moderate slowdown in the rate of growth, from 1.8 percent per year to 1.7 percent, world population is expected to exceed 6 billion by the year 2000 -- an increase in only 2 decades almost equal to the entire world population as recently as 1930.

Although population density varies widely among regions and among countries, 90 percent of this growth will occur in the low income countries. The proportion of industrialized countries' population in the world total will probably decline from 33 percent in 1950 to 20 percent by the year 2000. Moreover, population growth in developing countries is primarily the result of recent declines in infant mortality, resulting in a disproportionate number of children in these populations. Because the childbearing years of these

young people is still ahead, there is a builtin momentum toward population growth.

As is discussed elsewhere in this report, the potential is still great for expanding the ability of the earth to support people, both by making more productive use of the earth's resources and by distributing the benefits of production more equitably. Yet the ability of our planet to support life is not infinite. Eventually the world's population will stabilize -- the question is: Under what conditions of human and social life? At the very least, explosive population growth makes the provision of decent conditions for all people more difficult. In many areas of the world, it is severely hampering development by overwhelming all attempts to educate, house, and employ the population. In addition, attempts by growing numbers of people to wrest a living from the land is undermining the very soil, water, and forest resources on which long-term stability and improvements in the standard of living depend.

Many developing countries, including some of particular importance to U.S. national security, are currently experiencing some combination of rapid population growth, food scarcities, massive rural-urban migration, and high unemployment -- particularly among urban youth. Most poorer countries must expect at least a doubling of their populations within the next two or three decades. This growth is likely to

generate intensifying pressures for migration, which is already beginning to create political problems for receiving countries on all continents.

These factors add up to an increasing potential for social unrest, economic and political instability, and possible international conflicts over control of land and resources. Unless population growth can be brought under control, the world's efforts to solve the broad range of environmental, resource, and economic problems signaled by The Global 2000 Report will be undercut.

The situation is obviously serious, but it is not hopeless. Significant fertility declines have been achieved in many developing nations, including China, Thailand, Indonesia, Colombia, and, most recently, Mexico. There is general consensus among population experts that population growth may be influenced in two ways: by making family planning services available and motivating people to use them and through development, in particular, broader educational and employment opportunities. Development, discussed elsewhere in this report, is critical for many reasons. However, certain aspects of development appear to have an especially close bearing on population growth trends. As the World Bank stated in its 1980 World Development Report:

> Better nutrition and health, by lowering infant mortality [and thus the family's expectations

about survival of children,] are essential ingredients of fertility decline. So is education, especially of women, since it delays marriage, alters attitudes about family size, and makes modern contraception more acceptable.

Education of women is also of value in that it makes women eligible for other forms of employment which can be of greater overall benefit to a family's welfare than having a larger family. The report of the UN World Population Conference, held in 1974, also stressed the importance of education for women.

Actions which the United States and other governments take now could make a significant difference in population trends. For the first time, government requests from developing countries for population assistance substantially exceed contributions from donor countries. Family planning services are currently believed to be available to approximately one-third of all couples in developing nations and used by a quarter. Demographers have concluded that if availability and usage in the developing world could be doubled by the end of the decade, world population in the year 2000 would be one-half a billion lower than The Global 2000 median projection of 6.3 billion. Even more striking, this effort could also mean that global population would eventually stabilize at 8 billion, versus the 12.2 billion that would

result if higher fertility rates continued over a longer period. The difference of 4.2 billion is almost equal to the total current world population.

Controlling population growth is not a problem only of developing countries. Though developed nations have much lower population growth rates, their consumption of the resources per capita is very much higher. Nonetheless, the experience of these nations illustrates the possibilities of slowing or halting population growth. A number of European nations, including East and West Germany, Sweden, and the United Kingdom, are already experiencing zero population growth. The United States, the USSR, Japan, Austria, France, and Italy have natural increase rates of under 1 percent per year and could feasibly approach zero population growth by 1985.

A. Population Assistance

Ironically, although demand for family planning is growing and population stresses on resources become more pronounced, overall support for international population efforts has recently declined in real terms. U.S. assistance in FY 1980, at $185 million, amounted to only about 5 percent of total aid flows and was lower in constant dollars than in FY 1972. Even so, the United States remains by far the world's leader in international population assistance, providing more than one-half of total government aid. The

total amount of aid from all sources is more than matched by the developing countries themselves.

The U.S. bilateral program for population assistance currently accounts for about one-fourth of the population budget of the Agency for International Development (AID) and operates in 22 countries. AID's strengths in population control efforts derive from its use of in-country missions, ability to provide grants as well as loans, and its capacity to draw on American scientific and professional experience. The Peace Corps' widespread network of community health projects could provide the basis for accelerated dissemination of integrated health and family planning activities.

1. An integrated, expanded program

Experts believe if all the resources (in real terms) available to family planning programs were doubled in the next few years, the result would be a major surge in contraceptive use within the following 5 years. To meet this recommendation, AID's budget for population assistance would need to be raised in steady increments to about $500 million, with similar increases from other donors. AID's health programs, which are integrally related to population stabilization efforts, would need to grow to $350 million. In any event, because of the youth of much of the world's population, the number of women of reproductive age will be increasing for many years. Increases in assistance will be required to

reach all these women and to maintain birth rates even at present levels.

Recommendation: During the coming decade, the United States, together with other bilateral and multilateral donors and agencies, should launch a major new international population-health initiative aimed at a major surge of family planning practice by doubling resources available and improving maternal and child health care in the developing countries.

2. Multilateral assistance

Bilateral programs are not always the best vehicle for assisting developing countries. Private and international organizations also have sound programs already operating which can be used more effectively. About one-half of AID's population budget currently goes to the United Nations Fund for Population Activities (UNFPA), the major international population organization, and to private intermediaries, many of which have extensive local level grass roots programs. UNFPA, as the most broadly acceptable organization offering population assistance, is able to work with some countries that would not accept any other donor. It has the additional advantage of attracting a broad range of financial assistance from a great many donors who might not otherwise contribute. In a little over a decade, it has funded almost 3,000 projects in 131 geographic entities. At present, UNFPA is able to meet only two-thirds of the requests it receives for assistance. The U.S. contribution to UNFPA has declined from 21 percent of the total AID population budget in 1977 to 16

percent in 1980. The role of other multilateral institutions should also be strengthened.

Recommendation: UNFPA should continue to receive about the same share of AID's population budget (15 percent) as that budget increases. AID should also take the lead in strengthening the roles of other international institutions, such as the World Bank and the International Planned Parenthood Federation, in extending family planning services.

B. Biomedical Research

The contraception revolution begun two decades ago has slowed greatly, despite the acute need for more convenient, inexpensive, and safe contraceptive methods. Even in 1974, when funding for contraceptive development was at its peak, financial support was believed to be less than one-third of that needed to pursue the existing leads. Today, expenditures are 25 percent below 1974 levels. The government currently provides more than one-half the research dollars spent in this field in the United States. In general, private pharmaceutical companies are tending to invest in low risk advances that may improve, but are unlikely to revolutionize, contraceptive use. Long-term contraceptives are often inherently less profitable products to market; moreover, the risks of side effects or physiological changes they entail mean that lengthy and costly periods of testing are required. The fact that research funding is insufficient and insecure has aggravated the situation. As a result, longer-term contraceptives are

not being studied sufficiently, and industry has not played its hoped for role in developing new methods.

Research is needed for products that will be used globally, not only, as at present, for those perceived as meeting U.S. domestic needs. The United States should consult with other donor countries and particularly with developing countries on health concerns and contraceptive needs.

In addition, present U.S. government support for reproductive research is weighted toward basic research. More emphasis is needed on turning research findings into new contraceptive products and developing ways to encourage greater use of the products.

Several measures could help to regain the lost momentum in biomedical research. Of primary importance is increased funding for development of contraceptives and research on their safety. The most effective way to manage this increased funding for research and development may be to create a new coordinating institution -- possibly a new government or quasi-government organization. One possibility is a National Population Institute within the National Institutes of Health (NIH). In addition to direct government funding of research, methods to increase incentives for research by the pharmaceutical industry and subsidies for the large-scale clinical testing phase of safety evaluation

should be considered.

Recommendations:

- Government assistance for research directed at development and use of new contraceptive methods, now funded at $20.4 million annually, should be doubled and thereafter increased by at least 10 percent annually for the next decade.

- The United States should formally consult, at both the policy and technical levels, with other donor countries on contraceptive research needs and with recipient countries on their health and contraceptive needs.

- A study undertaken by NIH, other appropriate government agencies, private foundations, and industry should determine the feasibility and need for a new government or quasi-government organization that could coordinate and fund research necessary for development of new contraceptives.

- An additional study should be undertaken by NIH in cooperation with The food and drug Administration (FDA), the Patent Office, the Department of Justice, and industry to propose steps which might be taken to increase incentives for the pharmaceutical industry to develop new contraceptive methods.

C. Policy Development

In 1975, President Ford assigned to a National Security Council (NSC) interagency group, under the chairmanship of the Department of State, responsibility to develop international population policies. The NSC Ad Hoc Group on Population Policy, consisting of 19 U.S. government agencies and departments, has functioned effectively and should continue, as presently constituted, to address matters of international population policy.

Over a decade ago, President Nixon and the Congress

established the bipartisan Commission on Population Growth and the American Future. After 2 years of effort, public hearings, and research, the Commission issued a broad range of recommendations -- many of which are still valid. Nevertheless, despite the involvement of individual government agencies in population and family planning, the United States still lacks an explicit domestic population policy.

Recommendation: The United States should develop a national population policy which addresses the issues of:

- Population stabilization
- Availability of family planning programs
- Rural and urban migration issues
- Public education on population concerns
- Just, consistent, and workable immigration laws
- The role of private sector -- nonprofit, academic, and business
- Improved information needs and capacity to analyze impacts of population growth within the United States
- Institutional arrangements to ensure continued federal attention to domestic population issues.

D. Public Awareness

There is a great need throughout the world for more people to be aware of the nature of current population trends and their economic, political, environment, and resource implications. In order to create a strong and sustained international consensus which can support and

influence national leaders in their approach to population issues, the United States should take action to insure that population issues are at the forefront of the world's agenda.

Recommendation: The President should prepare a special message on the subject similar to that of President Nixon in 1969. Senior American officials should make every attempt to discuss the issue in their public statements and place population on the agendas for meetings with heads of government and other foreign officials. The United States should promote meaningful resolutions on population in the UN and other international fora.

CHAPTER 2

FOOD AND AGRICULTURE

Global 2000 projects a difficult future for the large portion of the human race that is underfed today. Worldwide, a per capita increase in food output of less than 15 percent between 1970 and 2000 is projected, even under the study's optimistic assumptions regarding future technological advances. The study also foresees:

- Very slight improvement in the food consumption per capita in developing countries of the Middle East and South Asia and a decline in Africa
- An approximate doubling of real prices for food
- Increased annual variability in food production.

In addition to their grim implications for the world's poor, these projections imply sharply rising food costs for U.S. citizens and environmental stress in the United States and other developed countries caused by the need to raise production substantially for export.

Yet there is nothing immutable about this future. The Heritage Foundation's Report on Agriculture to President-Elect Reagan put the matter this way:

> Hunger is man's oldest enemy. There is now the scientific knowledge and institutional arrangement which makes it possible to overcome hunger, not only within the United States but throughout the world. This can be done within the lifetime of many people

now living, if there is the political will to do so.

The World Bank has recently projected that India, once viewed as a substantial contributor to the worldwide foodgrain deficit, should be able to meet its domestic food demands for the foreseeable future and perhaps to export grain in some years. This is not to say that hunger has been vanquished in India. Far from it; there is still much to be done in making adequate food available to the poor. Yet India's accomplishment in raising food production significantly in the last decade is very real; the trend in cereal grain production has been strongly upward, with output 35 percent higher in 1979 than in 1970. Some of the factors involved were adoption of effective agricultural policies by the Indian government, availability of much improved technology, creation of a strong framework of institutional support (in part with U.S. technical assistance extending over two decades), and slower-than-expected growth in Indian population. What India has accomplished with help from international donors suggests that it is possible to improve the future food situation worldwide by increased production in developing countries. Equally important is to raise the incomes of the poor and malnourished so that they can benefit from greater food availability.

There are still innumerable obstacles to overcome. Feeding the world's population demands a coordinated approach

to a web of complex interrelated problems: the world's rapidly growing population; watershed disruption and loss of good soils caused by deforestation; soil erosion and degradation from many causes, including desertification; increasing costs of energy-intensive inputs such as fertilizers and pesticides; worsening regional shortages of water; extinction of locally grown strains of food crops and their wild relatives needed for breeding desirable qualities in plants -- all are part of the food problem.

These resource and technical problems are by no means all. Social and economic factors are equally important to food production. Many analyses -- most recently that of the World Bank in its World Development Report 1980 -- have particularly emphasized the importance of land tenure to food production. Experience in many countries supports the commonsense judgment that people will generally work harder and coax more growth from a plot of ground in which they have a personal stake than they will on land where they are replaceable hired workers or insecure tenants. Other factors, including agricultural pricing policy and availability of technical assistance and credit to small farmers, are also critical to food production.

In addition, solving the "food" problem and solving the "hunger" problem are not the same. Hunger is widespread today because of severe economic inequality, which leaves the poorest quarter of mankind unable to purchase an adequate

diet. The March 1980 report of the President's Commission on World Hunger provided an excellent statement of the social, economic, and political roots of the hunger problem and a wide array of recommendations for overcoming them.

In this report, we have not tried to duplicate a full array of recommendations on national and international policies needed to eradicate hunger from the planet. Rather, we have focused on issues of special relevance to the production and resource findings of Global 2000, albeit with a sensitivity to the critical social and economic aspects that underlie the hunger problem. The following sections provide recommendations on increased assistance to accelerate food production and incomes among the world's poor, the enhancement of global food security, sustaining crop and range land, and technological measures to increase food output over the long term. Throughout, it must be kept in mind that agricultural development and technological change cannot be isolated from the broader socioeconomic concerns analyzed in the Hunger Commission report. Indeed, if technological change is pursued in isolation from a more general program of social and economic reform, the plight of those on the bottom can actually be worsened.

A. Assistance and Cooperation for Agricultural Progress

1. Expanded agricultural aid program

An urgent task facing the community of nations is to help

the poorest countries build a sustainable foundation of food production and raise incomes sufficiently for people to buy the food. Best estimates are that the low income developing countries need at least $5-$10 billion per year in new capital investments in agriculture. The Brandt Commission, assuming that the poor countries concerned would meet one-half half the capital costs and 80 percent of the recurrent costs of an adequate agricultural program, called for additional foreign aid on the order of $5.4 billion per year (in 1980 dollars).

It is in the interest of the United States to contribute to such an international program. Obviously, oil exporting countries with large cash surpluses as well as other traditional donors must do their fair share. It will also take a greatly expanded U.S. assistance program in agriculture to meet our appropriate share and reestablish U.S. leadership in responding to the critical problems of hunger and rural poverty. U.S. willingness to do more would in turn be a significant stimulus to other donors to do likewise.

AID is currently spending at the rate of $635 million per year for its assistance programs in agriculture, rural development, and nutrition, with a projected rise to $1.4 billion by mid-decade. These funds not only are used to meet capital costs but also cover some of the recurrent costs of development -- training, technical assistance, staff support, and the like.

There are opportunities for effective use of an increase in food and agricultural assistance on the order of 30-50 percent over planned expenditures for the next few years. This increased expenditure by the United States would be expected to generate three times as much additional investment by other donors, private enterprises, and the developing countries themselves. With the expected snowball effect, the additional investment would help 25-30 million more people each year to attain adequate diets. At this rate of increase, almost one-half the people in the Third World who would otherwise be undernourished would have adequate diets by the year 2000.

An expanded food and agriculture program should include a special emphasis on small farm development and on off-farm employment and, as appropriate, assistance for agrarian reform, food security, research and training, development of infrastructure and transport, extension, credit, marketing, and other areas. Peace Corps activities in small farm extension, alternative energy technologies, and integrated rural development would contribute to the U.S. strategy. The soundness of host country agricultural policies would be taken into account in the allocation of aid funds. In future programs, special attention should also be given to the problems of energy use and efficiency on farms in developing countries.

Recommendation: The United States should undertake a signifi-

cant expansion in U.S. bilateral assistance to the food sector in low income countries.

2. Institution building

During the 1960s and early 1970s, a substantial amount of U.S. foreign assistance was devoted to building developing country institutions in agricultural policy, education, extension, and research. The Department of Agriculture (USDA) and U.S. universities played major roles in these efforts in collaboration with AID. Without doubt, these institution-building activities made a major contribution to the agricultural development of many countries.

In recent years, the emphasis on and funding for our bilateral training and institution building has declined. Despite the successes achieved by the earlier projects, there are still not enough well-trained professionals in the agricultural and rural development institutions of developing countries. This manpower shortage severely impedes agricultural progress. Moreover, training and institution building are still needed in many middle income developing countries where AID no longer operates.

A renewed U.S. effort to support the strengthening of agricultural institutions in developing countries should include participation by U.S. universities and the business community as well as AID and USDA. Options for a U.S. contribution must be developed and analyzed within a broad frame-

work, international as well as national. They should be coordinated with efforts of the Consultative Group on International Agricultural Research (CGIAR), a major international network of agricultural research and training centers of other international institutions and of other countries. In early 1980, CGIAR established a new International Service for National Agricultural Research (ISNAR), which seeks to improve institutional capacity in developing countries and link national agricultural training and research programs with the work of the international centers.

Recommendation: In cooperation with international institutions and the U.S. private sector, AID and USDA should seek ways to support and improve institutional capability in agricultural management in developing countries.

B. Sustaining Croplands and Rangelands

Of the world's land area (outside Antarctica), only about 11 percent offers no serious limitation to agriculture. The land not readily arable suffers from drought, mineral stress (nutritional deficiences or toxicities), lack of fertility, stones or gullies, shallow depth, excess water, susceptibility to erosion, or permafrost.

Although there are still large uncultivated areas in the world (such as the vast savannahs of Brazil), much of this land is far from people and infrastructures, and its suitability for sustained use as crop- or rangeland is still undetermined. The poor but populous countries of Bangladesh,

India, and Egypt have little if any room to expand. Taking into consideration the capital investments and technology required to open new lands and the location of the lands, the Global 2000 projections indicated a net increase in arable lands of no more than 4 percent between the 1971-75 period and 2000. Globally, arable lands per person were projected to decline from four-tenths of a hectare (about one acre) to one-quarter of a hectare by the end of the century. Even where new lands are available for cultivation, an effective agricultural system also requires experienced farmers and infrastructure as well as machinery, water, and capital.

The prospects for feeding the growing world population thus depend less on the opening of some new breadbasket than on improving yields and, to an increasing extent, on sustaining the crop- and rangeland that is already in use. This section focuses on the last issue. Saving good agricultural lands for agriculture and stopping further deterioration of the soil base are both critical.

Conversion of agricultural lands. Although erosion, salinization, or other results of agricultural mismanagement may be reversed and the productivity of the soil restored -- albeit at a definite cost and over time -- conversion of farmland to other uses usually means a permanent loss of agricultural resources. Land converted to urban or industrial use accounts for a growing amount of some of the earth's best

soils. In Egypt, for example, addition of newly irrigated lands has barely kept pace with losses of agricultural lands to development. The present rate of conversion of agricultural lands in the United States is not particularly high for a developed country -- it is currently 2.92 million acres per year from a base of 1.4 billion acres. But about 1 million of these lost acres are croplands of considerable potential. In fact, this much land would be capable of producing most of the food aid needs for drought-stricken countries of Sub-Saharan Africa.

The World Conservation Strategy concluded: "In view of the scarcity of high quality arable land and the rising demand for food and other agricultural products, land that is most suitable for crops should be reserved for agriculture." The location of housing, roads, airports, and factories is flexible; the location of high quality agricultural land is fixed. Besides preserving an irreplaceable resource, a policy of giving precedence to agriculture on good farmland reduces pressure on marginal lands which may degrade rapidly under intensive agricultural use.

Degradation of soil. Soil is a crucial life-support system. Although quantitative worldwide data are not available, there are many examples of soil deterioration around the world: loss of topsoil through water and wind erosion, loss of organic matter and porous soil structure, buildup of toxic

salts and chemicals.

For example, a recent General Accounting Office study of prime farmland in Iowa and Illinois revealed losses of 10-20 tons per acre per year on one-half the farms surveyed. The U.S. Soil Conservation Service considers soil losses of 5 tons per acre even on deep soil to be the maximum possible without loss of productivity. The limit on poorer soils may be as low as 2 tons per acre annually.

In the tropics, soil erosion is often much worse than on temperate farmlands because of the kind of soils and the nature of rainfall, which is often torrential. On irrigated soils, degradation by salinization and alkalinization is widespread; one-half the world's irrigated lands are damaged to some degree.

Desertification, primarily from overgrazing, is accelerating in many parts of the world. Grazing lands are the most extensive land use type in the world -- occupying 23 percent of the earth's land surface. They are generally in areas of low and irregular rainfall and are usually unsuitable for crops. Nonetheless, grazing lands and forage support most of the world's production of meat and milk.

Technology and management techniques are available that can halt or reduce soil deterioration both on croplands and grazing lands. Putting the techniques to use, however, is not easy. Even farmers in rich countries may consider them too

costly. In poor countries, the economic and political difficulties are many times greater. As The Global 2000 Report observes:

> [T]he fate of soil systems depends on societies' willingness to pay the short-run resource and economic costs to preserve soils for long-run benefits. . . . The political difficulties cannot be overemphasized. Often solutions to soil problems will require resettlement, reduction of herd sizes, restrictions on plantings, reforms in land tenure, and public works projects that will fail without widespread cooperation from the argarian population. The costs will be immediately apparent; the benefits will seldom be seen in less than half a decade . . . .

1. A comprehensive U.S. Strategy

The United States needs to take a thorough, comprehensive, coordinated look at the interrelated problems of national and global losses of agricultural lands and soils and to develop a strategy to address the problem. A process modeled on that of the Interagency Task Force on Tropical Forests (described in a later chapter) is called for. As is the case with Tropical forests, a U.S. strategy must be meshed with those of other countries and international organizations. A U.S. study could provide the foundation for proposals for an international plan of action.

Domestically, the U.S. has taken the first necessary steps. The Council on Environmental Quality (CEQ) and USDA established the National Agricultural Lands Study (NALS) to evaluate the economic, environmental, and societal effects of

conversion or retention of agricultural lands. Concurrently, the trends affecting the nation's soil and water resources are being appraised under the Resources Conservation Act (RCA). In addition, CEQ and USDA are studying ways to make U.S. farm assistance programs more consistent with conservation goals and are exploring possible incentives for conservation.

The proposed Task Force should broaden the inquiry, using the professional and technical capabilities of relevant agencies, to include the global agricultural lands and soils problem: assessing the seriousness of the problem, so far as data now available will allow; evaluating the many national and international programs now underway to deal with the problem; and recommending improvement in both the assessment of the problems and the response.

While the Task Force does its work, new actions in this area will of course be undertaken. For example, many recommendations of NALS, now concluding, may be promptly adopted; other issues will also be addressed and resolved during the course of the Task Force review.

Recommendations:

- An Interagency Task Force on World Agricultural Lands and Soils, including the Departments of State and Agriculture, The International Development Cooperation Agency (IDCA), AID, the Peace Corps, CEQ, the National Science Foundation, the Smithsonian Institution, other federal agencies, and interested public and private groups, should be established. The Task Force would assess the problems, review current national and international responses, and recommend a coordinated U.S.

strategy to address the problem. The Task Force would identify priority activities for U.S. and multilateral support; outline fields in which the United States has special competence; define research, development, demonemonstration, and training needs; address the responsibilities of U.S. firms and institutions operating abroad; propose more permanent institutional arrangements to address these issues on an ongoing basis. While developing a coordinated U.S. strategy, the Task Force should consult with other nations and encourage the United Nations Food and Agricultural Organization and Environment Programme to consider the development of an international plan of action.

2. Domestic actions

More than in any of the other global problems that this report considers, the United States has the opportunity to lead by example on conserving soils and agricultural lands. Despite a long history of conservation and unparalleled achievements in agricultural technology, our own land base continues to deteriorate at a rate which threatens long-term productivity. In the words of W.E. Larson, the current President of the Soil Science Society of America:

> [A]s the year 2000 approaches, mounting evidence suggests that our cropland resource base may be unable to satisfy projected domestic and foreign demands for food and fiber without sufficient increases in the real price of food. Our physical capacity to produce food at a reasonable cost may even become questionable if erosion and farmland conversion trends continue unabated through the remainder of this century.

Agricultural lands. The CEQ-USDA National Agricultural Lands Study is focusing on the conversion of agricultural land to nonfarm uses; the social, economic, and environmental consequences; and possible ways to reduce the rate of conver-

sion. Several actions are recommended on the basis of the NALS findings.

Recommendations:

- o The federal government should assist state and local governments to develop effective programs to reduce the conversion of agricultural land to nonfarm uses. This program of assistance should include:
  - Provision of technical, financial, and educational assistance to approved programs of state and local government wishing to develop agricultural land preservation policies
  - Provision of information and assistance to state and local governments to rank local agricultural land according to agricultural productivity, probable development pressures, and other factors to determine which land is most in need of protection in an agricultural land retention program.
- o The federal government should establish an Agricultural Land Conservation Fund to help finance state and local conservation programs, including programs for erosion control and agricultural land retention. Financing of the Fund could be tied to major sources of demand on agricultural resources while still maintaining the competitiveness of U.S. products.
- o The federal government should establish a program of financial incentives to help preserve farming on land best suited to agriculture and to channel other uses onto land less suited to agriculture. Options to be considered include modification of the capital gains tax, offering investment tax credits for spending needed for sustained agricultural production and conservation practices, coordinating agricultural land preservation efforts with soil conservation programs, and establishing special agricultural development districts which include agricultural land retention provisions.
- o The federal government should establish and articulate a national policy for protecting and conserving the nation's agricultural land base. In addition, federal agencies should thoroughly examine their programs affecting agricultural land to insure that federal action does not unnecessarily encourage conversion; agencies should

also take action to mitigate the negative impacts of federal activities on prime agricultural land. In appraising the results of their actions, agencies should consider how prime agricultural lands are affected by federal loan and loan guarantee programs; home mortgage assistance; capital improvement loans; sewer, water, and highway programs; funds for development proposals; and other direct or indirect subsidies for scattered development.

- State and local governments should examine, adopt, and better utilize available growth management tools, such as zoning, minimum lot size, and sewer regulations, to discourage conversion.

Deterioration of soils. The United States has spent substantial sums of money over the past four decades to combat soil deterioration, particularly soil erosion. Yet fertile topsoil continues to wash and blow away at distressing rates. A good start has been made under the RCA to evaluate the dimensions of the soil erosion problem. While much has been learned about erosion, additional efforts are needed. Conservation program tools, education, and technical assistance should be offered to farmers in order to curb the loss of topsoil from soils where poor management practice has led to declining crop yields and rising production costs.

Recommendation: The federal government should assure that findings and recommendations of the RCA study are implemented. USDA, in consultation with other interested agencies, should expeditiously consider a full range of alternative soil and water conservation programs, drawing on an objective appraisal of the effectiveness of existing programs. Three novel policy initiatives should be studied in the context of pressing new agricultural resource conservation needs in the 1980s:

- Binding multiyear contracts between farmers and the federal government stipulating effective, conserving practices to be used in order to receive farm program

benefits

- o A conservation incentive program integrating commodity support programs with efforts to encourage soil conservation

- o Use of the Agricultural Land Conservation Fund recommended above to support ongoing and proven state and local conservation programs.

3. International actions

Several international activities related to agricultural lands and soils should be undertaken promptly while the Task Force is developing a comprehensive strategy. For example, the United States should seek opportunities to exchange expertise with other countries for conversion of agricultural lands. AID should continue and expand emphasis on soil conservation in its development assistance projects for agriculture.

Recommendations:

- o The United States should seek an appropriate forum, for example through the Organization for Economic Cooperation and Development (OECD), FAO, or UNEP, for a technical conference on possible incentives, land use controls, and other methods to minimize conversion of agricultural land. Conversion problems in developing countries should be specifically addressed in the conference. The results of the National Agricultural Lands Study and the recent OECD Interfutures study could provide basic information and a starting point for the conference.

- o The programs of AID and the Peace Corps should give more emphasis to preventing soil deterioration and sustaining long-term productivity. Food and agricultural programs especially should include consideration of watershed impacts as well as on-farm productivity.

4. Assessing and monitoring the condition of world agricultural lands

Improved capacity to inventory, assess, analyze and monitor the extent, current use and productive potential of global land resources is essential. Data on losses of agricultural land and soil degradation are needed both to provide country-by-country information on food production potentials and to increase awareness of the lands and soils problem.

Special attention should be paid to identification and measurement of desertification. An inventory of the arid and semi-arid lands of the world describing present conditions of the resources and changes would help to guide prevention and control actions. Special attention should also be given to identification of prime farmland.

FAO is the most appropriate organization to monitor changes in global agricultural lands and soils. FAO is the action agency for the UN on matters related to food, agriculture, and rural development and commands strong support from its 120 members. FAO's recently created Soils and Water Division needs more backing and financial support in order to take effective action.

Recommendations:

- The U.S. Interagency Task Force on World Agricultural Lands and Soils should develop a recommendation for a global program, centered in FAO, to assess world agricultural lands and trends affecting their productivity. The recommendations should include the level and timing of a U.S. special voluntary contribution to FAO for the program; efforts to involve other countries; plans to fit into the programs of federal agencies, including USDA's Comprehensive Resource Inventory and Evaluation

System, which has begun collection of soils and other resource data on an international basis; and possible funding of and contributions by U.S. universities, as part of the program.

- o AID should include analysis of trends in long-term land availability and soil quality in its country profiles. AID's country profiles are discussed elsewhere in this report, especially in Chapter 9, Sustainable Development.

C. Technical Measures To Increase Food Output

In 1977, the National Academy of Sciences published a comprehensive evaluation of research and development capabilities to address the problem of world hunger. In this section, we do not duplicate the findings of that report, World Food and Nutrition Study: The Potential Contributions of Research. Instead, we have focused on a few technical measures related to basic agricultural resource issues.

1. Preservation of germ plasm for agriculture

The global loss of crop, tree, and animal genetic resources imperils future progress in food production. The Global 2000 Report has drawn attention to the potential loss of hundreds of thousands of plant and animal species. This report discusses the general subject in Chapter 5, Biological Diversity. Here the general issue is related to the specifics of agricultural development.

Agricultural genetic losses involve mainly the extinction of subspecies and varieties of cereal grains, useful trees, and livestock. Four-fifths of the world's food supplies are derived from less than two dozen plant and animal species.

Wild and local domestic strains are needed for breeding resistance to pests and pathogens into the high-yielding varieties now widely used. Local domesticated varieties of cereals and other food crops, often uniquely suited to local conditions, are being lost as higher-yielding and/or marketed seed varieties displace them. The increasing practice of monoculture of a few strains, which makes crops more vulnerable to disease epidemics and plagues of pests, is occurring at the same time that the genetic resources to resist such disasters are being lost. The current level of activity and financial support for genetic preservation and utilization in the United States and worldwide is inadequate. Once lost, natural genetic diversity can never be retrieved.

Genetic engineering is hailed by many as a potential tool for the development of new genetic diversity and as a replacement for proven plant-breeding methodologies. It is clear that genetic engineering can make substantial and unique contributions to crop improvement in the future, and research in this new area should be encouraged and supported. At the same time, greatly expanded plant breeding research is needed to develop superior varieties in order to meet the challenge of providing an adequate supply of food and fiber in the future.

Domestic germ plasm program. USDA is the lead organization in the National Plant Germplasm System (NPGS), a coor-

dinating network of scientists from the private, state, and federal sectors of the agricultural research community promoting the rescue, maintenance, and use of a wider base of genetic diversity among our crops.

Recommendation: The U.S. government should take steps to strengthen the National Plant Germplasm System, including an acceleration in the crop germ plasm collection program and enhancement of U.S. abilities to cooperate in international programs.

International germ plasm program. The International Board for Plant Genetic Resources (IBPGR), with headquarters in Rome, is funded under the auspices of the Consultative Group on International Agricultural Research. The IBPGR was established in 1974 in response to global concern about the loss of crop germplasm, and is promoting a variety of regional seed-collection, storage, and documentation efforts. The United States has pledged $750,000 to the IBPGR for 1980, about a quarter of its total budget. FAO has programs for the protection of tree and livestock germ plasm, and the United States participates in a number of scientific and technological agreements for the exchange of germ plasm -- the most recent is with China involving soybeans. Despite these international programs, some observers feel that current global efforts are inadequate.

Recommendation: The USDA should lead an interagency evaluation of the effectiveness of the International Board for Plant Genetic Resources and of FAO germplasm programs, and be prepared to promote increased donor funding as necessary to

accelerate global germ plasm protection efforts.

International agreement. One way to raise the visibility of and support for cooperative international germ plasm protection would be the development of a multinational agreement on the subject. A formal intergovernmental agreement would promote the establishment of appropriate regional collection and storage efforts, and of on-site living preserves. It could facilitate international research and information exchange. It could put the full weight of governments behind the needed programs.

Recommendation: The State Department should lead an interagency effort to explore the desirability and feasibility of an international agreement on the preservation of agricultural genetic resources.

2. Techniques for sustainable agriculture

Over the past several decades, chemical fertilizers, pesticides, and herbicides have played an important role in raising agricultural yields worldwide, and especially in developed countries. The Global 2000 projections assume that global use of agricultural chemicals will accelerate. However, continued rapid increases in their use may not be feasible. The manufacture of nitrogen fertilizers, and to a lesser degree pesticides, is based on fossil fuels and will be subjected to steeply rising costs. In addition, many of these chemicals produce a wide range of serious environmental consequences, some of which adversely affect agricultural

production. Alternatives that can contribute to raising agricultural yields on a long-term sustainable basis are available and should be encouraged. Among them are integrated pest management (IPM) and soil enrichment techniques. There are many promising areas for research and demonstration, for example, the potential for underutilized native species. Finally, national and international support for on site research to develop sustainable, stable methods of farming are highly desirable.

Integrated pest management. Pesticides can provide many benefits to agricultural production; however, despite a rapid rise in pesticide use, global food losses to pests remain enormous. At the same time, increased pest resistance to available chemicals often undercuts the effectiveness and boosts the cost of pesticide applications, and pesticides cause a multitude of serious environmental and health problems both in countries with developed agricultural systems and those seeking to increase yields substantially.

Meeting the demands of a rapidly increasing world population for food, fuel, and fiber crops will require a more sophisticated approach to pest control, involving the integrated use of multiple tactics, particularly since extensive reliance on chemical pesticides has created pest resistance and secondary pest damage problems. Integrated Pest Management offers the most efficient methods of maintaining pest

populations at tolerable levels, resulting in both a productive agricultural economy and a reduction in health and environmental hazards associated with extensive reliance on chemical pesticides.

Integrated pest management has become widely accepted in the United States. Since 1972, federal agencies have been modifying their pest management research, control, education, and assistance programs to adopt IPM strategies. The Interagency IPM Coordination Committee reported to the President on June 30, 1980, that significant progress was being made and included several recommendations to enhance the implementation of IPM further.

Recommendation: The recommendations of the June 30, 1980, Report to the President on IPM should be implemented by all relevant federal agencies. These agencies should also develop and implement 5-year research, extension, and education programs in IPM.

The United States also has strong interests in the accelerated use of IPM worldwide. In recent years, AID has begun to devote attention to pest management, as have multilateral agencies such as the FAO. Bilateral scientific and technological agreements provide an additional vehicle for exchange of information on IPM. However, extreme misuse of pesticides in developing countries remains prevalent. To be effective, consideration of an IPM alternative should occur early in the process of project design. In AID programs, attention to IPM can be strengthened by using IPM specialists

regionally as is being done in Central America.

The United States was asked by the NATO Committee on Current Challenges of Modern Society to organize a multicountry research project on Integrated Pest Management. This project will involve not only NATO countries but also Australia, China, Hungary, Israel, Japan, New Zealand, Poland, Spain, Switzerland, and Yugoslavia. NATO may also invite Brazil, Egypt, Sudan, India, and Pakistan to participate.

Recommendation: State, USDA, IDCA, AID, the Environmental Protection Agency, and CEQ should develop a coordinated international effort, including field capability, to promote IPM. Enhanced bilateral technical assistance involving EPA as well as AID, expanded attention to IPM by multilateral aid organizations, and actions by other international institutions should be stressed. The feasibility of establishing an international IPM Information System should be studied.

Efficiency of fertilizer use. One promising area for research and farmer education involves development of farm techniques to increase the efficiency with which fertilizer is used. The efficiency of nitrogen recovery by crops averages about 50 percent with current U.S. cultural practices, but a recent review of this subject indicates that substantial increases in efficiency are achievable. Current USDA research programs on all aspects of nitrogen fertilizer, including pollution and basic research, total about $3.3 million, and all the states have modest programs.

A new federal-state research program with funding of $3.8 million per year for 10 years should be able to develop

techniques and systems that, if widely adopted, could increase average nitrogen fertilizer recovery on U.S. farms from its current 50 percent to 75 percent. Emphasis would be placed on improved soil testing, more timely applications of fertilizer, and new techniques for application to soils. Fertilizer needs for conservation tillage systems would also be stressed. This research program would have to be followed up with extension and other dissemination activities. Assuming the results were widely adopted, the eventual payoff from this research could run over $500 million per year in saved fertilizer costs alone. This research would also reduce water pollution by fertilizers. The program should develop extensive links with international agricultural research centers and national research institutions abroad.

Recommendation: A new federal-state research program to increase the efficiency of fertilizer use should be initiated. Techniques of special interest in developing countries and the tropics should be included in the research program, and links with international research programs should be stressed.

Biological fixation of nitrogen. Biological fixation of atmospheric nitrogen by both associative and symbiotic mechanisms shows great promise for lessening reliance on commercial nitrogen fertilizer. This area of research refers to furthering the ability of some plants to take nitrogen from the air and transform it into the amino acid needed for growth. Research underway suggests that significant improvement in the ability of legumes to fix nitrogen symbiotically

can be developed. The potential international impact of this research is substantial.

Associative nitrogen fixation by grasses also holds important potential for range and grassland applications. The current limited research indicates some progress in developing associative systems, particularly with wetland grasses. This research should be expanded and intensified to include a wide array of species adaptable to different ecological situations. It is proposed to expand the research on both symbiotic and associative fixation mechanisms by developing a joint federal-state program with additional funding of $3.0 million per year for at least 10 years, aimed at reducing U.S. reliance on commercial nitrogen by at least 15 percent.

Recommendation: An expanded federal-state research program on biological nitrogen fixation should be initiated, with research needs of relevance to the tropics included and mechanisms developed to enhance international cooperation in this area of research.

Onsite research. Many of the techniques for sustainable agricultural management have been tested under a variety of conditions. Others, however, are at an earlier stage. Field demonstrations are an essential part of developing these techniques for use all over in the world, in many kinds of climate and terrain, in rich countries and poor.

Recommendation: The Department of Agriculture in cooperation with such international institutions as CGIAR and FAO, AID, and other interested U.S. agencies, should help develop an international program of on site research into farming techniques that are ecologically and economically sound. The

program should include projects in the humid and semi-arid tropics, tropical mountain areas, and the savannahs. Cooperation of the U.S. private sector in developing such a program should be encouraged.

D. Food Security

Since the crop failures, the severe regional food shortages, and the drawdown of the world's grain reserves of the early 1970s, much international attention has been given to the need for more effective management of grain reserves to provide security against fluctuations in food supply. The crop failures and grain shortages of 1980 lend new urgency to this subject. The findings of Global 2000 add further emphasis. With a rapidly growing world population, agriculture in many regions will spread into more and more marginal lands, where fluctuations in production are most likely and severe. In this situation, the effects of a year or two of bad weather can be critical. The recently passed Food Security Act is a step in the right direction, but more is needed.

1. International reserves

The 1974 World Food Conference called for the establishment of an internationally coordinated system of nationally held grain reserves, a goal to which the United States and other nations agree in principle. However, this principle has not yet been embodied in an effective agreement.

Attempts to negotiate a buffer stock agreement failed in February 1979 over the issues of stock obligations, price

bands and special provisions for developing countries. The participants in those negotiations then requested the International Wheat Council to develop a new approach. What has emerged is an approach that maintains the concept of nationally held reserves but bases international coordination on consultations in times of market stress. Members of the Wheat Council will decide in 1981 whether to begin the process of negotiations on the new approach.

Recommendation: The United States should actively work toward assured storage of basic food to allow for an effective and timely response when world weather or other events bring about the next major shortfall in food supplies. The United States should participate in the International Wheat Council's deliberations on an international reserve system in order to complete an effective and equitable agreement in 1981 if possible.

2. National and regional reserves in developing countries

An additional outcome of the 1974 World Food Conference was an increase of assistance to developing countries in food storage and reserve management. FAO and other agencies have initiated new activities to these ends. A few developing countries, especially India, have developed effective reserve policies on their own initiative.

Recommendation: In collaboration with FAO and the World Bank, the United States should give increased assistance to the development of food storage in developing countries and to reserve programs at both the national and regional levels. The United States should, where appropriate, earmark a portion of future P.L. 480 food assistance for developing country grain reserves.

CHAPTER 3

RENEWABLE ENERGY RESOURCES AND CONSERVATION

The world's energy future cannot be an extrapolation of the past. The finite nature of the resource, combined with political and economic factors, means that world oil consumption will not continue its steep climb of recent decades. Nor can the inefficient energy-use patterns that cheap, plentiful oil made possible continue for long.

At the same time that the world's "modern sector" confronts problems of oil price and supply, the world's poorest half, most of whom rely mainly on traditional fuels such as firewood and agricultural waste, face another energy crisis: a dwindling supply of firewood, leading to severe economic and ecological problems.

Hence rich and poor alike face the necessity of a rapid transition to a more sustainable pattern of energy supply and use. Among the energy alternatives that can help people throughout the world achieve decent, comfortable, productive lives, two -- renewable energy sources and energy conservation -- were chosen for particular attention in this report. Other energy sources and strategies must also be included in the mix; however, this report focuses on the still relatively neglected potential of renewable energy and conservation. These alternatives are widely available. Carefully selected

and managed, they can be environmentally benign and sustainable over the long-term future. Their potential has hardly yet been tapped.

The strong U.S. commitment to developing renewable energy sources and conserving energy through more efficient, productive use is highly significant to the world at large. The commitment, of the United States and success in carrying it out can demonstrate to other countries the worth and practicality of renewable sources and conservation in the mix of alternatives to meet human energy needs. The United States is building the hardware and know-how which other countries will afterwards be able to use. The United States, in turn, has much to learn from others. Most important, every barrel of oil conserved, or replaced with diverse renewable sources, gives the whole world a little longer to make the transition away from an overdependence on oil, and eases current pressures on the world oil market.

Indeed, the links between U.S. national interests and those of other countries -- especially the developing countries -- are nowhere more obvious than in energy. Just as use of renewable energy source and success in more efficient use of fossil fuels by the United States are important to the Third World nations, so are theirs to us. The United States has broad foreign policy and national security interests in the Third World's economic progress; high energy prices and

threatened scarcities are jeopardizing that progress. The United States and other affluent nations are not only generally interested in reducing the worldwide demand for oil, but are also interested in reducing demands for financial aid due to high oil prices. An accelerated transition to use of renewable sources in developing countries can in some cases relieve the pressure to adopt high technology energy alternatives such as nuclear energy. International cooperation in the development, demonstration, and acceptance of new energy and conservation technologies can directly benefit domestic RD&D efforts. Finally, foreign adoption of new technologies can in some cases contribute to their commercialization in the United States, as global demands for related products, components, and patents make possible production economies.

A. International Proposals

The World Bank estimates the oil importing developing countries now spend about $50 bill on annually to purchase oil. The total net official development assistance from all sources to all developing countries is just over half that amount. To lift the increasingly heavy burden from developing countries requires a prompt beginning in a broad-range effort, including energy conservation and increased efficiency, accelerated production of oil, gas, coal, and hydropower, and sustained production of energy from renewable sources.

The World Bank has proposed a 5-year program of energy

investments in the developing world that includes investment in oil, gas, and coal, large-scale power generation, and increasing production of renewable energy. It wishes to create a special affiliate to finance these investments.

While such a balanced energy program will help meet development needs, long-term environmental and natural resource constraints point to the need for sustained priority attention to energy conservation and renewable sources. The essential role of renewable energy and conservation in smoothing the global energy transition are increasingly being recognized by governments and individuals worldwide.

Many of the elements of a U.S. effort to promote renewable sources and conservation internationally are already in place, at least in rudimentary form. AID and the Peace Corps are rapidly increasing their support for energy analysis, renewable energy experimentation and application, and fuelwood planting to help meet the basic energy needs of the world's poorest people. With U.S. support, the World Bank is beginning to get involved in promotion of renewable energy, has already embarked on an ambitious fuelwood program, and has drawn up plans for energy conservation activities. The U.S. Department of Energy (DOE) provides significant support for renewable energy research. DOE is also involved in a number of international cooperative programs, including the Country Energy Assessment program, a program designed to help devel-

oping countries identify energy resources and demand and develop energy strategies compatible with their particular energy situation. The U.S. private sector -- including corporations, universities, voluntary organizations, grassroots organizations, and other groups -- is extremely active in research, experimentation, and use of renewable and conservation technologies.

Thus, an expanded effort to promote renewable sources and energy conservation internationally need not be built from scratch. What is needed now is to enhance and develop coherently the incipient programs and to establish some new programs to fill in gaps. Described below is an interwoven set of initiatives, involving a variety of agencies and programs, which together would constitute a dramatically increased U.S. effort to expand the global use of renewable energy and to promote energy efficiency. In addition, the United States will learn much of use at home as a result of greater energy cooperation abroad.

1. Global fuelwood program

Traditional fuels -- firewood, charcoal, dried dung, and crop residues -- provide essential cooking and heating energy for half of mankind. In many low income countries where virtually all rural residents and many of the urban poor depend mainly on wood for meeting household energy needs, consumption is fast outpacing the growth of new supplies, with

severe economic and environmental consequences. Eighty percent of all wood used by the developing world is burned for fuel. Current rates of tree planting must be increased fivefold if the needed wood is to be available by the end of the century.

U.S. support for a global fuelwood program that would double the rate of tree planting in developing countries over a 5-year period is highly desirable. U.S. efforts should take at least three forms: support for the large expansion of World Bank fuelwood-forestry lending recently proposed by the Bank, a major expansion of AID and Peace Corps fuelwood assistance, and support for adoption of a global fuelwood program at the 1981 UN Conference on New and Renewable Sources of Energy.

Expanded world bank program. As recent analyses by the World Bank and others make clear, the production of wood (mainly in fast growing plantations) is the most cost-effective way to meet a good share of rural household energy needs in developing countries through the year 2000. The World Bank has concluded that massive reforestation is essential, and recommends raising the global rate of tree planting fivefold, from 1.25 million acres a year to 6.25 million acres. In the near-term, institutions in developing countries are not capable of handling a program that would entirely fill the gap. However, the Bank in 1980 outlined a feasible five-year, $2

billion LDC fuelwood-forestry program that would double the rate of planting in developing countries and set the stage for an expanded effort in the late 1980s. This proposal is based on a country-by-country analysis of fuelwood planting needs and institutional capacities. The Bank itself has proposed providing roughly half the financing for this global program, expecting host countries and other donor agencies to provide the remainder. The program would include village or family woodlots, major efforts to improve the efficiency of firewood use through better cooking stoves, fuelwood plantations, research and development for improved tree species (especially fast growing species and species suitable for arid lands), erosion control measures, improved analysis and survey techniques, training programs and pilot projects in forest management to build stronger national institutions.

In carrying out this program, it is important to analyze carefully the possible ecological effects of introducing non-native tree species.

Recommendation: The United States should support recent World Bank proposals for a major increase in assistance for fuelwood growing and conservation. The United States should encourage the Bank to seek ecological analysis in implementing the program.

Expanded AID program. The United States is well situated to make a substantial contribution to the proposed global program. AID's fuelwood, forestry, and related activities are expanding, and valuable experience is being gained. With more

personnel in the field than most donors, long experience in community development activities, and the opportunity to use the talents of community-oriented groups such as the Peace Corps and U.S. private voluntary organizations, AID is able to promote the types of community participation that are essential to successful village woodlots. A very substantial expansion of AID's fuelwood assistance, combined with support of the World Bank effort, would do more than any other feasible U.S. action to help meet the basic energy needs of the world's poorest billion, and, if undertaken in an ecologically sensitive manner, would entail major global environmental benefits as well.

Recommendation: AID should substantially increase its assistance for fuelwood plantations and related activities, adding perhaps $100 million a year over a period of at least 5 years. This would constitute a reasonable and significant share of the World Bank's proposed global program.

2. Renewable energy in developing countries

Expanded World Bank renewable energy program. The World Bank has concluded that major needs and cost-effective opportunities exist for increased lending for renewable energy. In addition to the fuelwood-forestry program described above, the Bank proposes to support production of alcohol from biomass in selected tropical countries, increasing loans from an earlier planned $200 million up to $650 million for the 5 years 1981-85. The Bank sees this program as feasible without impairing food production or harming the environment. In addition, the

Bank expects to incorporate use of renewable technologies, such as biomass-based energy, solar, thermal and electric technologies, small hydro, and wind power, into many of its development projects.

At the Venice Summit, the United States joined in a call for a feasibility study of a new World Bank energy affiliate or facility that, with support from the Organization of Petroleum Exporting Countries (OPEC) as well as Organization for Economic Cooperation and Developing (OECD) countries, would channel major additional resources into energy development in the Third World. The Bank has indicated that it would undertake an expanded fuelwood-forestry program and the other renewable energy programs mentioned above if funds available for its five-year energy program rise from $13 billion to $25 billion. Such an expansion of lending may well be dependent on the establishment of a new energy fund or affiliate. The United States should strongly support establishment of this affiliate while pursuing the renewable energy lending opportunities already identified by the Bank.

The Bank's proposed fuelwood and alcohol additions together total $1.125 billion above planned lending over the 5-year period -- and hence comprise one-tenth of the $12 billion increase the Bank desires for energy lending overall. This allocation of funds recognized the dire straits of developing countries in trying to meet their current oil import

bills. Helping them meet the current crisis is clearly the first priority. However, the Bank should analyze the energy return of marginal Bank funds devoted to renewable energy sources versus oil exploration, other fossil fuel investments, and conservation. Moreover, the unique long-term benefits of renewable energy activities in helping countries prepare for the inevitable transition away from primary dependence on petroleum should be taken into account when weighing the priority to be accorded renewable sources.

Recommendation: The United States should urge the World Bank to accelerate its renewable energy lending. The United States should support the idea of the new energy facility. If a major capital expansion for energy does materialize, the Bank should be urged to examine carefully the relative priority given to renewable energy sources as opposed to fossil fuels.

Easier access by developing countries to U.S. technology. One of the attractive features of renewable energy sources for developing countries is the potential they offer for reducing dependence on foreign sources of energy, and for contributing to the development of indigenous industries and employment. As the use of renewable energy grows, developing countries will inevitably import increased amounts of equipment and components, but will also strive to establish local capacities to manufacture energy equipment to meet local needs.

With a solar research program of $700 million, and major support for conservation-related technologies, the United States is the world leader in renewable and conservation technology development. The terms on which new technologies

that have been developed with federal funds are available to companies or other parties appear to vary, with patents held by the government in some cases but not in others, and distinctions between U.S. and foreign firms sometimes in effect. However, it is extremely difficult to obtain good information on this complex topic. (This in itself may be a deterrent to potential foreign users of newly developed technologies.)

The U.S. government could hasten progress in renewable energy use and conservation in developing countries by helping their governments or firms to gain access to new technologies developed with federal funds, and also, to the extent possible, by reducing barriers to the transfer of proprietary technologies. In addition to its practical merits, such an effort would be of political value in the upcoming UN Conference on New and Renewable Sources of Energy, where access to technology is certain to be a major issue. Some trade disadvantages might accrue, but these would probably be offset by broader energy, economic, and political gains. U.S. firms could be major beneficiaries of larger-scale establishment of renewable energy markets and industries in the Third World. At the same time, the United States should attempt to insure that any of its actions form part of a comprehensive effort with other technologically advanced nations.

Recommendation: DOE should survey the terms on which new energy technologies developed with federal funds are available, and should develop mechanisms for facilitating developing country access to both federally owned and privately owned

technologies. The fullest feasible access to government-controlled technologies should be provided.

New programs of technical assistance. Several U.S. government programs reflect the importance we attach to encouraging use of renewable energy sources and energy conservation in other nations as well as our own. AID's rapidly growing energy assistance programs now place primary emphasis on new and renewable energy as do bilateral cooperation programs with developing countries implemented by DOE, the Departments of Commerce and Housing and Urban Development and DOE's commercilization programs. The International Development Cooperation Agency's (IDCA) Trade and Development Program transfers U.S. energy technology from the public and private sector at the cost of the recipient. Country Energy Assessments being performed by DOE and AID have alerted other countries to the realities of their energy situation and can help avoid wasteful use of foreign assistance.

Nevertheless, some gaps exist in our bilateral programs. AID activities are limited to poorer countries where our development interests are paramount, but where commercial energy use is generally low, and the impacts on the world energy market from conservation and renewable sources will not be great. Moreover, AID concentrates its limited funds on rural poverty and is not involved on a large scale in the modern-sector energy problems of developing countries. Several of our bilateral technology cooperation programs do

involve the better off developing countries -- but DOE emphasizes activities in countries and programs that will also yield significant technological benefit for our own domestic energy programs. For energy, foreign policy, and trade reasons it would be desirable to have greater flexibility for energy cooperation with middle- and upper-income developing countries.

In view of these broader U.S. interests, IDCA has proposed that DOE undertake a cooperative technology adaptation and development program focussed on Third World needs. Such a program would put U.S. expertise to work on the technical aspects of energy supply and demand in both the comparatively neglected higher-income and in the modern sector of poorer developing countries. The proposed set of activities would have importance not evident from their low budget costs, because they would also strengthen our political and technical links with developing countries and would indirectly benefit domestic development and commercialization programs.

Chapter 10, Institutional Changes, discusses the general issue of providing technical assistance, without reimbursement, to requesting foreign nations.

The opportunities for short-term technical assistance to lesser developed countries in the energy area are legion, and range from advice on specific scientific or technical questions to assistance with more general energy analysis and

policies. Aid agencies or developing country governments often fill this need with expensive consultants. However, there is evidence that many U.S. professionals might be willing to provide technical advice on a voluntary basis for two or three weeks at a time. Contributions in the areas of energy conservation and renewable energy sources could be stressed.

Such a program would differ from existing voluntary programs (Peace Corps, The International Executive Service Corps) by tapping the skills of professionals at the peak of their careers -- individuals who would not consider the lengthy commitment involved in a regular Peace Corps assignment. Past experience with limited UN and private efforts along similar lines indicates that a program could provide beneficial technical assistance at a cost of roughly $2,500 per expert (for short consultancies) plus management expenses.

Issues to be considered include the relative roles of the federal government (through the Peace Corps) versus professional associations in managing such a program, and mechanisms for linking specific development needs with U.S. volunteers. Potential conflict of interest problems would also have to be analyzed.

Recommendation: AID and IDCA, in consultation with representatives of relevant professional organizations, should study the desirability and feasibility of a voluntary program of short-term technical assistance in energy.

Financing renewable energy systems. AID should also

focus on removal of the financial barriers which now place renewable energy beyond the reach of the rural poor. Substitute sources of energy, and conservation as well, may require prohibitive first costs. Assistance in financing the adoption of new energy systems -- possibly by means of incentives, soft-credit institutions, and cooperative purchasing arrangements -- may be as important as improving the technical merits of new energy systems. Rural credit programs for developing country agriculture which have been in operation for many years could be the source of ideas and experience.

Recommendation: AID should devote increased attention to building appropriate institutions for the financing of renewable energy systems by potential developing country users.

3. Energy Efficiency in Developing Countries

Although conservation has become a major concern in industrial countries, its value has not yet been so widely perceived in developing countries. The potential of increased efficiency as a competitive energy "source" has up to now been largely ignored by international aid agencies. Yet recent studies by the World Bank and AID consultants indicate that vigorous efforts to improve efficiency of petroleum use could markedly reduce developing country oil-import costs. For the remainder of the century, increased efficiency has the potential to provide major energy and financial benefits to Third World and world markets.

Increased AID assistance for energy efficiency. Because

AID operates in the poorest countries and focusses particularly on the poor within those countries its overall emphasis on rural energy and fuelwood -- including more efficient use of fuelwood (e.g., improved cooking stoves) -- remains appropriate. Still, AID programs and cooperative programs with the Peace Corps in technical assistance, training, information dissemination, financing, and research in the area of fossil fuel efficiency could have a significant payoff in terms of development and basic human needs. AID is currently developing a small scale program with these objectives. Even if these programs are increased somewhat, AID's role would still necessarily be restricted to laying the groundwork for larger conservation investments by others through institution building, feasibility studies, and pilot projects. The large-scale implementation of economically sensible conservation technologies could then be financed by the World Bank or local governments.

Recommendation: AID should accelerate its activities to promote energy efficiency, especially efficiency of petroleum use, in developing countries.

New World Bank program. The World Bank's recent report, Energy in the Developing Countries, drew attention to the considerable scope for improved efficiency of oil use in developing countries. It concluded that effective policies of demand management, energy efficiency and increased production could reduce the oil import bill of oil importing developing

countries by 25 percent in 1990 -- a massive financial and oil savings. The greatest potentials for conservation are in the industrial and transport sectors.

To date the Bank has done virtually no work in this area, and its "current" program for FY 1981-85 includes no conservation lending. In its newly proposed expanded 5-year program, the Bank would spend $1.25 billion on "industrial retrofitting," one key part of the efficiency challenge.

The Bank's own analysis, like that of others, suggests that in the long-term technical assistance, training, and equipment investments in oil conservation would have a greater payoff than the shorter-term benefits of many planned investments in oil exploration or renewable energy sources in developing countries. The initiation of a major Bank program to increase the efficiency of oil use should not be dependent on the proposed overall energy capital expansion or on the establishment of a new affiliate.

Recommendation: The United States should urge the World Bank immediately to initiate oil conservation lending activities, and to monitor closely monitor the adequacy and scope of its conservation lending program. The Bank should be encouraged to incorporate energy efficiency concerns into all its new industrial, housing, transportation, and other projects, and also into the terms of its structural adjustment lending.

4. Interagency coordination and planning of developing country energy programs

As more federal agencies become involved in energy activities in developing countries, problems of coordination have

appeared. The expanded DOE role suggested above could accentuate the problem, and in any case, it must be incorporated into a broader, coherent strategy.

Effective use of limited U.S. resources in assisting developing countries with energy analysis, development of renewable sources energy efficiency, and other energy techniques requires coordinated planning and budgeting, and the development of a comprehensive strategy. The involved agencies -- AID, DOE, State, IDCA, and the Peace Corps in particular -- should build on the interagency steering group which has helped alleviate many potential problems in the past 3 years.

In view of its mandate to oversee U.S. government activities influencing economic development in developing countries, IDCA will play an important role in such a planning effort. However, the major U.S. interests at stake go beyond economic development per se. They include foreign policy, national security, and energy interests, and thus would be an appropriate responsibility for the Department of State.

Recommendation: State, in cooperation with IDCA and DOE, should establish an interagency task force that will develop a strong new coordinating and planning mechanism for all U.S. energy programs in developing countries.

5. 1981 UN Conference on New and Renewable Sources of Energy

The UN Conference on New and Renewable Sources of Energy, scheduled for August 1981, provides a unique opportunity to

accelerate the global development and use of alternative energy sources. The Conference should help to legitimize renewable energy, and should help countries determine which new and renewable technologies can fulfill national energy needs in the decades ahead. A properly designed plan of action adopted by the Conference could include promoting necessary research, reducing barriers to the use of new and renewable energy, accelerating global commercialization of new and renewable technologies, and building the capacity of developing countries to solve their pressing energy problems.

The U.S. government has already established a set of ambitious general objectives for this Conference. Interagency committees are now developing the U.S. position on Conference issues, including research and development, information flows, transfer of technology, finance, education and training, industrial issues, and rural energy. It is premature at this point to make detailed recommendations on specific Conference proposals. In preparing for the Conference, however, it is important that the United States continue to emphasize the importance we attach to it.

Recommendation: In future energy and other messages, the President and senior officials should stress the importance the United States attaches to having this Conference hasten the global development and use of new and renewable energy technologies.

B. Domestic Recommendations

The United States, despite progress in energy conserva-

tion, is still a heavy user, compared with the rest of the world. With 6 percent of the world's population, we use 30 percent of the fossil fuel energy each year.

Evidence is mounting that U.S. economic growth, as measured by Gross National Product (GNP), need not be tied to a similar energy growth rate. The most important reason is that the U.S. economy, including much of its building and transportation stock, its industrial processes and machinery, is inefficient in its use of energy, compared both with other economies and with the technological and cost-effective options that already exist. The opportunity is enormous for improving the energy efficiency of U.S. capital stock -- in effect creating "conservation energy" -- to get the same desirable end result of warmth, comfort, jobs, and mobility that fossil fuel energy provides. Conservation, coupled with achievement of a national goal of getting 20 percent of our energy from solar and renewable sources by the year 2000, gives us the opportunity to make a significant difference in the world's energy budget.

U.S. federal policy is relatively inexperienced in dealing with conservation and renewable energy. However, conservation is currently the cheapest source of domestic supply. U.S. policy should recognize the fundamental appropriateness of allowing the market to work in this situation. Thus the policy of pricing energy at its true cost should be continued

and natural gas price decontrol should be accelerated. In fact, the major conservation gains may result primarily from broad price and tax policies. An exception is the buildings sector where pervasive institutional barriers interfere with the potential for conservation.

Some forms of renewable energy currently compare with other sources less favorably than conservation. The government will have to improve its existing programs to stimulate this market if the 20 percent goal is to be met.

The U.S. government does not yet have a complete set of policies that will ensure achievement of conservation and renewable goals -- for understandable reasons. A massive renewable energy program has been built quickly almost from scratch, and must find a way to promote and complement the large, varied efforts underway in the private sector. Renewable energy is inherently more disparate and decentralized than other major energy technologies, making the management and planning task more difficult.

The Administration and the Congress have recently created valuable new programs such as the Solar and Conservation Bank, and are considering many other new policies and programs. Numerous potentially valuable federal actions have been proposed by private groups. Spurred by federal tax credits and grants, the private sector -- including universities, corporations, grass roots organizations, and individuals -- is

engaged in massive research, experimentation, and implementation of conservation and renewable technologies.

1. Integrated conservation-renewable energy strategy

The federal government has not yet developed a coordinated strategy for achieving its curren' goal of 20 percent of energy from renewable sources by 2000. We have a plethora of programs without the means to evaluate their actual effects, and we have not established sectoral and near-term goals that will allow us to measure progress toward the long-term goal. Obviously, such a strategy can not be too detailed or rigid given the uncertainties, but a more systematic planning framework and strategy is necessary if federal funds are to be well spent, federal programs sharply focussed, and our vital goals achieved.

Recommendations:

- An interagency task force should be established to chart a realistic path for achieving the goal of getting 20 percent of our energy from renewable energy by the year 2000. A national energy conservation plan, with near- and long-term sectoral goals, should be developed as part of the integrated strategy. The active involvement of the private sector in design and implementation should also be ensured.

Examples of elements that should be included in the plan are the following:

- Existing DOE and Internal Revenue Service incentive, grant, and R&D programs should be evaluated and funds directed to successful programs.

- Federal regulations and programs which are directly or indirectly impeding energy productivity in the economy should be identified and changes recommended.

2. Improving energy data

Below a very gross level of aggregration, there is little data on how and where energy is used throughout the economy. It is important that the government continue to gather and analyze data on the end uses of energy. This information will allow it to analyze policy options which work with, instead of against, the operation of the market. In addition, the federal government should develop a means of documenting actual conservation progress, and uses of renewable energy, by sector. The present lack of conservation and solar data makes it difficult to gauge the nation's progress in improving energy efficiency. And it puts these programs at a disadvantage in competition for research funds, in comparison with fuel production programs that result in visible and well-documented amounts of new energy.

The development of useful conservation and solar indicators is no simple task. Each major sector (housing, commercial buildings, transportation, industry) has its unique qualities and factors that must be taken into account, and field sampling will be necessary in some cases to supplement other sorts of data.

Preliminary analysis of this topic indicates that a program to provide reliable conservation and solar indicators would eventually cost about $3 million per year. Once indicators are established, they could be translated into a set of

simple national and sectoral conservation and solar indices. The "conservation index" and "solar index" could help to educate the public and put conservation and solar on a par in the public mind with oil production figures.

Recommendations:

- DOE should develop a system of national conservation and solar monitoring by major sectors. Simple conservation and solar indices should be developed and publicized.
- The Department of Energy/Energy Information Administration should receive necessary budgetary and personnel support to expand its collection and analysis of energy end use data.

CHAPTER 4

TROPICAL FORESTS

The world's tropical forests are disappearing at alarming rates as growing numbers of people seek land to cultivate, wood to burn, and raw materials for industry. The best projections indicate that unless governments individually and collectively take action, much of the world's tropical forests will be scattered and highly degraded remnants by the first quarter of the 21st century.

The loss and degradation of tropical forests cause numerous social, economic and ecological problems which already are affecting the lives of millions of people around the world -- particularly the poorest. Intensified seasonal flooding with loss of lives and property, water shortages in dry seasons, accelerated erosion of agricultural lands, siltation of rivers and coastal waters, and the disappearance of plant and animal species at rates without precedent are major consequences of tropical deforestation. The potential for local and regional climate modification also exists as large areas of tropical rainforest are cleared. In many tropical forests, the soils, terrain, temperature, patterns of rainfall, and distribution of nutrients are in precarious balance. When these forests

are disturbed by extensive cutting, neither valuable trees nor productive grasses will grow again. Even where conditions are more favorable to regrowth, extensive clearance destroys the unparalleled ecological diversity of the original forest.

Worldwide recognition is growing that tropical deforestation is an urgent problem of global significance. Although the United States possesses only about 1 percent of the world's tropical forests, we share with other nations important interests in their conservation and wise management. Tropical forests are already a significant source for specialty woods, foods and pharmaceuticals exported to the United States and other nations. With their enormously rich diversity of species, they are a genetic storehouse of potentially great future value to humankind. Moreover, tropical deforestation is at the center of a complex of immediate, large-scale human problems of worldwide significance. The flooding, loss of cropland, and growing scarcity of fuelwood caused by loss of forests combine to deepen human poverty and misery, thus adding to pressures for massive migration of impoverished people and to the potential for political instability. Many development assistance efforts are undercut by the effects of tropical forests loss. AID missions, for example, report that a number of projects

financed by U.S. investments such as water supply systems or agricultural improvement programs, are failing due to the flooding, erosion and siltation caused by forest loss. At the same time, calls are mounting for U.S. disaster relief to help victims of flood and drought in places where such conditions are linked to the removal of forests.

Thus, for many reasons, tropical deforestation is high on the list of the world's most pressing resource management problems. The United States has taken the lead in stimulating an international attack on the problem. Our government raised the issue in the United Nations in 1979, and successfully urged the UN Environment Programme (UNEP) and the Food and Agriculture Organization (FAO) to work toward an international plan of action for management and wise use of tropical forests.

The United States has also begun action at home to shape a more effective U.S. response to the world problem of tropical forest loss and degradation. A federal Interagency Task Force on Tropical Forests submitted to the President in May 1980 recommendations for a U.S. policy, strategy, and program. The Task Force report analyzed the trends, causes and consequences of tropical deforestation; defined the U.S interests involved; and provided a blueprint for future action by the United

States, other nations, and international organizations.

In his 1979 Environmental Message the President called for stronger U.S. and international actions to protect and wisely manage tropical forests. Many U.S. agencies (AID, the Peace Corps, the Forest Service, the National Science Foundation, the Department of the Interior) have announced plans to intensify efforts for better forest management. Interest from many quarters of the public in improved management of tropical forests has proved to be strong. Representatives of industry, conservation groups, and universities worked with the Interagency Task Force and support its recommendations. Congressional committees have held hearings on the subject and media coverage has been extensive.

The recommendations in this chapter are thus based on a strong foundation of recent, intensive work by the U.S. government to define central needs and next steps. They are supported by commitments from a broad range of U.S. private organizations, and they fit with the recently expressed intentions of other governments and international organizations to attack the problem.

The recommendations are distilled from the extensive, detailed program mapped out by the Interagency Task Force on Tropical Forests. They are directed at certain broad problems that are at the heart of the overall tropical

forestry situation: conversion of forests by impoverished people seeking land, food, and energy, and permanent removal of forest cover by poorly managed industrial logging and ranching operations. They emphasize the development of an international plan of action for tropical forest management, with responsibilities for meeting urgent needs divided among nations and international organizations; strengthening forest management capabilities in tropical countries; and expanding U.S. contributions -- public and private -- to a new international program.

The rapid awakening of worldwide concern about tropical forest loss over the past two years; the availability of talents, technology, and institutions -- both public and private -- to address the problems; and the new commitments by governments and industry to ecologically sound forest management, all create good prospects for progress.

A. World Program for Improved Tropical Forest Management

1. International plan of action

An effective program for conservation and wise management of tropical forests requires international cooperation and assistance as well as action at the national and local levels in tropical countries. A number of national and international bodies are already active. But the need is clear for better delineation of

the most essential and most urgent problems on an international basis; for a better aggregation of international resources to address critical needs; and for an agreed division of tasks. In 1979 at the UN General Assembly, the United States proposed an International Plan of Action on deforestation to meet these objectives. Following U.S. initiatives in UNEP, work on an action plan began in March 1980 at a meeting of experts. A second meeting is scheduled for August-September 1981.

Recommendation. The United States should continue to press for adoption of an international plan of action on tropical forests, supporting completion and implementation of the plan as promptly as possible.

2. Strengthening international leadership

Pending the completion of an international plan of action, present international leadership and coordination of tropical forest activities needs to be strengthened. Several U.S. organizations are already conducting or planning activities, many of which overlap and at the same time are inadequately funded. To improve these activities, and also to provide a focal point for an international plan of action once it is adopted, a strong central coordinating body must be designated.

In view of its present mandate, past experience and position within the UN system, the focal point for the plan of action and, in general, for international efforts to attack tropical forest problems, should be the Food

and Agriculture Organization (FAO) of the United Nations. The entire Forestry Department of FAO receives only about 4 percent of the entire FAO budget, and the forestry program lacks a coherent tropical component. A special U.S. voluntary contribution would help FAO overcome these deficiencies and help it play a central role in designing and implementing an international action plan on tropical forests.

Recommendation: The United States should make special contributions to FAO over a period of at least five years to support an expansion of its tropical forest activities; encourage FAO to take a leadership role in the international plan of action; promote limited support for FAO technical assistance to developing countries to improve forest management; and employ U.S. professionals in FAO to help design and implement an expanded FAO tropical forest program. First year funding should be at a level of about $750,000, with funding for later years to be determined on the basis of FAO performance and success of the U.S. initiative in prompting similar contributions from other nations.

B. Strengthening U.S. Capabilities

The United States has been a catalyst in evoking a world response to the loss and degradation of tropical forests. To continue this leadership role, we need to strengthen both our organizational and our scientific and technical abilities. The government needs a continuing mechanism to pull together U.S. tropical forest activities into a coherent program, to see that priorities set forth by the Interagency Task Force receive attention, and that the interests and abilities of the private sector

are integrated into the government effort. Moreover, for effective, lasting contributions to improved management of tropical forests, U.S. abilities for research, monitoring and assessment, training, education, and demonstration need to be strengthened and mobilized. Federal agencies, universities, and other private institutions have already begun to launch new scientific and technical programs and better coordinate their activities (an example is the new Consortium of Universities for International Forestry). Greater improvement is needed, however.

1. Coordination

The Interagency Task Force on Tropical Forests has been coordinating U.S. tropical forest activities on an ad hoc basis. Its mandate should be expanded and strengthened to cover several important tasks over the next year or two, including: assembling and preparing from individual agency submissions a coordinated annual federal program and budget; coordinating efforts by AID and other U.S. institutions with those of the World Bank, FAO, and the Organization of American States (OAS) to avoid duplication of effort; coordinating the U.S. part of the international plan of action now under preparation; and encouraging participation of nongovernment organizations, including industry, citizens' groups and universities.

Recommendation: The Interagency Task Force on Tropical

Forests should coordinate U.S. programs on tropical forests including the preparation each year of a consolidated federal program and budget, and should explore the opportunities for joint or coordinated programs with the World Bank, FAO, and OAS.

As an option, the Tropical Forest program could be coordinated in a manner similar to the U.S. Antarctica program. Initiated by an Office of Management and Budget (OMB) circular, the Antarctic program provides centralized budgeting and management to ensure government attention commensurate with long-range U.S. policy interests. Program planning and coordination is carried out by an interagency body headed by a lead agency. Funds are centrally justified and appropriated, and then disbursed centrally to the various action agencies. A third option would be to assign the tropical forests coordination role to a single agency, possibly the U.S. Forest Service.

2. U.S. research, education, and training

The United States has unique strengths in research, education and training which should be applied more effectively to tropical forest management needs. Federal government agencies, universities and private industry should all intensify their efforts to increase scientific knowledge of the tropical forest biome, to improve our ability to manage tropical forest resources, improve professional education in tropical forest issues, and to provide additional training opportunities for experts

both in the United States and abroad.

Recommendation: The National Science Foundation (NSF) and the Board on International Food and Agriculture Development should jointly conduct a study of measures U.S. government, industry, universities and other private institutions can take to strengthen U.S. research and training in tropical forest management. Government agencies (particularly the NSF and AID) should immediately seek to increase funding to U.S. universities for tropical forest research, education and training, and to support other U.S.-sponsored programs with the same purpose.

3. National centers

The "national center" and "center of excellence" concepts, used elsewhere successfully, could have important symbolic and practical value in tropical forest management.

The U.S. Forest Service Institute of Tropical Forestry in Puerto Rico and the Institute of Pacific Islands Forestry in Hawaii could both meet the requirements. Both conduct research on tropical forests (including management of plantations and natural forest ecosystems, wildlife and endangered species, watershed management, insect and disease control). Both have outstanding capabilities for training and information dissemination. As designated national centers for tropical forestry research, these institutes could receive increased funding and staff, with core staff supplemented by visiting staff from other federal and state agencies, universities, industry, and from tropical nations. These national centers would concentrate on areas in which the United

States has special expertise, such as: forest inventory, including remote sensing and data evaluation; full use of renewable resources including low grade timber, alternative use of forest products, and use of small sawmills; land use classification and planning; ecosystem and forest management; and wildlife habitat management.

Recommendation: The President should designate the Institute of Tropical Forestry and the Institute of Pacific Islands Forestry as "national centers" for tropical forest management to: (1) demonstrate further the U.S. commitment to addressing the global tropical deforestation problem; (2) provide centers for the clustering of government and private sector expertise and information; and (3) expand training and education opportunities for experts from other nations.

4. UN Associate Experts Program

As demonstrated by the European countries, participation by professionals in the FAO Associate Experts Program is an effective way to build a country's corps of qualified tropical forest specialists, while at the same time contributing to international resource management efforts. For a number of years, the Department of Agriculture (USDA), AID, and many universities have urged that the United States provide the necessary funding to enable its professionals to work in and through FAO. Returned Peace Corps volunteers with forestry, resource, and firsthand conservation skills and understanding of Third World problems are a potentially rich source of U.S. participants in such a program.

Recommendation: The United States should promote the necessary funding to use the FAO Associate Experts Program as a means for training junior professionals in tropical forest management and, in the process, expand the cadre of U.S. experts. At least four U.S. junior professionals should be placed in the FAO Program to begin with, specifically to work on tropical forest management. The U.S. should commit itself to expanding its participation in the FAO Program, reaching a level of 10 tropical forest management candidates annually within a few years.

5. Private sector participation

The Interagency Task Force on Tropical Forests called attention to the major contributions U.S. private industry can make in tropical forest management; it judged industry abilities to be "underutilized" in U.S. government planning and practice. The Task Force called for a new partnership between government and industry in this area. Industry has indicated its willingness to cooperate toward improvement of tropical forest management, both independently and cooperatively with the government. As an example, at a meeting of the Association of Southeast Asian Nations/U.S. Business Council in October 1989, the Weyerhauser Company announced its intention to collaborate with other U.S. forestry firms on a demonstration reforestation program in Southeast Asia.

Recommendations:

- The Interagency Task Force on Tropical Forests should assign high priority to improving government-private industry collaboration on tropical forest management, working in close association with the National Forest Products Association and the U.S. Chamber of Commerce.

- The Departments of Commerce and State should explore possible modes of government-industry cooperation to implement the proposed Southeast Asia demonstration program. They should also examine ways to promote industry research and development in tropical forest management, and a sharing of U.S. technology and expertise with other nations. For example, one area in which the United States might make a special contribution is waste reduction in the forest products industry.

- The Interagency Task Force on Tropical Forests should work with U.S. industry to develop an "international code of conduct" for the forest products industry, with a view toward gaining international agreement on such principles to avoid penalties to U.S. industry. This effort might possibly be integrated into the UN negotiations already underway to establish a general code of conduct for multinational corporations.

C. U.S. Support for International Programs

The United States must improve and expand its work with other nations and international bodies in the effort to improve tropical forest management. Direct U.S. support of international efforts includes technical assistance to developing countries to help them to build management institutions, to train experts, and to conduct demonstration and management programs. It also includes working through multilateral bodies (World Bank, the United Nations Education, Science and Culture Organization (UNESCO), FAO, UNEP), both to draw on pioneering work some of them are carrying out, and to influence the nature of their activities. U.S. financial contributions provide major support of most of these bodies. To make the best use of U.S. funds and manpower requires closer coordination of our own programs and theirs. U.S. public

and private institutions must carefully target their programs on the basis of a good understanding of what the rest of the international community is doing.

1. U.S. technical assistance

In the past 2 years AID and the Peace Corps have increased their efforts to address tropical forest problems, and they plan to do more. These present and planned increases still, however, add up to rather modest levels of effort. Both agencies need Executive Branch and Congressional support to continue building their programs to assist developing countries with tropical forest management.

Recommendations: AID and the Peace Corps should expand their technical and financial support to developing countries for tropical forest management, concentrating on high priority areas in which the United States has strong or unique capabilities: resource monitoring; land use planning; training and institution building; research; and park and forest resource management.

AID and the Peace Corps will need to rely on other agencies (for example, USDA, the Department of the Interior, and the Smithsonian Institution) and private institutions for technical advice and professional specialists. These agencies and institutions should attempt to lend technical resources more readily to U.S. development assistance programs, and also to international bodies such as FAO. Recommendations for improving the supply of qualified people and resources from other federal agencies to U.S. development programs are discussed further in Chapter 10, Institutional Changes.

2. Joint programming with international organizations

In recent months, representatives of the World Bank and FAO asked to work more closely with U.S. government

agencies to ensure that their expanding activities in the tropical forest sector are better coordinated with U.S. bilateral activities. Joint programming with the World Bank, FAO, and possibly other multilateral institutions will ensure that U.S. investments are not duplicating those of others and may enable the United States to influence the direction of international efforts to a greater degree.

Recommendation: The U.S. Interagency Task Force on Tropical Forests should work with the World Bank and the FAO to achieve closer cooperation and joint programming between the United States and national organizations in tropical forest management. The Task Force should also explore opportunities for similar cooperative relationships with other international organizations, also including the Organization of American States.

3. World Bank Watershed Reforestation Survey

A major goal recommended by the Interagency Task Force on Tropical Forests is to double the current rate of forest planting worldwide by 1985. The World Bank's new fuelwood forestry program (described in Chapter 3, Energy) would help to meet the goal. It would pay dividends directly in providing trees for fuel and saving the inordinate share of income or labor many Third World families have to spend for fuelwood, freeing them for more productive purposes. It will also relieve some of the pressures on remaining natural forests and thus indirectly help to protect a variety of forest values,

including habitat and watershed protection.

The fuelwood-forestry program does not directly address the need to protect and restore large watersheds in Asia, Latin America and Africa. Here, unless the pace of forest planting is quickened, present problems of soil erosion, siltation, downstream flooding, and water shortages in dry seasons will worsen. Drawing on its recent experience with the fuelwood program, however, the Bank could develop an analog for watershed reforestation, selecting watershed areas where reforestation is most needed and where efforts are likely to succeed, in light of local political and social conditions.

Recommendation: The World Bank should be encouraged to survey needs and opportunities for replanting in large deforested tropical watersheds, and to recommend a cooperative program to be undertaken by the Bank, other multilateral institutions, and bilateral donors.

4. Agroforestry

A key element in protecting tropical forests from clearcutting for agriculture is the wider and more successful practice of agroforestry. In agroforestry, the raising of trees can be alternated or interspersed with the raising of crop plants, allowing for relatively non-destructive use of tropical land on a continuous basis. Because the pressure to open up forest lands for agriculture is the principal contributor to tropical deforestation, and because agroforestry is widely perceived as a possible

solution to the conflict, greater attention to this technology deserves high priority.

The United States has little expertise in this area; we should look to other nations and international organizations to carry out the bulk of the work, and support their efforts. At present, however, several international bodies are vying for leadership in this field, seeking U.S. endorsement and financial contributions. To achieve a rational, effective international program in agroforestry, the roles of various international, regional and national institutions and the proper division of responsibility among them, must be sorted out.

Recommendation: The U.S. government (specifically the Departments of Agriculture and State, IDCA, AID and the Smithsonian Institution) should conduct a study to identify the most effective international institutions for agroforestry research and development and examine what the U.S. role should be.

5. Protecting critical areas

Certain unique tropical forest ecosystems are sure to be destroyed if action to preserve and protect them is not carried out on an urgent basis. Increasingly, tropical developing countries are acknowledging the threats to these resources of global importance but indicate that they are unable to shoulder alone the financial burden of protecting them from destruction. The richer nations must confront the issue of whether they are prepared to

contribute to the costs of protection. Several European countries have broached the concept of an international fund. Chapter 5, Biological Diversity, contains recommendations for protection of unique, representative, and vulnerable tropical forests and other such ecosystems.

Finally, the United States is recognized as a world leader in calling attention to the extraordinary value of tropical forests, and arousing world interest in protecting and using them wisely. Thus the U.S. government should take particular care that its actions do not cause significant adverse effects on tropical forests, as a result of carelessness or ignorance. Chapter 10, Institutional Changes, discusses such a proposal.

CHAPTER 5

BIOLOGICAL DIVERSITY

An irreplaceable source for food, fuel, fibers, medicines, and building and industrial materials needed by a growing world population is the 5-10 million now living plant and animal species which nature has provided. Yet with continued rapid alteration, pollution, and loss of habitat and with the overexploitation of some species, as much as 15-20 percent of all species on earth could be lost in the next 20 years. This estimate includes plants, insects, and invertebrates as well as mammals, birds, and other vertebrates. About one-half the loss would occur as a result of tropical deforestation.

The full direct costs to human interests from such losses cannot be counted. A great many of the species under threat have not been studied for their potential or even classified and given scientific names. Beyond question, the loss would be great. The potential for new pharmaceuticals is extremely significant; about one-half the commercial drugs now on the world market were originally derived from living organisms. Wild animals and plants provide a wealth of materials, such as wood and fibers, and chemicals, such as oils, resins, and dyes, which benefit humankind. The locally cultivated varieties and wild relatives of the world's major food crops are

sources of genetic traits essential to improving crop yields and resistance to pests and diseases. Wild plants and local cultivars -- and wild animals as well -- may also prove invaluable sources of new food crops.

Besides the practical human-centered reasons for conserving a diversity of species, many people find broader philosophical or ethical grounds for restraint in destroying our fellow inhabitants of the earth. Respect for nature or reluctance to interfere with productive natural systems is for many a compelling reason to conserve the irreplaceable life forms of tropical forests, coral reefs, islands, freshwater systems, deserts, grasslands -- indeed, of all the earth's life zones and major ecosystems.

The recommendations that follow include several approaches to conservation of species and biological diversity. The species-in-the-wild approach concentrates efforts on species that are of recognized value or that are known to be in danger of extinction. This approach is embodied in the U.S. Endangered Species Act, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and the International Whaling Convention. Another approach is what may be called the Noah's Ark strategy -- to try to collect in a safe place, such as a zoo or seed bank, samples of species judged most important.

A more comprehensive approach, and one with greater

likelihood of long-term success, is to conserve entire ecosystems -- the web of which species are a part. This approach conserves not only the species that enjoy public concern, such as the Bengal tiger, but also the less conspicuous animals that it feeds on, their prey, and the plants and nutrients that nourish the whole system. Likewise, protection of marine ecosystems can help preserve the inconspicuous coral reef invertebrate which secretes a powerful chemical that future research may find invaluable as a drug as well as the humpback whale.

Natural ecosystems themselves provide essential, though unpaid and often unnoticed, services to human beings. Ecosystems cleanse water, providing natural sewage treatment; remove pollutants from the air; recycle some essential elements and nutrients.

In addition, although some unique ecosystems, samples of representative ecosystems, and species which are intolerant of human disturbance need special protection, a multiple-use approach is certainly the most effective way to conserve a great variety of plants, animals, and functioning ecosystems. As a practical matter, much of the world's fauna and flora may be conserved only in marine, freshwater, and terrestial habitats which are used for other more human-oriented purposes as well. With foresight, scientific knowledge, and technical skills, human activities can be planned to avoid as much as

possible disruption of nonhuman forms of life and allow fruitful coexistence.

Many parts of the world that are rich in genetic resources are poor in income and in resources that have current economic value. It is of the greatest interest to the United States, the developed world, and all humanity to protect the biological storehouse from which necessities of life will be derived in the future. At the least, poor nations in the tropical belt, where the greatest diversity of species exists, need technical assistance for protection and management of biological resources. The support and cooperation of the wealthy nations are essential to ensure conservation of biological diversity and areas of high biological productivity for the whole world's benefit. Moreover, well-conceived, sustainable economic development (discussed throughout this report) can be a powerful force for conservation of biological diversity, for this kind of development allows people to make their living without the total destruction of the cropland, pasture, forests, and water supplies which are essential both to meeting human needs and to supporting the diversity of other life on the planet.

A. Comprehensive U.S. Strategy

An Interagency Task Force on Conservation of Biological Diversity chaired by the Departments of State and Interior should begin a review of all U.S. programs to prevent species

extinction and maintain biological diversity. The mandate of the existing Interagency Task Force on Wildlife could be broadened to encompass this effort. In an undertaking similar to that of the earlier Task Force on Tropical Forests, this Task Force should set long-term goals and develop a coordinated strategy for U.S. national and international programs on protection and management of wild plants and animals. Although the Biological Diversity Task Force is proposed as a vehicle for carrying out many of the recommendations set forth below, some issues can be promptly addressed during the course of the Task Force review by individual agencies or ad hoc groups formed to address specific problems. In other words, some of the issues need not and should not wait.

The Task Force on Biological Diversity should develop a strategy which includes the following basic elements: selection of priority areas for protection; assistance to developing nations in providing such protection; conservation of biological diversity outside protected areas; identification of actions that may destroy biological diversity and ways to avoid them; development of a contingency plan to protect biological resources damaged by natural catastrophes; improvement of domestic conservation programs; and management, training, and research needs.

Because the United States has experience and special expertise in the tropics of the New World and because of the

interest we share with our American neighbors in wild living resources, the Task Force should give special emphasis to cooperative programs in the Western Hemisphere.

The World Conservation Strategy prepared by the International Union for the Conservation of Nature and Natural Resources (IUCN) for the United Nations Environment Programme (UNEP) can be used as a guide for developing a U.S. strategy. IUCN's work illustrates one essential role played by non-government organizations in protecting biological diversity. The Task Force should tap skills and experience.

Recommendation: By 1983 an Interagency Task Force on Conservation of Biological Diversity should develop a comprehensive, long-term U.S. strategy to maintain biological diversity, reviewing current programs and recommending strong, integrated national and international programs to carry out the strategy. Thereafter, the Task Force should report every 2 years to the President on the status of and trends in biological diversity worldwide. While the Task Force is developing a coordinated U.S. program, agencies should not postpone undertaking new conservation efforts.

L. Identification and Protection of Global Biological Resources

1. Selection of priority areas

Only a very small portion of the earth's surface can be set aside for special protection and management to maintain biological diversity. Thus these "ecological protectorates" must be carefully selected, taking into account the ecosystems and organisms most in need of protection. Several international efforts are already underway to identify the areas that deserve top priority. The Food and Agriculture Organiza-

tion (FAO) Panel of Experts on Forest Gene Resources has selected and located 130 tree species in need of site protection, most of them in six regions. The International Board for Plant Genetic Resources has identified 10 ten high priority regions for the collection and preservation of crop genetic resources. The collection and storage of these resources are discussed in Chapter 2. At least equally important is the protection of these resources on the sites where they are growing, thus allowing the process of natural selection under local environmental conditions, including pests and disease, to continue.

A similar effort is the work on the "Red Data Book," an inventory of endangered and threatened species throughout the world and an identification of their habitats, being undertaken by IUCN's Survival Service Commission. Some of AID's environmental profile and related studies also provide useful information on a country-by-country basis. Other than the IUCN work on endangered species, priorities for protecting aquatic species and ecosystems have not been established; nor have there been an adequate survey and identification of ecosystems of exceptional diversity or productivity.

IUCN has reviewed the world's representative ecosystems or "biogeographical provinces" and has concluded that of the 193 ecosystems identified, 35 are not represented in any protected areas. Another 38 are inadequately covered, having

only one park or reserve. A beginning has been made, however, in building a global network of representative and unique ecosystems, designated and managed by individual nations. The United Nations Education, Science and Culture Organization's (UNESCO) Biosphere Reserves network, a part of the Man and the Biosphere (MAB) program, is intended to conserve the integrity of plants and animals in natural ecosystems, safeguard genetic diversity, and allow for research and education. In 1980, there were 177 Biosphere Reserves in 46 countries, including 33 in the United States. The program is an important beginning, but many gaps remain. UNESCO's capacity to help countries assess needs and establish further reserves is limited, and it needs support. The need for inventory efforts, especially in the tropics, has recently been analyzed by the National Academy of Sciences. The NAS study found a serious lack of trained systematists qualified to participate in inventory work. This problem is discussed further below.

In addition to international efforts in which the United States has participated, the United States should develop a uniform classification of ecosystems for this country, using systems such as the MAB classification that can later be incorporated into an international system. Such a classification would make it possible better to coordinate efforts by public, state, and federal organizations to conserve unique ecosystems and samples of representative ecosystems.

Recommendation: The Interagency Task Force on Biological Diversity should examine the existing international efforts to identify priority areas for protection of biological diversity and determine how much increased U.S. support should be provided for these efforts. As part of this effort, the Task Force should consider a special U.S. contribution to UNESCO to help expand the Biosphere Reserves program. The Task Force should also recommend procedures for developing a U.S. classification of ecosystems compatible with international classification and mechanisms for systematic conservation of sustainable samples of those ecosystems.

2. Identification of the world's fauna and flora

A fundamental step to conserve biological diversity is to inventory the world's animal and plant species. Although efforts to do this have been going on for thousands of years, less then one-half the millions of extant species have been studied and given scientific names. Accurate identification of subject species is fundamental to biological research, and it is axiomatic that efforts to conserve biological diversity will be less successful if we cannot identify all the species that will be affected by those efforts or that need help to survive.

Recommendation: The Task Force should review international efforts to inventory the world's plant and animal species and recommend an effective U.S. contribution to these efforts. It should also review efforts to maintain collections of the world's fauna and flora and make recommendations to improve these efforts. Academic institutions and federal agencies concerned with the conservation of biological diversity, such as the Agency for International Development, National Science Foundation, National Park Service, Fish and Wildlife Service, Department of Agriculture and National Oceanic and Atmospheric Administration (NOAA), should give greater support to training systematists and to systematic research. They should also reevaluate their present levels of support for maintaining collections of specimens in museums and herbaria.

3. International funding for protection of critical areas

Because a disproportionate share of the burden for preserving globally significant ecosystems falls on poorer countries, the possibility of sharing the costs must be acknowledged as legitimate. The richer countries may have to pay part or all the costs of protection and management of critical areas that are of unique value to humankind. Tropical forests are a particular case in point. They are unmatched in biological diversity, serving as habitat for about one-half the earth's species; they are rapidly declining in extent, due to intense pressures from various human activities; and they are located principally in poor countries.

A number of rich countries may be favorably disposed to exploring the concept of an international fund to assist with protection and management of ecological reserves, especially tropical forest areas.

Recommendation: The Interagency Task Force on Conservation of Biological Diversity should study the possibility of establishing an international fund to help developing countries protect and manage reserves in identified critical habitats and ecosystems, especially tropical forests. The United States should consider contributing a substantial share to such a fund (perhaps one-quarter of a proposed $100 million per year from all donors continuing over 10 years).

4. Collection and preservation of species and germ plasm

Although the protected area approach outlined above is

desirable and must be pursued, it cannot save all the species that are fast disappearing from the earth, especially those in rapidly dwindling tropical forest areas. There is still a need for collection of individuals of selected species and maintenance of these organisms in well-run institutions. Many plant and animal species of tropical forests have limited geographic distributions. Once they are extirpated from their habitats, they are lost forever -- unless they are maintained artificially by humans. Present efforts to inventory, identify, collect, and preserve tropical forests species in particular, and others as well, are currently inadequate.

Recommendation: The Interagency Task Force on Conservation of Biological Diversity should study needs for species and germ plasm collection with a special emphasis on tropical areas, the capabilities of existing institutions to serve as centers, and the best ways to support a global network of cooperating institutions. The Task Force should also evaluate U.S. national centers, including zoos, botanical gardens, museums, and seed banks. Special attention should be given to coordination of collections and efforts to avoid duplication.

5. Bilateral assistance for conservation of habitat

Along with the multinational approaches described above, consideration should be given to an increased bilateral program for conservation of critical ecosystems and habitat. This effort would go beyond present programs of technical assistance for research, planning, training personnel, and operation of reserves and would provide grants for protection and management of important wildlife habitat or other areas of outstanding ecological importance in developing countries.

Proposals have been made to finance such assistance by means of a small tax on international trade in wildlife.

In the past few years, AID has begun to integrate habitat conservation within some of its rural development and watershed projects. Such multiple-purpose projects can contribute very effectively to the conservation of biological diversity in the project areas.

Recommendation: The Interagency Task Force on Conservation of Biological Diversity should consider a program of U.S. bilateral assistance to developing countries to protect and manage important wildlife habitat, areas of outstanding biological diversity, or representative samples of important ecosystems. The Task Force should work with AID to encourage inclusion, where appropriate, of habitat conservation as an integral aspect of its rural development and watershed programs.

6. U.S. Man and the Biosphere Program

The U.S. National Committee for Man and the Biosphere has just recommended a 2-year plan expanding the U.S. MAB program for research and management in such areas as tropical forests, temperate forests, grazing lands, biosphere reserves, and inland and coastal waters. At the same time, the Committee recommended line-item funding for the U.S. MAB program in addition to funds provided by various federal agencies and private sources. As the U.S. component of the major multinational program to protect diversity, these recommendations have a high priority.

Recommendation: A budget for U.S. MAB activities for the next 2 years should be established that includes funds earmarked for MAB in addition to present contributions from federal agencies and other sources.

7. Implementing international conventions

Some of the important conservation treaties to which the United States is party have not been fully implemented. Only in the past 2 or 3 years has the United States given much attention to the 1940 Convention on Nature Protection and Wildlife Preservation in the Western Hemisphere. The potential of this treaty for protection of wild species and habitat throughout the Americas is great. The United States should encourage its full implementation. Under CITES, the United States does control trade in endangered or threatened species (though enforcement should be improved, as discussed below). However, we can improve conservation efforts within our own country for the species listed, and additional resources should be provided to the Office of Endangered Species for listing non-U.S. endangered species.

Recommendation: The Interagency Task Force on Conservation of Biological Diversity should review U.S. implementation of conservation treaties to which we are party and recommend needed improvements. The International Convention Advisory Commission, established by the Congress to advise the Secretary of the Interior on his responsibilities as the U.S. Scientific Authority under CITES, should review domestic efforts to conserve species already protected by that Convention and should suggest needed actions including expanded efforts to list non-U.S. endangered species.

C. Technical Assistance for Training and Education

The presence of trained professionals in countries with rich plant and animal resources is a basic prerequisite for long-term protection of genetic diversity. The United States

can offer training to professionals from other countries, provide support to and help build up training institutions in foreign countries, and help encourage communication among wildlife management and conservation professionals of the Third World. In providing technical assistance to developing countries for training these professionals, the United States and other donor countries should concentrate efforts where the resources are richest and the needs greatest.

A number of constructive avenues exist for expanded support by the United States and other countries for training in protection of species and genetic diversity. The U.S.-Canada-sponsored park training course offered to foreign professionals at the University of Michigan is an example of useful training that can be offered in the United States. The World Wildlife Fund and the University of Michigan are just completing a study for AID and the National Park Service to identify natural resource training needs in Latin America. The study proposes a multilateral 5-year program with AID support of $8 million and a larger amount contributed by other donors and the host countries. Training in wildlife management is being offered at two excellent colleges in Mweka, Tanzania, and in Garoua, Cameroon, both of which could benefit greatly from a modest assistance program of approximately $100,000 per year.

Recommendation: The Interagency Task Force on Conservation of

Biological Diversity should evaluate and recommend a comprehensive program of U.S. assistance for training wildlife management and conservation professionals of developing countries. The effort should be coordinated with those of other nations and international organizations and should include the following elements:

- The United States, in cooperation with other developed nations, should identify institutions in key developing nations that have the potential to produce strong self-sustaining curricula in the conservation and management of wild living resources and should provide seed money to those academic and non-academic training institutions to help them achieve these goals. Emphasis should be given to interdisciplinary studies that integrate management of wild living resources and rural development.

- Undergraduate, graduate, and postdoctoral scholarships and fellowships at U.S. institutions should be offered to the most promising students from key developing nations. This assistance should include interdisciplinary training in ecology, environmental law, and living resource management. The training of indigenous systematic biologists is of great importance in establishing priorities for conservation for each country.

- The United States and other developed nations should consider sponsoring exchange of graduate students, postdoctoral students, and professional conservation managers between less developed countries; the need for scientific communication within the community of developing nations is especially great.

It is particularly important that awareness be increased among the world's political leaders and policymakers of the implications of environmental instability from the destruction of the world's living resources as well as the multiple benefits to be gained from their appropriate utilization.

Recommendation: U.S. ambassadors and other senior officials should put the U.S. concerns with global maintenance of biological diversity on the agenda of their meetings with foreign counterparts and raise the issue in appropriate multinational forums.

D. Institution Building in Other Nations

There are several means by which developing nations can be encouraged to improve their institutions that carry out conservation activities. Article II of CITES obligates its parties -- including the United States and 59 other nations -- to designate national Management and Scientific Authorities. The authorities' responsibilities can include monitoring the status of all wild plant and animal taxa in their countries to help insure that exploitation does not carry a risk of extinction. An effectively functioning Scientific Authority may well have a catalytic effect in many developing countries, stimulating the development of environmental awareness.

Recommendation: The United States should provide assistance to selected nations that are parties to CITES, to help improve government institutions' ability to carry out conservation efforts. Assistance would be offered upon request of the foreign government, after consultation with the State Department. A funding level of about $200,000 a year might be appropriate.

E. Design of Ecosystem Reserves

The design of ecosystem reserves is fundamental to conserving biological diversity, but relatively few studies have addressed such issues as the minimum size of reserves and their optimum distribution. Applied ecology projects in the United States usually have a smaller scope (for example, descriptions of biological communities for impact assessment), or else they are pure research projects without immediate relevance to the design of reserves. The genetics of wild,

dwindling populations and the role of slight climatic changes on community structure and dynamics are other areas of applied ecology that need further work. U.S. ecologists should cooperate with scientists in selected nations, international organizations, and private groups to study these phenomena.

Recommendation: NSF, the Department of the Interior, and the Forest Service should place high priority on increasing funding for domestic and international research on the design of ecosystem reserves, the genetics of dwindling populations, and other relatively neglected issues identified by the Task Force on the Conservation of Biological Diversity.

F. Improving U.S. Abilities To Offer Technical Assistance

The National Park Service and the Fish and Wildlife Service offer limited technical assistance to other countries, mainly to carry out the U.S. effort to protect global biological diversity. With modestly expanded budgets and higher personnel ceilings, they could improve their own existing programs and lend technical expertise to AID and Peace Corps programs as well.

Chapter 10, Institutional Changes, discusses the general issue of providing technical assistance, without reimbursement to requesting foreign nations. With its knowledge and experience in conservation of wild living resources, the United States is well qualified to lend such assistance.

Additional authority to send conservation professionals for short-term expert consultancies abroad upon request would further strengthen U.S. efforts to help other countries con-

serve living resources and habitat. Such a corps of conservation professionals should not be a large permanent organization but rather a flexible system whereby U.S. experts from federal, state, or private organizations could be made available to other nations to help them develop programs, institutions, or managers to improve their ability to manage living natural resources.

Recommendations:

> The United States should establish a corps of park, wildlife, and forestry professionals for temporary assignment abroad to assist other nations in developing the expertise and infrastructures to manage their living natural resources effectively.
>
> The Interagency Task Force on Conservation of Biological Diversity should explore whether AID, Peace Corps, and other appropriate federal agencies should have on the staff of some overseas embassies or missions at least one specialist in wild living resources.

Enforcement of Controls on Trade in Protected Species

U.S. ability to control trade in the species listed for protection under CITES, the Endangered Species Act, and the Lacey Act is inadequate. Increased funding and personnel rankings should be provided for enforcement of these U.S. regulations.

Recommendation: The number of port inspectors and special agents in the Fish and Wildlife Service should be doubled. Likewise, a substantial increase in resources should be provided to the Animal and Plant Health Inspection Service and the Customs Service for fulfilling their responsibilities under CITES, the Endangered Species Act, and the Lacey Act.

Introduction of Exotic Species

The introduction and spread of nonnative species have caused severe damage to some of the world's ecosystems. The survival of native wild plants and animals is threatened by competition, direct destruction, or transmittal of disease from the introduced species. The IUCN has concluded that introduction of exotic species is the third most important cause of extinction of vertebrate species, accounting for 19 percent of known extinctions, compared with 67 percent for habitat destruction and 37 percent for overexploitation.

Executive Order 11987 requires that federal agencies restrict the introduction of exotic species into natural ecosystems, to the extent permitted by law. Exceptions may be made when the Secretary of Agriculture or the Secretary of the Interior finds that introductions of exotic species will not have an adverse effect on the natural ecosystem. The Order, issued in 1977, directs agencies to promulgate rules and regulations to implement it. However, none has yet been issued in final form.

Recommendation: The Department of the Interior, in conjunction with the Department of Agriculture and other appropriate agencies, should promulgate rules and regulations to implement fully Executive Order 11987 as soon as possible. The Interagency Task Force on Conservation of Biological Diversity should review the adequacy of state and federal controls on introduction of exotic species.

CHAPTER 6

COASTAL AND MARINE RESOURCES

The waters of the oceans and seas that cover 71 percent of the earth's surface play a major role in moderating the earth's climate and, with proper care, will remain a major source of food and other resources that can help mankind meet projected shortages in coming years. These waters are also home to hundreds of thousands of species of animals and plants. Despite their great importance to all mankind, there are growing threats to coastal and marine ecosystems. The threats are in the form of urban and industrial development and destruction of highly productive coastal wetlands and reef areas; chemical and radioactive pollutants washed from the land, discharged and dumped into the ocean, or deposited from the atmosphere; uncontrolled exploitation of ocean resources; and mounting pressure on the world's fisheries.

At the heart of all issues concerning the oceans is the fact that the oceans are a shared resource. Effective action to protect the marine ecosystem requires international cooperation. The United States, with its considerable scientific and technical expertise -- and also as a significant source of the pollution and coastal development that threaten ocean resources -- should play a leadership

role in efforts to protect the oceans.

A. Sustainable Fisheries Management

Fishes and shellfish provide an important source of protein for much of the world's population and will continue to be needed. The increasing human population and the increasing pollution of productive coastal waters are, in combination, intensifying the pressures on the world's remaining fishery resources, thereby raising the likelihood of overexploitation and resource failure. Human ability to harvest the ocean resources on a sustainable basis depends on maintaining the diversity and stability of the whole system, even though all of the biological production may not be converted to direct, usable value to human beings.

Both national and international programs are needed to conserve ocean resources. For example, the U.S. Fishery Conservation Zone is estimated to contain 20 percent of the world's supply of traditionally exploited living marine resources. Other countries also control considerable portions of the oceans' resources in their economic zones. The United States and other countries within these proposed zones must develop and adopt new management techniques, particularly those that take into account the target species' complex relationships with other associated species, including marine mammals and

endangered species, to avoid the decline or loss of both target and other living resources. The Draft Law of the Sea Treaty encourages comprehensive coastal nation management of fish stocks within proposed 200-mile economic zones.

The harvest of heretofore underutilized fishstocks offers some hope of yielding more marine living resources for human use, but economic processing, marketing, and ecological problems will need to be overcome. In addition, although the harvest of new species could be an important source of protein, the harvest of some (such as Antarctic krill) may create new ecological problems for the oceans. As human ability to cause irreversible changes increases, we need to understand better the intricate processes that sustain marine ecosystems in order to protect their value to all mankind.

1. Fisheries management in the United States

During the last 4 years, there have been significant accomplishments in managing major fisheries in the U.S. Fishery Conservation Zone under the Fisheries Conservation and Management Act of 1976 (FCMA). However, earlier this year, the National Academy of Sciences noted that recent experience in stock assessment "indicates the need to introduce new theoretical concepts and experimental techniques that will increase ecological information to management . . . ." A broader understanding of the optimum

yield concept and the dynamics of the multispecies approach to management can help the United States increase the use of an essential resource. By means of technical assistance through FAO and AID, it can also help developing countries manage their own fisheries resources (see below).

A large U.S. technical conference -- involving federal and state government fishery managers; representatives of Regional Fishery Management Councils; academic, industry (commercial and recreational), and other nongovernmental fisheries specialists -- should be held. The conference would review implementation of marine fisheries management, analyze problems encountered, discuss innovative management techniques, and suggest improvements to the federal fishery management process. Jurisdictional issues (state, federal, international) might also be addressed at such a technical conference. Another subject might be the ability of the National Oceanic and Atmospheric Administration (NOAA), under present fisheries legislation, to protect habitat essential to maintenance of fish stocks.

Recommendation: Preparation for a U.S. fisheries conservation and management strategy conference to be held in 1982 should begin immediately. It is anticipated that the preparatory research and conference itself will require $100,000.

2. Fisheries management in developing countries

A common fundamental problem faced by developing coastal nations is lack of accessible and usable scientific

and management expertise to realize, on a sustainable basis, the potential benefits of their fisheries resources. Although management techniques of the United States can undoubtedly be improved, our knowledge can be more effectively shared with other countries. Besides AID and FAO programs, NOAA has an international mandate through the Sea Grant Program for cooperative efforts with developing countries, including exchanges respecting "assessment, development, utilization and conservation" of coastal and marine resources. At present, Sea Grant funds are used primarily for research by U.S. universities.

Recommendation: The Sea Grant Program should explore with AID the expansion of projects to develop fishery science and management techniques in coastal developing countries. In addition, the United States should increase its bilateral support, through AID and the Peace Corps, and its multilateral funding of FAO for fisheries management projects in developing countries.

3. Needed research

Several areas involving fisheries need further research. The Convention on the Conservation of Antarctic Marine Living Resources is one of the first to use an ecosystem approach to fisheries management. Research on this approach could have wide applicability and deserves high priority in the U.S. Antarctica program.

Incidental catch of nontarget species in the course of fishing is one of the most economically wasteful and ecologically destructive aspects of aquatic living resource

management. For example, in warm water shrimp fisheries, a large percentage of the total catch is discarded. Applied research is needed on equipment, design, and alternative catch techniques to minimize the catch of nontarget species. The successful reduction of the incidental catch of porpoises in U.S. tuna fishing should be repeated for other marine mammals, sea turtles, and seabirds affected by other fisheries. Research is also needed to find direct or indirect uses for some kinds of incidentally caught organisms, which themselves may constitute substantial protein sources. What is now an accidental catch may have substantial economic value to the fisheries industry. Before promoting increased use rather than minimization of incidental catch, however, we must also understand the ecological implications from use of such nontraditional species.

Recommendation: The National Marine Fisheries Service of NOAA should undertake research needed to implement the Convention on the Conservation of Antarctic Marine Living Resources, to devise strategies to minimize the impacts of incidental take during commercial exploitation of marine fish, and to provide for the efficient utilization of the protein obtained incidentally.

B. Coastal Habitat Protection

Sustained productivity of the ecosystems of the coasts, where the land meets the sea, is essential to alleviate projected shortages of food. It is estimated that 60-80 percent of commercially valuable marine fishery species

use estuaries, salt marshes, or mangrove swamps or other nearshore oceanic areas for habitat at some point in their life cycles. The Chesapeake Bay, for example, accounts for 25 percent of the nation's $80 million crab industry, and Long Island's Great South Bay claims a hard clam industry with an annual retail value of $100 million. Reef habitats also provide food and shelter for large numbers of fish, invertebrate, and plant species.

Yet many indicators point to increasing destruction or pollution of coastal ecosystems. Rapid urban expansion is likely to continue claiming coastal wetland areas for development. At present, 60 percent of the U.S. population lives in counties bordering the nation's shoreline (including the Great Lakes), a number which may reach 75 percent by 1990. Of the world's 10 largest metropolitan areas, 7 border existing or former estuarine regions. Historically, coastal areas have been favored by industry, especially for energy facilities, and by recreational development. Upstream manipulation of estuarine river systems through dams or diversion for agriculture and municipal water supplies can also destroy estuarine habitats as irrevocably as direct dredging, filling, or paving. Federal leasing of the outer continental shelf will also accelerate in many areas. If projected trends are realized, there will be a substantial increase in coastal and marine pollution

from land-based activities such as agriculture; industry; logging; water resource development; disposal of dredge spoils; and energy production, processing, and distributing systems. The diversity, stability, and productivity of renewable marine resources will be severely stressed. Pollution in the coastal zone, especially by domestic sewage, industrial wastes, and pesticide and fertilizer runoff, is of special concern in developing countries where it may threaten the development of aquaculture -- one of the best hopes for protein-poor countries.

1. U.S. coastal resources

The Fish and Wildlife Service and NOAA are presently conducting inventories of the nation's wetlands and coastal fish and wildlife resources and their habitats.

These inventories will augment understanding of the sensitivities of various important living resources of coastal and marine areas to the impacts of development. The studies will not attempt to tell industries where they can or cannot locate facilities -- but rather will alert industry and government to areas with the greatest potential for conflict with environmental values before resources are committed.

Despite the importance of wetland-estuarine systems, the protection of these ecosystems is seriously fragmented. Involved agencies include the coastal states, the Environ-

mental Protection Agency (under the Clean Water Act), the Army Corps of Engineers (under the Clean Water Act and the Rivers and Harbors Act), the Department of the Interior (through planning mandated in the Estuary Protection Act of 1968), and NOAA (with authority and funding to establish a national system of estuarine sanctuaries under the Coastal Zone Management Act of 1976, as amended).

Recommendation: The Departments of Commerce and Interior should complete, as soon as possible, inventories and mapping of wetlands, estuaries, barrier islands, marshes, mangroves, coral reefs, and other coastal ecosystems; an interagency working group should develop a coordinated program for protection of estuaries and nearshore oceanic areas.

2. International coastal resources

The United States should share information with other countries on the importance of coastal wetland-estuarine systems, coral reefs, and other coastal ecosystems; insure that its own efforts, either domestically or in foreign assistance, are not involved in the destruction of important coastal resources; support the efforts of international organizations that protect coastal areas; exchange information with other countries; and provide scientific and technical assistance to other countries.

Recommendations:

- o NOAA's Office of Coastal Zone Management should initiate exchanges and training programs with other countries on common coastal issues. It is especially important to seek systematic collection of information

and standardized terminology and classification of resources within the coastal zone through international agreement, building on the NOAA and Fish and Wildlife Service systems presently in use.

- Accession to the Convention on Wetlands of International Importance (the Ramsar Convention) would be a symbolically important commitment to conservation of unique resources in the coastal zone and should be seriously considered.

C. Pollution

Nearly all kinds of pollutants ultimately enter the oceans via dumping, discharge, runoff, or atmospheric deposition. Thus monitoring and assessment of marine pollution and its impacts can provide warning of problems emerging from the cumulative effects of human activities. It is anticipated that no major measurable impacts on the earth's open oceans will appear during the next 20 years, in part because of the ocean's capacity to dilute waste material. However, the same great volume makes it very difficult or even impossible to remove toxic substances from the ocean, once they are recognized as a serious problem. The growing quantities of pollutants flushed daily through the coastal zone and into the oceans represent a risk of uncertain magnitude and longevity.

International agreements on control of marine pollution have addressed contamination by petroleum, radioactive materials, and dumping of wastes at sea, but the largest source of marine pollution -- land-based outfalls and

runoff and atmospheric emissions of synthetic organic chemicals and heavy metals -- have not usually been effectively regulated or even monitored. It is highly important to establish and monitor the marine environment's assimilative capacity for pollutants as a basis for planning to protect the continued productivity of the oceans in the face of increasing pollution. Successful data collection and monitoring require the phased integration of environmental data systems which are presently separate and incompatible.

Despite the existence of a U.S. Federal Plan and an Interagency Committee on Ocean Pollution Research, Development, and Monitoring, there is no clear statutory mandate for overall assessments of marine environmental quality. Given the extensive time for impacts to be noted in the ocean and the risk of slow recovery or irreversibility, expanded assessment of conditions and trends is needed.

Through assessment and monitoring of our own land-based pollution, the United States could make a major contribution to the Caribbean Regional Seas Program being developed by the UN Environment Programme and governments of the region. Some elements of the program are modeled on the more advanced Mediterranean Action Plan, sponsored by UNEP and adopted in 1980. The United States, through the Department of State and NOAA, can make a major

contribution to this effort. The Caribbean Regional Seas Program is discussed further in Chapter 10, Institutional Changes.

Recommendation: NOAA and other relevant U.S. government agencies should initiate a large-scale comprehensive assessment of inputs into and impacts of major pollutants on coastal and ocean areas from all land-based activities within the United States.

D. Marine Sanctuaries

The United States should pursue Marine Sanctuary designations for areas within its own jurisdiction or containing resources under its jurisdiction, as part of conservation efforts for particular regions, species, groups of species, or kinds of ecosystems. Sanctuaries may include marine resources entirely within U.S. waters, or areas of protection for internationally significant migratory marine species that move through U.S. waters, to facilitate coordinated protection of living marine resources.

With the increased pressures on living marine resources projected for the year 2000, it is of urgent importance to commit resources to a full-scale effort to identify and conserve unique and representative marine ecosystems. Marine areas selected for conservation can serve to maintain breeding stocks, can be used as research areas against which changes can be measured, and can provide for public education.

Recommendation: NOAA should continue its program to

develop the necessary documentation for establishment of Marine Sanctuaries, in cooperation with the Fish and Wildlife Service and other institutions concerned with marine conservation, and should place special emphasis on migratory species' habitats where international action will be required. The Department of State should use the criteria developed by NOAA and other concerned agencies to prepare or modify, as appropriate, bilateral and multilateral management agreements to ensure that ecologically sound protection is afforded to migratory species which use habitats beyond U.S. jurisdiction.

E. Whaling

In 1979, the International Whaling Commission (IWC) established a moratorium on commercial whaling from factory ships (except for the relatively numerous minke whale). This action was a positive step to protect several species and stocks of whales. The United States has long been committed to a moratorium on all commercial whaling and should continue efforts to obtain it.

Recommendation: The United States should continue to support a moratorium on all commercial whaling until the scientific basis for setting quotas on whale stock is strengthened sufficiently to assure the whales' continued existence; member nations of the IWC reliably supply the data needed to set catch limits; IWC members are no longer purchasing whale products from, or transferring whaling technology and equipment to, or otherwise supporting, nonmember nations or pirate whaling ships.

F. Antarctica

Nations of the world share a common interest in protecting the unique ecological and scientific values of the Antarctic region, including both the continent and the Southern ocean. The new Antarctic Convention on the Conservation of Marine Living Resources is the first world

fishery agreement to be based on ecosystem management principles; the United States was a leader in developing the ecosystem concept. The Convention is not yet in effect and has not been implemented. The United States should now take a leading role in implementing the Convention properly on the basis of the necessary research. Antarctic krill may turn out to be an important source of food or animal feed. It is also essential to the natural Antarctic ecosystem, serving as the main source of food for the whales and other organisms of the Southern ocean. Research on sustainable use of the krill as well as on other Antarctic fisheries is essential.

The 13 parties to the Antarctic treaty of 1959 are now considering the development of a mineral resources regime for Antarctica to determine whether offshore oil and gas (and other minerals) activities should take place in Antarctica and, if so, where and how. Reflecting the U.S. position and leadership, the parties agreed at their tenth meeting in 1979 that a regime should include:

- o assessing the possible impact of mineral resource activities in the Antarctic environment in order to provide for informed decisionmaking;
- o determining whether mineral resource activities will be acceptable;

- governing the ecological, technological, political, legal, and economic aspects of those activities in cases where they would be determined acceptable, including:
  - (a) establishing, as an important part of the regime, rules relating to the protection of the Antarctic environment; and
  - (b) requiring that mineral resource activities undertaken pursuant to the regime be undertaken in compliance with such rules.

Recommendations:

- The United States should ratify the Convention on the Conservation of Antarctic Marine Living Resources and should play a leading role in implementing it. We should support conduct of the necessary research, by other nations as well as ourselves, to carry out the treaty's concepts of ecosystem management.

- The United States should continue its leadership role in ensuring adequate attention to the unique Antarctic environment as possible offshore oil and gas activities in Antarctica are considered. Before any development activities are permitted, there must be sufficient scientific information to allow an informed decision on whether the activities should take place at all and, if the answer is affirmative, where activities may occur and under what conditions and safeguards.

CHAPTER 7

WATER RESOURCES

All the human needs for water -- for agriculture, industry, drinking water and household use, and sewage disposal -- will greatly increase over the next 20 years. Demands for water for irrigated agriculture, which accounts for almost three-quarters of human water use, are expected to double worldwide by the year 2000 if sufficient capital is available to construct the necessary dams, canals, and pipes. In one-half the countries of the world, population growth alone will cause demands for water to double over the next 20 years.

The extent and the severity of water resource problems facing the world in the next two decades are not precisely known because detailed data on water availability and water quality by region are presently unobtainable for vast parts of the globe. Yet it is clear that the problems will be serious; indeed, they already are in many drought-stricken areas and in parts of the Third World where water-borne disease is rampant. The available evidence suggests that without concerted efforts to the contrary, reliable water supplies will increasingly be disrupted because of damage to watersheds, and contamination is likely to increase by the year 2000 -- all during a period in which demand will rise because of

drinking water, food, energy, and industrial needs. Deforestation is expected to be particularly damaging to water resources in less developed countries.

According to Global 2000, if all the fresh water in the globe were evenly distributed among the world's people, there would still be 3.5 times more water per person than needed in the year 2000; at present the ratio is 10 to 1. Of course, water is distributed very unequally over the earth's surface. Nevertheless, many kinds of projects can be undertaken to improve the distribution of fresh water, including those to make more water available in arid regions, and to use the water that is available more effectively. One major approach is to undertake "structural" projects -- dams or irrigation systems. There are also many nonstructural alternatives, including preservation of wetlands for flood control, and a whole range of water conservation techniques, from recycling of industrial water to planting of drought- or salt-tolerant crop varieties.

As the experience of Egypt with the Aswan High Dam shows, however, it is essential to plan water resource management efforts intensively within the context of all other resources and needs. In that case, the negative consequences of the project (people displaced, loss of the sardine fishery in the Mediterranean which once produced one-half of Egypt's fish, salinization of irrigated lands, spread of

schistosomiasis through irrigation canals) undercut its benefits (doubling of agricultural potential on irrigated soils and the potential to produce 8,000 megawatts of electricity). Worldwide, irrigated agriculture is projected to increase 50 million hectares by 1990. Yet already, one-half the irrigated land in the world has been damaged by salinization (accumulation of salts), alkalinization, and waterlogging (from poor drainage). Effective, sustainable use of water resources will require, in both the developed as well as the less developed nations, much better data on water resources and needs, greatly increased attention to planning and management, improvements in water quality, and advances in both application and use of water conservation techniques.

A. Data, Policy, and Planning

Water resources will be critical to increasing world food supplies in coming years as well as to a variety of other needs. Yet, as noted above, data on water availability and needs are very poor, and strategies for how best to address water resource needs are often non-existent. Knowledge of ground water potential and drawdowns is particularly inadequate. World water resources are an extremely valuable commodity; yet insufficient thought is currently being given to how best to develop and manage them so as to meet agricultural, industrial, and domestic needs more effectively yet sustainably. Further complicating these efforts is the

fact that many water resources cross national boundaries and may thus be the subject of conflict or, at any rate, fragmented planning and management.

Recommendation: The United States should establish an Interagency Committee on Global Water Supply and Management, chaired by the U.S. Geological Survey. The Geological Survey is one of the leading water science organizations in the world and, through its international activities program, currently has developed expertise on hydrological conditions in many countries. The Committee should work with other countries and appropriate international institutions to develop better data and monitoring of water resource availability and needs on a country-by-country basis and worldwide, to identify areas of conflict between nations over water resources, to determine how the United States can best contribute toward developing solutions to water needs, and to identify research needs. In particular, the Committee should seek ways for the United States to share expertise and knowledge and exchange information with other nations on environmental assessment of water resource development projects, nonstrucstructural alternatives to such projects which may be more environmentally sound, and water conservation techniques.

B. Training in Water Resources Management

The training of professionals and technicians in water resources management is of special importance in achieving sustained relief from water shortages. Solutions to water problems may require anything from in-depth scientific knowledge of hydrology to basic competence in maintaining pumps. To avoid losing agricultural land through waterlogging, salinization, and alkalinization in irrigation projects in particular requires a high degree of water management and design skills. Water conservation, an alternative to developing new supplies, requires a knowledge of conservation technologies, training for maintenance, and education of the

public to the need for such measures. Although not dramatic, repair and maintenance of existing urban water systems (where leakage may account for one-half of water usage) are often much more economic than development of new supplies.

Recommendation: The United States should improve its bilateral technical assistance in water resources management and its multilateral efforts in cooperation with other nations in the following ways:

- Expand AID and Peace Corps training programs on water supply and management
- Increase funding for the Food and Agriculture Organization (FAO) efforts to distribute information and training in irrigation water management to farmers
- Through bilateral and international programs provide financial assistance and equipment and assign teachers to educational institutions in developing countries to promote more effective water management, including conservation and economic methods of reusing and recycling water
- Prepare training manuals in local languages, geared to specific aspects of water supply and management
- Make full use of the skills and services of professional societies and public and private institutions in the water resource field, including the U.S. Geological Survey, to assist developing country needs
- Undertake an expanded international exchange fellowship program focused on nondegree training in management, organization, and water policy
- Support, through the National Academy of Sciences, global water problem mitigation planning by the International Institute of Applied Systems Analysis.

C. Research

There are many promising avenues for making better use of water resources which deserve immediate attention.

Recommendation: The U.S. government should seek to encourage and expand both public and private and domestic and international, research efforts in the following areas:

- o The relationship between crop yield and water
- o Water and crop management methods for reducing the quantity of water used for irrigation
- o Research and development of high-yield crops which use less water or poorer quality water.

D. Drinking Water and Sanitation

In 1975 the World Health Organization (WHO) estimated that approximately 60 percent of the population in developing countries lacked adequate water supplies because of deteriorating quality or prohibitive distance from supply. Roughly four-fifths of the world's rural population lacked access to safe, reliable drinking water supplies. In the politically more powerful, and logistically easier to serve, urban centers, about one-quarter of the people lack safe, reliable drinking water supplies; however, with the explosion of spontaneous settlements around urban centers projected for the year 2000, it will be a major accomplishment to maintain this level of service. In 1975, about two-thirds of the population of developing countries lacked access to suitable waste disposal systems. Roughly nine-tenths of the rural population and about one-quarter of the urban populations lacked adequate sanitation facilities. Today more than 500 million people are affected each year by water-borne or water-related diseases -- dysentery, malaria, schistosomiasis, and others.

Most of the afflicted are children.

The years 1980-90 have been designated by the United Nations as the International Drinking Water Supply and Sanitation Decade. The steering committee for the Decade program, chaired by the UN Development Program (UNDP), is made up of eight agencies, including the World Bank, and is staffed by WHO. The United States should actively participate in this multinational effort. In addition, the United States should give the water needs of the rural poor a high priority in its bilateral AID and Peace Corps assistance efforts.

Recommendation: The United States should actively participate in multinational efforts to assure safe drinking water. This includes continued support of the activities of the UN Decade on Drinking Water Supply and Sanitation. In U.S. bilateral programs for assistance to developing countries, assuring safe drinking water should be an important goal.

E. Conflict Resolution

Water resources represent a great potential for conflict because of competing demands on limited supplies or because of deterioration in quality through use. Conflicts exist both within national boundaries and between adjacent countries. The projections of Global 2000 suggest that such disputes will increase dramatically. Despite the potential for disputes, conflict resolution arrangements often do not exist in international treaties or are not adequately addressed.

Recommendation: The Central Intelligence Agency, the Department of State's Bureau of Intelligence and Research, the

Department of Defense, and other concerned agencies should inform the National Security Council of any potential conflicts over water resources and, as required, provide detailed analyses of those situations. The Water Resources Council should undertake similar anticipatory planning as to potential conflicts within the United States. Because of the risk to peace, the United States should encourage other countries, and should itself, establish conflict resolution arrangements which can mitigate or help resolve future international water conflicts. Global water assessments should identify existing or potential trouble spots and emerging conflicts early enough to allow development of measures to avoid conflict. Possible conflicts involving the United States should, of course, receive particular attention. The United States should provide financial and technical support for the data collection, planning studies, and evaluations performed by regional institutions. It is particularly appropriate that the United States explore international treaties to encourage environmental assessments of projects potentially affecting shared resources.

CHAPTER 8

GLOBAL POLLUTION

Many parts of this report concern threats to the earth's renewable resource base resulting from extreme poverty, the absence of economic development, and the scarce possibilities for making a living in nondestructive ways. These threats are only one part of the story of global resource and environment problems. The earth's life support systems are also threatened by certain byproducts of economic development and industrial growth. Contamination from hazardous substances or man-induced climate modification could affect virtually every aspect of the earth's ecosystems and resource base. This section offers recommendations for action to prevent global contamination from hazardous substances and global atmospheric and climate problems.

A. Contamination from Hazardous Substances

The increasing use of hazardous substances over the past three decades is the source of growing global concern. While human beings benefit greatly from the advances of science, at the same time, careless use of pesticides and other toxic substances and the haphazard disposal of by-products and waste from chemical and energy processes pose fundamental dangers to plant, animal, and human life in virtually all areas of the world.

The United States has, for the most part, adequate domestic legislation to address pollution problems. Primary emphasis in the United States must be on effective implementation of existing legislation and continued monitoring and study of the fate and effects of hazardous substances.

Internationally, there is a basic need for wider sharing and standardization of information among many countries concerning use and occurrence of hazardous substances, basic toxicological information, and treatment processes. Needs for specific international action and agreements are also apparent.

1. International harmonization and coordination

Although countries vary considerably in their attitudes toward toxic substances problems, internationally consistent approaches can be mutually beneficial and may sometimes be essential. Toxic substances do not always respect national boundaries -- they may cross them in air and water, in foods, in consumer products, as imported bulk chemicals, or as chemical wastes. Toxic substances affecting the global commons such as the ocean and stratosphere may be controllable only through international action.

Many governments are developing or have recently enacted legislation to control toxic substances. Although these control programs differ substantially from country to country, they have a common objective -- the protection of human

health and the environment. However, differences in regulatory approaches may strain financial, technical, and human resources. For example, differences in testing, data requirements, and laboratory practices could lead to refusal by one country to accept, as valid, information from another. Industry and some governments are also seriously concerned that differences in degree and type of control measures could lead to nontariff barriers to trade.

Although there is much good will and theoretical agreement on the need for international cooperation, it is no easy matter to reach practical working arrangements. Differences in social, political, economic, cultural, scientific, and technological values and experience lead to substantial differences in interpreting the same body of scientific data and evaluating the risks and benefits of toxic substances controls. In addition, there are significant language and technical impediments to international exchange of information.

Recommendations: U.S. policy should recognize the need for international agreement on harmonization and coordination of efforts to control hazardous substances and waste. Specifically, the United States should:

- Support the continuing work of the Organization for Economic Cooperation and Development (OECD) in developing international guidelines for testing of chemicals and for data use.

- In anticipation of a favorable conclusion of the OECD work, begin working on an interagency effort led by the State Department on a possible broader agreement which

would seek to harmonize the control of hazardous industrial chemicals in areas other than current OECD work.

- Form an interagency group, headed by the State Department, to examine coordination of chemicals-related efforts of international organizations including the United Nations Environment Programme and the World Health Organization, as well as OECD. The group would spearhead U.S. participation in these efforts and would also consider how recent gains in agreement on industrial chemicals might be expanded to include pesticides, foods, drugs, and consumer products.

- Establish coordinated chemical data and information systems and exchanges with other countries and international organizations.

2. Hazardous substances export policy

Federal policy on the export of substances which are significantly restricted or banned in the United States has been under consideration for some time and a Hazardous Substances Export Policy has been proposed. The unrestrained export of such substances by U.S. firms not only introduces dangerous contaminants into the global environment but tends to undermine foreign confidence in American-made products. Importing countries -- many of them poorer, less developed nations of the world -- have urged that exporting countries not permit the export of banned products without the knowledge and consent of the importing government. To address this problem, the proposed Policy provides a more uniform procedure for carrying out legally required notifications of the export of many banned or significantly restricted substances and an annual summary of U.S. regulatory actions regarding

hazardous substances.

The Policy also provides, in certain very limited circumstances, for export controls under the authority of the Export Administration Act. Such controls would be considered for extremely hazardous banned and significantly restricted products whose export would cause clear and significant harm to the foreign policy interests of the United States.

The Policy also calls for enhanced efforts to seek international agreement on principles involved in the export of hazardous substances.

Recommendation: Exports of hazardous substances should be better controlled. Specifically, an Executive order should be issued implementing the Hazardous Substances Export Policy as proposed in the Federal Register and revised pursuant to comments. In addition, the State Department, in cooperation with other agencies, should seek international agreement on hazardous substances export policy.

3. Hazardous wastes

What the United States, as one of the world's largest generat -s of hazardous waste, does with its waste has global ramifications. Other countries may be affected, through both intentional and inadvertent export. Improvement in the ability to handle wastes domestically will benefit not only the United States but other countries as well.

Recommendation: To improve U.S. ability to handle hazardous wastes and protect human health, the U.S. government should:

- Encourage states to grapple with the issue of siting hazardous waste facilities and guarantee continued

federal assistance on siting problems.

- Convene the Second National Waste Exchange Congress to encourage trading of industrial wastes and byproducts as an alternative to disposal.

- Establish specific programs to identify and use relevant foreign science and technology related to control, recovery, and recycling of wastes. Technology on waste control from other countries is, in certain instances, much superior to what now exists in the United States. Large benefits could accrue from a minimal expenditure of funds.

4. Hazardous wastes export policy

It is important that the hazardous waste problem now being faced by the industrialized nations not be "solved" simply by transferring it to less developed nations who are even less able to prevent or mitigate adverse impacts. The uncontrolled export of hazardous wastes from the United States could damage our reputation as a responsible member of the international community as well as our bilateral relations with a recipient country and, in some instances, its neighbors.

Once a hazardous waste leaves the territorial jurisdiction of the United States, the United States loses its ability to regulate transportation, storage, and disposal activities. The best way to ensure that movements of hazardous wastes are properly conducted to protect the global commons and the health and environment of all nations is by international agreement. In the meantime, it is necessary for the United States to exercise restraint to protect its

own foreign policy interests as well as the world environment.

Hazardous waste exports, unlike chemical substances, generally offer no benefits that must be considered in conjunction with the disadvantages, they do not contribute to a positive balance of trade (we usually pay to export them), and they pose recognized hazards to health and the environment. Thus a general presumption against their export seems reasonable. Nevertheless, because there is a severe shortage of adequate disposal facilities, there may be situations in which export is mutually beneficial to the United States and the recipient country in order to take advantage of the most practical and environmentally sound disposal options.

Recommendation: Procedures for regulating the export of hazardous waste should be developed. One mechanism is to use the Export Administration Act, with regulation similar to that of the proposed Hazardous Substances Export Policy except that the presumption against export would be stronger. Another action is to seek an amendment to the Resource Conservation and Recovery Act (RCRA) to control exports of hazardous waste. The Environmental Protection Agency's (EPA) current RCRA regulations already require notification of export.

In addition, efforts should be made, working through OECD and UNEP, to reach agreement with other countries on common criteria for transportation, storage, and disposal; for labeling hazardous wastes in international commerce; and for full notification and disclosure of all pertinent information to receiving nations.

5. Trade in hazardous substances

For a variety of reasons (taxes, labor costs, regulatory costs), the manufacture of hazardous substances outside the United States and other developed countries appears to be

increasing. Many hazardous substances industries are locating in developing countries, where the capability to control byproducts of the manufacturing process is inadequate.

Recommendation: A U.S. interagency study should examine the problem of location of hazardous industries in developing countries. The study should emphasize assessment of the problem, possibly using data on U.S. imports of hazardous substances to evaluate the magnitude of such trade and to identify which countries are becoming the centers of manufacture of specific hazardous substances. Consideration should be given to targeting bilateral and multilateral technical assistance to developing countries that are becoming centers for hazardous substance manufacture. The study might be coordinated by the Council on Environmental Quality and the Department of Commerce and should include the Departments of State and Labor, EPA, the Agency for International Development, and other interested agencies.

6. Pesticide use

Pesticides provide many benefits to agricultural production, but contamination from pesticides also poses major threats to both developed and developing countries. To control problems of worker poisoning, water supply contamination from pesticide runoff, destruction of species and habitat, increasing resistance of pests to pesticides, and crop losses, the United States must increasingly use integrated pest management (IPM) and encourage other countries to do so. Further discussion and specific recommendations are included in Chapter 2, Food and Agriculture.

7. Nuclear Wastes

Many reports, including The Global 2000 Report, project increasing global use of nuclear energy during the remaining

decades of this century. Some of this expansion will take place in developing countries. As the number of nuclear power plants increases, the problem of nuclear waste will increase proportionately.

A typical light water reactor produces about 30 tons of spent fuel per year. During the same period, 26,000-46,000 cubic feet of low-level radioactive wastes are also produced. The onsite spent fuel storage facilities for a reactor which begins operating today will reach capacity levels in two to three decases. There is growing concern that, lacking the scientific-technical expertise, the institutional capacity, and an informed public, countries will resort to marginal or unsate methods of disposing of their nuclear wastes, e.g., shallow land burial or unsanctioned ocear disposal.

The accumulation of spent fuel also increases the likelihood of nuclear weapons proliferation. Reprocessing is often but incorrectly advocated as a "solution" to the problem of spent fuel disposal. In fact, reprocessing could create an even greater waste disposal problem; U.S. studies have shown that the volume of wastes from reprocessing which regaire long-term isolation from the environment is approximately 10 times the original volume of the unreprocessed spent fuel. Moreover, reprocessing only defers the time when wastes must be disposed of and does not in itself result in

the disposal of any wastes. Unless the rate of nuclear waste accumulation is slowed or real waste disposal options are provided, it is likely that reprocessing will gain acceptability as a false and temporary solution to serious waste management problems.

One primary end product of reprocessing is plutonium, which, in addition to its potential use as a substitute for uranium as a nuclear fuel, can also be used to make nuclear weapons. Because of this potential, U.S. policy is to discourage construction or expansion of reprocessing facilities which are not related to near-term needs for the separated plutonium for advanced reactor research and development. These efforts could be seriously undermined if more and more countries mistakenly accept the notion that their nuclear waste problems will somehow be helped by reprocessing.

Recommendations: To address the problem of nuclear waste in different countries, the United States should:

- Use all available opportunities to encourage nonnuclear energy alternatives.
- Take an active role in promoting the establishment of international facilities for storage-disposal of nuclear wastes (including spent fuel) and continue the announced U.S. policy of accepting spent fuel from selected developing countries; this action will help prevent the spread of nuclear weapons capability by reprocessing technologies which can result in direct access to weapons-usable materials.
- Initiate a major study of the nuclear waste management plans and practices of each nation engaged in nuclear trade with the United States and with other nuclear supplier nations. Such a study would include a

comprehensive inventory of types and projected amounts of wastes; existing and potential waste disposal sites; nation-by-nation goals, programs, and policies, as well as current practices; and an assessment of the technical and institutional capability of individual nations to dispose of their nuclear wastes safely.

- Give high priority to assisting the International Atomic Energy Agency (IAEA) and UNEP in their efforts to develop criteria and standards for nuclear waste management.

- Endeavor to include provisions in all agreements with other countries for protecting the environment from contamination from nuclear wastes. This action would be consistent with section 407 of the Non-Proliferation Act, which obligates the President to endeavor to provide for cooperation of the parties in protecting the environment from radioactive, chemical, or thermal contamination arising from peaceful nuclear activities.

Political concern about the risks of disposal of radioactive waste on land may lead to greater interest in oceanic disposal. Yet present understanding of the long-term cumulative effects of radioactive materials introduced into the oceans is tentative and incomplete. Present international agreement allows disposal of low level radioactive material in the oceans. This discussion and accompanying recommendations are addressed only to low level wastes.

Recommendation: The United States should exercise international leadership, bilaterally and in multilateral organizations, to insure that the ocean commons is adequately protected from the introduction of radioactive material. Specifically, the United States should:

- Encourage recipients of exported U.S. nuclear technology to adhere to the radioactive waste provisions of the London Dumping Convention and other international rules and standards for protecting the global environment from nuclear wastes

- o Expand scientific assessment and monitoring of releases of radionuclides into the oceans
- o Increase cooperation with other countries on such assessment and monitoring
- o Urge and participate in increased capability to monitor the deliberate or accidental introduction of radioactive materials into the ocean or atmosphere.

C. Global Atmospheric and Climate Problems

Adequate supplies of food, water, and energy to meet the growing demands of the world's people will depend, in large part, on favorable climatic conditions over the coming years. Nevertheless, basic knowledge of climate and man-induced or natural alteration of the atmospheric processes is surprisingly small.

Scientists have identified a number of important climate and air pollution problems that could have significant adverse effects on the human condition and society over the coming years. In particular, three long-term changes in the global atmosphere are considered of great importance: the increase in concentration of carbon dioxide (CO_2), the depletion of the ozone layer in the stratosphere, and the deposition of acid rain. Quite generally, the need to be able to better forecast climate changes is also a pressing issue.

1. Carbon dioxide

Carbon dioxide is an odorless, tasteless gas that occurs naturally in trace amounts (0.03 percent) in the atmosphere. CO_2 plays a critical role in maintaining the earth's heat

balance by trapping part of the infrared radiation emitted from the earth. Over the past century, CO_2 atmospheric concentrations are believed to have increased about 15 percent, largely as the result of burning fossil fuels. Depending on the growth rates in the burning of fossil fuels, the global atmospheric CO_2 concentration could double before the middle of the next century. The result could be significant alterations of precipitation patterns around the world, and a 2-3° C rise in the average surface temperature of the middle latitudes. Such climate changes could in turn lead to widespread agricultural, ecological, social, and economic disruption. At present, the nature, time and onset, and regional distribution of these impacts are not at all well understood.

Recommendation: The United States should ensure that full consideration of the CO_2 problem is given in the development of energy policy. Efforts should be begun immediately to develop and examine alternative global energy futures, with special emphasis on regional analyses and the implications for CO_2 buildup. The analyses should examine the environmental, economic, and social implications of alternative energy futures that involve varying reliance on fossil fuels, and they should examine alternative mechanisms and approaches, international and domestic, for controlling CO_2 buildup. Special attention should also be devoted to determining what would be a prudent upper bound on global CO_2 concentrations.

International collaboration in assessing the CO_2 problem is particularly important. The international dimension of the problem is clear. The developing nations include about 70 percent of the world's population but presently account for

only about 20 percent of the world's total commercial energy consumption. In the coming decades, the percentage of global energy that they consume is likely to increase. By the year 2000, the United States may be using about 25 percent of global fossil fuel consumption (down from 30 percent today) and contributing a similar share to global CO_2 emissions.

Recommendation: The United States should continue to work toward international cooperation on research, with the goal of eventually forming a consensus on the seriousness of the CO_2 problem and the desirability and need of taking international action to avoid serious climate modification.

2. Ozone depletion

Ozone (O_3) is a trace gas in the atmosphere; it plays an important role in the overall radiation balance of the earth. The stratospheric ozone layer protects the earth from damaging ultraviolet radiation. This layer is now believed to be threatened, however, by emissions of chlorofluorocarbons (CFC) used as aerosol propellants, blowing agents in foam production, solvents, and refrigerants; by certain other halocarbon emissions; and by nitrous oxide (N_2O) emissions from the denitrification of both organic and inorganic nitrogen fertilizers. The most widely discussed effect of ozone depletion and the resulting increase in ultraviolet radiation is an increased incidence of skin cancers, but damage to food crops and fish could also be significant and might actually prove to be the most serious ozone-related problem.

Although the United States has banned non-essential aerosol uses of CFCs and some other countries have taken steps to control CFC emissions, the worldwide growth in non-aerosol uses of about 7 percent per year threatens to wipe out current gains.

Recommendation: Further domestic and international action is called for. Specifically, the United States should:

- Support more research on ozone depletion, including research on modeling, chemical reaction rates, measurements, and effects of ozone depletion on human health, plants, animals, and ecosystems
- Commend and encourage the continuation of UNEP and OECD efforts in integrating, evaluating, and disseminating research results on causes and effects of ozone depletion and on regulatory and economic aspects of controlling emissions
- Continue to explore effective ways to protect the ozone layer, such as the recent statement of intent by EPA to propose regulations to halt growth in CFC emissions by limiting the total ozone-depleting capabilities of all CFC production to present levels.

3. Acid precipitation

The increased emission of sulfur oxides and nitrogen oxides primarily from the burning of oil and coal is causing rainfall over wide areas to become more acidic. Much of the eastern half of the United States, large parts of southern Canada, and parts of northern Europe and southern Scandinavia have been affected. All told, several thousand lakes have been damaged. A number are lifeless, perhaps irreversibly so. Acid precipitation may cause damage to forests, soils, crops, nitrogen-fixing plants, drinking water, and building

materials as well. It is known that over a period of 3-5 years simulated acid rain begins to acidify soils and release metals. Most food crops do not grow well in acid soils, and the increased uptake of metals in crops could affect human health in certain cases. The extent to which acid rain will adversely affect food production is still unknown, but it could be significant over the next 20 years.

Sulfur emissions do not respect international boundaries and have been the source of controversy between countries. The United States and Canada are currently engaged in discussions and negotiations on emissions affecting the other's territory.

Recommendation: To reduce the threat caused by acid precipitation, the United States should:

- Support further research on acid precipitation, particularly research relating to identification of significant natural and man-made sources of acids and acid precursors, transport patterns, chemical transformation processess of precursors to acid, and atmospheric phenomena related to acid rain. A long-term program of research and monitoring of acid precipitation is essential for determining trends in acidification and identifying the sources and causes of harmful effects. This effort should be coordinated by the federal Task Force on Acid Precipitation.

- Go forward on work between the United States and Canada under the Memorandum of Intent to control transboundary air pollution. This work includes negotiation of a bilateral agreement as soon as possible.

- Intensify efforts under the Clean Air Act or other legal authority to control acid deposition and other interstate pollution caused by long-range transport. Amendments to the Clean Air Act may be required to increase EPA's ability to address acid deposition and the

regional air quality degradation caused by long-range transport in an efficient and equitable manner.

4. Climate and atmospheric processes in general

The uncertainties and risks posed by CO_2, ozone depletion, and acid rain are representative of the climate and atmospheric issues that will confront policymakers as they grapple with the problems of growth and change over the coming decades. The seriousness of the impacts of human activity on the atmosphere has only recently been recognized. Yet attention has been concentrated on just a few of the climate problems that will confront our society in the decades ahead. The results of scientific research on the atmosphere have been useful to policymakers in dealing with these problems, but too often the information available is based on too thin a foundation of basic knowledge to provide unequivocal answers. It is clear that energy generation, manufacturing, and agricultural activities will increase at an unprecedented rate in response to rapid world population growth and to wider application of sophisticated technologies. Without an intensive program of fundamental research on atmospheric and climate processes and the effects of global atmospheric pollution and climate change on earth, science will be unable to provide answers to the many climate-related policy questions that will inevitably arise as a result of these accelerated activities.

Existing federal research programs on climate and the atmosphere provide a solid foundation for addressing the pressing needs for both research and international cooperation. As a result, the initiatives offered below are primarily designed to foster international cooperation, provide better management and coordination of existing federal programs, and extend basic research to address important issues not adequately covered at present.

Most of the recommendations concern the World Climate Program (WCP) which was established by the 8th World Meteorological Congress in 1979. Its three basic objectives are to take full advantage of present knowledge of the climate, to take steps to improve that knowledge significantly, and to foresee and prevent potential adverse manmade changes in climate.

Recommendation: To further understanding of climate and atmospheric processes in general and to foster international cooperation, the United States should:

- Work for the improvement of the WCP by calling for the establishment of an overall intergovernmental planning and coordination body. In addition, establishment of a voluntary fund for all aspects of the WCP instead of relying on funding through large bureaucracies (World Meteorological Organization (WMO), UNEP) would be beneficial. Part of this fund could be used to support training and establishment of necessary observation and analytic capabilities in developing countries.

- Strengthen the National Climate Program in the Department of Commerce by making available a pool of discretionary funds to be used for such matters as support for an internationally organized assessment of global impacts of atmospheric CO_2.

- Announce a policy of greater U.S. participation in the global monitoring of atmospheric and oceanic variables of climate and climate changes, an expanded effort to obtain improved climate models, and an expanded research program on the chemistry of the global atmosphere.

CHAPTER 9

SUSTAINABLE DEVELOPMENT

The Global 2000 Report lends new perspective and -- if it is possible -- adds new urgency to the findings of recent surveys of the global development prospect such as the World Bank's World Development Report, 1980, and the Brandt Commission's North-South: A Program for Survival. These and other studies all indicate that many developing countries face slower economic growth in the coming years than was previously expected. The studies further indicate deepening poverty for the poorest countries and for huge numbers of the poorest people within many more countries.

The economic and political roots of these economic projections have been well analyzed by the World Bank, the Brandt Commission, and others. In addition, The Global 2000 Report makes clear the immense importance of the complex interactions among natural resources, environment, population, and economic development. A deteriorating relationship between human populations and the natural systems and resources that sustain them is a major contributor to deepening poverty in many regions. Emerging resource scarcities and the declining productivity of forests, rangelands, croplands, and fisheries are undercutting economic progress. Major capital investments have produced disappointing results

in some cases because ecological feedbacks and problems with the underlying resource base have been ignored in the planning process.

The Global 2000 Report lays to rest the myth that environmental protection and development are necessarily incompatible goals. Many of the world's most severe environmental problems are in part a consequence of extreme poverty: deprived people are forced to undermine the productivity of the land on which they live in their necessary quest for food, fuel, and shelter. Cutting of trees by the very poor for fuelwood and land to grow food is a major cause of deforestation in many regions. Overgrazing on marginal lands is the leading cause of desertification in others. Only a concerted attack on the socio-economic roots of extreme poverty, one that provides people with the opportunity to earn a decent livelihood in a non-destructive manner, will permit protection of the world's natural systems. Nor will development and economic reforms have lasting success unless they are suffused with concern for ecological stability and wise management of resources.

The U.S. government has recognized the importance to U.S. national interests of global economic progress, the eradication of poverty, and global environmental stabilization. These interests arise from economic and national

security as well as from humanitarian concerns. This report presents proposals for significant increases in foreign assistance, targeted on critical development problems that most affect the poorest. Still, it must be recognized that the prospects for economic progress in the developing countries are affected by many other forces in addition to foreign aid. Foreign exchange and capital needs are usually influenced more by export, direct foreign investment, private bank loans, and domestic savings than by international development assistance. Developing countries' domestic social, economic, and political policies often have more impact on the plight of the poor than do any international policies. A wholesale attack on global poverty must include, in addition to aid, consideration of such issues as protectionism, commodity agreements, export credits, debt rescheduling, practices of private corporations, decisionmaking in multilateral institutions, and domestic policies of developing countries. In particular, as the World Development Report, 1980 has emphasized, the development of human resources -- raising education levels, increasing health care, and improving nutrition -- must be given more emphasis in development planning and investment.

The U.S. government, most recently through coordination of the International Development Cooperation Agency (IDCA), is already attempting to promote an overall strategy for

international development. Its elements include:

- o Efforts to maintain an open international trading system
- o Efforts to encourage and provide international finance to help developing countries hard hit by oil price rises and inflation make needed structural adjustments (e.g., changes in government budgets, tax policy, and monetary policy)
- o Efforts to increase the amount of money available to finance development programs, including expansion of assistance from bilateral and multilateral donors, conventional finance from government agencies and private banks, and investment funds from private sources
- o Encouragement of the adoption by developing countries of policies and programs that support more equitable growth and meet the basic needs of the poor.

A. International Assistance

One common thread in all recent analyses of the development prospect is a focus on the extreme inadequacy of current international development assistance in relation to the cost-effective opportunities and vital needs for aid. One part of the solution, obviously, is for developed countries and oil-exporting countries with a foreign exchange surplus to work together to increase substantially

the resources available to multilateral development banks.

The multilateral development banks, principally the World Bank, are the largest source of external official development assistance to developing countries. The banks have been active in all major sectors of global population, resources, and environment problems. Their programs in population, food and nutrition, water supply, health care, and energy development are well conceived and are among the most effective means of dealing with global population, resource, and environment issues.

The multilateral development banks merit continuing support from the United States. It should be noted that the United States is sufficiently in arrears of its obligations to the development banks to damage their effectiveness, particularly the work of the International Development Association (IDA). This fact tends to undercut the leadership role of the United States with regard to the banks.

Recommendation: To enable the World Bank and other development banks to carry out their critical development tasks and to make the U.S. voice better heard on resource, environment, and development issues, the United States must make up its arrearages to the banks and development funds and contribute its share to the IDA and to the World Bank's general capital increase ($8.8 billion over 7 years, of which only $660 million would actually be paid in).

There is a need for more awareness of natural resource and environment issues in the programs and projects of the development banks. In February 1980, several of the banks,

including the World Bank, together with UN Environment Programme and other international organizations, signed a Declaration of Environmental Policies and Procedures Relating to Economic Development. The Declaration is a good first start in integrating conservation and environment considerations into the programs of the banks. More specific and concrete action is needed, however, to implement the pledges of that Declaration.

Several ways are available to bring more awareness of resource and environmental issues to development bank programs. One effective measure would to be integrate resource and environment considerations into the Country Economic Profiles of each borrower country prepared annually or biannually by the World Bank. These documents are the result of extensive country visits by multidisciplinary teams and are widely (albeit discreetly) circulated in the world development community. They provide the World Bank with information that it needs to make sound loan judgments. In addition, they are heavily relied upon by government planners and others in agencies and banks. Enlargement of these economic surveys into Country Economic and Resource Surveys could have a very beneficial influence on global population, resources, and environment issues.

Addition of staff and systematic environmental review procedures for specific projects similar to those recently

implemented by the Agency for International Development in their programs would also be useful. These and other actions implementing the steps in the UNEP Declaration are essential.

Recommendation: The United States should also press the development banks to integrate resource and environmental considerations more fully into their planning. The banks should be urged to add staff who are specialists in resource management and environmental planning and to undertake environmental review procedures. The World Bank should be requested to integrate resource and environment considerations in its Country Profiles.

B. Bilateral Assistance

In the past, the United States has made substantial use of foreign assistance to further foreign policy goals. Following World War II, a massive foreign aid program helped to rebuild the war-damaged economies of Western Europe and Japan. The United States remained a world leader in development assistance through the 1950s and early 1960s, turning its efforts after the reconstruction of the developed countries to the Third World. Over the past decade or so, however, U.S. development assistance has declined, dropping from $3.046 billion (1970 dollars) in 1970 to $2.131 billion (1970 dollars) in 1979. In view of the size of our GNP and the level of our prosperity, the United States has fallen far behind many other countries in provision of official development assistance.

U.S. development assistance is currently projected at

about $10 billion in bilateral aid over the next 5 years. There are opportunities for effective use of a substantial increase on the order of about 40 percent over a 5-year period. These additional aid funds, if accompanied by similar renewed commitments by others, could have a significant impact on the web of development-resource-environment problems, possibly reducing by one-half the number of hungry people by 2000 and increasing from one-third to two-thirds the proportion of the world's families which have access to family planning.

The increase would be targeted at the key sectors of food, energy, and population and health. Many of the proposed uses of a major aid expansion are discussed in the chapters on food, energy, and population. Together they form an integrated aid package by the United States which could provide leadership in confronting the challenge of global development.

Recommendation: The United States should provide for a major expansion in bilateral aid beginning in the years immediately ahead, with emphasis on food, energy, and population and health. The programs should be coordinated with those of other countries.

C. Integrating Natural Resource and Environment Considerations

U.S. development assistance programs must be planned with adequate attention to natural resource and environment, thus helping to assure the long-term success of U.S.

investments and sustainability of development. What is required is a holistic approach in which consideration of natural resource and environment factors are fully integrated into IDCA's and AID's decisionmaking both in Washington and in the field. Other agencies with significant activities abroad should also ensure that resource and environmental considerations are key factors in the planning of projects that contribute to economic development. The United States has made strides in the past 4 years, increasing attention to environment and natural resource issues in development assistance and cooperation programs. Much remains to be done, however.

Of particular importance are AID's country environmental profiles, which provide a much needed information base for the design of strategies and specific development assistance projects for the protection and more effective management of critical natural resources. These studies may be used very effectively as planning tools not only by AID but by host countries as well.

In response to a Congressional mandate, AID has completed numerous library-based country environmental profiles. However, it has completed very few of the in-depth studies, including field work in the receiving country, that are needed for effective program planning and alteration. Recommendation: AID should greatly accelerate the production

of country environmental profiles, with a target of completing them within 2 years, basing them on in-country examinations and working with the consent and aid of host governments. The profiles should give serious consideration to such issues of global importance as deforestation, loss of biological diversity, and desertification.

AID's programs have been improved through the conduct of environmental assessments for projects that AID supports. However, the perspectives provided by the country profiles, environmental assessments, and other sources have not always been fully incorporated into the decisionmaking process.

Recommendation: AID should seek more and better-trained staff in the environment and natural resource field to:

- Improve analyses of environmental impacts of projects and to plan new projects in natural resource management
- Train field personnel to be attentive to natural resource and environment problems
- Oversee more closely the planning and implementation of environmentally sensitive projects, such as dams, roads, irrigation, and land colonization
- Assist developing countries in building their own natural resource management institutions.

Although the country assessment and environmental profiles have greatly contributed to integrating natural resource and environment issues into AID's assistance programs, there is a need for strengthening attention to resource and environment issues by other agencies involved in development assistance and cooperation. In particular, improved integration on the part of IDCA, the policysetting

body for U.S. assistance, would be beneficial, because consideration of natural resource and environment issues sometimes falls between the cracks of IDCA's priority planning areas of food, energy, and population and health.

Recommendation: IDCA and other agencies with significant activities abroad affecting economic development should consider ways to further the integration of natural resource and environment issues into their decisionmaking. Thought should be given to adding a new IDCA division on resource management and environment protection and, generally, to improving staff capabilities in these issues.

D. Technical Assistance

A major contribution of the United States toward sustainable development is provision of technical assistance by agencies other than IDCA and AID. Major barriers exist to increase the flow of technical assistance. Chapter 10, Institutional Changes, discusses the barriers and makes recommendations.

CHAPTER 10

INSTITUTIONAL CHANGES: IMPROVING OUR NATIONAL CAPACITY TO RESPOND

The Global 2000 Report deals with real problems of population, resources, and environment -- problems of hungry people and barren soils, of forests cut for needed fuelwood at a rate faster than new trees are planted, of the links between global poverty and resource depletion. Throughout this report we have tried to present useful suggestions for dealing with these substantive issues.

But that is not enough. If there is one clear lesson from the exercise of putting The Global 2000 Report together, it is that the U.S. government currently lacks the capacity to anticipate and respond effectively to these global issues. The difficulties encountered in assembling the projections presented in the Global 2000 study amply documented this fact. As of today, the government still does not adequately project and evaluate future trends; take global population, resource, and environmental considerations into account in its programs and decisionmaking; and work with other countries to solve these problems. Clearly, changes in our governmental institutions are needed to insure continuing attention by governments and citizens in our own country and others to long-range global population, resource,

and environmental issues.

This chapter provides no final answers to these institutional problems. Rather, it opens a discussion and outlines options. Its chief recommendations are for the creation of two new institutions that would focus the government's attention and response to long-term global population, resource, and environment issues. One of the recommended institutions would be located in government (Federal Coordinating Unit). The other would be a hybrid public-private organization (Global Population, Resources, and Environment Analysis Institute) to help bridge the gap between the government and the private sector. One or the other of these institutions would carry out most of the rest of the recommendations made in this chapter. Such focal points are needed to coordinate the gathering of data and making of projections, to coordinate disparate agency policies, and in general to force a consistent, coherent vision of global problems lying ahead and to force decisions on how the United States may best influence that future.

A. The Government's Predictive Capability

A necessary predicate to effective action by the government on long-term global issues is the ability to make reliable projections of global population, resources, and environment trends. These projections are, of course, only as good as the data and models on which they are based.

The Global 2000 Report emphatically pointed out the need to improve data and modeling from the point of view of both the "user" (i.e., policy analyst) and the "doer" (i.e., those who collect data or formulate models).

The projections in Global 2000 were based, for the most part, on data readily available to agencies and on the models that they ordinarily use. Data, models, and projections for some sectors (such as population and food) were extensively detailed, but for others they were extremely sketchy. In some cases, essential data were not available, had not been validated, or conflicted with data from different sources. Likewise, in some cases, models for specific sectors were not documented or validated. All the sectoral models suffered from a serious lack of coordination or links with models for other sectors, and assumptions for the various models were inconsistent. With this inadequate analytic capability, the U.S. government is seriously hampered in its ability to anticipate developing problems and to act on them in a timely fashion.

Advanced below are several recommendations for meeting the need for improved data collection and modeling. The recommendations fall into three broad categories: coordination of data collection and modeling, improving the basic quality of data and models, and interaction with international efforts on data collection and modeling. Throughout it

should be kept in mind that data collection and modeling are part of and serve the needs of a larger effort to develop sound policies on global issues.

1. Coordination

Data on world population, resources, and environment, collected by many different agencies, by foreign countries, and by international organizations, are typically redundant, inconsistent, and incomplete. Moreover, because many of the data are collected to fill specialized needs, they are ill-suited for such uses as global modeling. No entity has overall responsibility for a well-conceived, coordinated effort to make available the data needed for policy analysis of long-term global issues.

Similarly, the creation of models of world population, resources, and environment by many different entities again results in redundancy, inconsistency, and gaps. An additional and perhaps more serious problem has to do with the inconsistency of assumptions among the models and the lack of "feedback" and "exchanges" among them. In U.S. government practice, the models for each sector or subject area generally produce projections independently of other sectoral models. Furthermore, these models are not well-suited to analyzing different scenarios -- that is to answering "what if" questions -- particularly those which involve more than one sector. Again, no U.S. government entity has overall

responsibility for coordinating the modeling efforts of various agencies to insure compatibility, feedback, and linkage and for making available the modeling capability needed for policy analysis of long-term global issues.

The result of this distressing lack of coordination in the government's data collection and modeling efforts is that "collectively, the executive agencies of the government are currently incapable of presenting the President with a mutually consistent set of projections of world trends" (Global 2000: Technical Report, p. 5). To serve the President and the national interest better, we need to institute some means of coordinating the efforts of various government agencies on various sectoral issues to produce holistic, integrated projections.

Recommendation: A single government center should act as coordinator for the federal government to insure availability of an adequate data and modeling capability to carry out policy analysis on long-term global population, resource, and environment issues. To be most effective, this center should be part of the Federal Coordinating Unit for policy, discussed below, or at least closely coordinated with it. The center should:

- Identify long-range problems of global significance
- Promote the development of appropriate analytical tools and data required to assess long-term implications of global problems
- Coordinate and insure preparation, at timely intervals, of long-term projections of trends in global population, resources, and environment and carry out other studies related to these problems
- Prepare timely reports that assess the state of global modeling and data collection, evaluate these analytic

activities in the federal government, and make recommendations for improvements

- Name lead agencies for each population, resource, and environment subject area to decide what data should be collected, by whom, and with what methodology

- Coordinate modeling activities of government agencies to insure linkage, feedback, and compatibility of data among various models

- Establish and support a nongovernmental center as part of the public-private Global Population, Resources, and Environment Analysis Institute, discussed below, to enhance global modeling and analysis.

2. Improving the quality of data and models

In addition to improving coordination of the separate efforts of agencies on global data and modeling, the government should also take basic steps to improve the quality of data and particularly the quality of the models used. Improvements in both are essential. The most sophisticated of models will be of little use unless the data upon which it is based are full and accurate. Likewise, good data alone cannot assure valid results and will be wasted unless the models are of high quality. Some data upon which The Global 2000 Report was based were considered excellent (for example, population, climate, and economic data for the developed countries). Other data were quite poor (such as the data on water supply and use for most of the globe).

The models for various sectors used in Global 2000 also varied greatly in quality. Some were rich in detail, especially regional detail; others were far more fragmentary.

Some models were well documented so that interested critics could examine assumptions and techniques. For others, less adequate information was available. Although the potential importance of modeling in policy analysis is widely recognized, the methodologies available to the U.S. government are at best uneven and in some respects are rudimentary. For both data and modeling, quality assurance, and hence validity, was often an unknown factor.

An additional problem is lack of accessibility. For instance, most data are held in agency files and data banks and are hard to identify and use. Increased accessibility to data and models by other agencies and the public would improve the state of the art considerably.

The recommendations of this section are closely related to and are often supportive of the coordination recommendations above. These recommendations, however, are more technical and are directed more to the data collectors and model formulators than the preceding recommendations.

Recommendation: The government center responsible for coordinating data and modeling should undertake affirmative measures to improve the quality of data and models used by the U.S. government for analysis of long-term global population, resource, and environment issues. These measures should include establishing standards of data reliability, recommending increased support for data collection as necessary, and creating mechanisms for data validation. The government center should also develop and promote standards for model documentation, establish mechanisms for third-party validation and assessment of models, and review agency modeling plans and budgets. To further the goal of improved data and modeling, the center should have limited

funds of its own to sponsor research and applications activities. The center should promote wide access to data and models by establishing standards for data exchange and security and by working toward an integrated system for storing, processing, and using data on population, resources, and the environment. Existing data systems should be maintained by the organizations that established them, need them most, and use them most or be merged with others as determined to be most practical. This central office, in consultation with groups of modelers, should also work toward creation of a central storage and analysis facility to serve the needs of frequent users.

The government center should also establish a clearinghouse of information on the location and type of data and models used for global analyses. This task could be undertaken by such entities as the Office of Statistical Policy and Standards, the National Technical Information Service, the Library of Congress, or a private or international organization.

3. International cooperation

Data collection and modeling efforts of other countries and international organizations obviously present opportunities for improving U.S. efforts.

Recommendation: The government center responsible for data collection and modeling should take steps to assess work done outside this country and incorporate it, where appropriate, into U.S. efforts. Additionally, the United States should support and encourage efforts of international organizations such as the International Institute for Applied System Analysis and the Earthwatch network of the UN Environment Programme.

B. Policymaking on Long-Term Global Issues

A basic conclusion reached by almost all contributors to this report, within and without the federal government, was that the U.S. government is giving insufficient attention to long-term global population, resource, and environment issues. Agencies pay attention to their

small corner of the larger interlinked web of issues identified in The Global 2000 Report. Much of the energy of the bureaucracy is spent battling short-term day-to-day brush fires. And few agencies, other than the State Department, have the mandate and wherewithal to look beyond the territorial boundaries of the United States. Because no agency has the mandate to look at "the big picture," the federal government has no way of coordinating, deciding upon, and carrying out federal policies on long-range global population, resources, and environment problems. The point cannot be made too strongly: no entity is looking at these problems as a whole and on a continuous basis.

The problem, then, is how to insure institutionally that the federal government, in all its relevant aspects and branches, is aware of the importance of long-term global population, resource, and environment issues and takes these issues into account in its decisionmaking. This section lays out a number of options to address this problem, none of which alone is a complete solution.

1. Coordination of federal policy

An institutional focus for global concerns which would include compilation and assessment of data, projection of global trends, policy integration and coordination, and, above all, the means to insure that diverse people in

diverse agencies continue to think and act in terms of global problems is urgently needed. Some of the recommendations set forth here require legislation in order to be implemented; for most, however, legislation is optional.

There follow several options for structuring and housing an institution which could meet the needs described above:

- Creation of a new office in the Executive Office of the President (EOP) devoted solely to long-term global issues. This option would give the issues maximum emphasis, as well as enhancing the chances for adequate staffing and budget. A new office located in the EOP would be near the President, would not have competing responsibilities, and would be able to elicit cooperation from various agencies without disputes over agencies' prerogatives. The office's outlook would be not colored by a line agency's mission and preoccupations.
- Creation of an interagency coordinating committee on long-term global isues. A staffed interagency committee could be chaired by the head of an EOP unit or the Vice President. The staff of the interagency committee would be located in, though distinct from, the EOP unit. This approach would carry out the same types of functions as a new EOP office,

although not so efficiently.

- Assignment of the tasks to the Council on Environmental Quality or other existing EOP unit. The mission of an existing EOP unit -- CEQ, the National Security Council (NSC), or the Office of Management and Budget (OMB) -- could be broadened to handle long-term global issues. Additional staff resources and capabilities would have to be added. Of these, CEQ is the most logical because of its existing mandate and expertise in data collection and monitoring of environmental issues, because of its having cochaired The Global 2000 Report effort, and because of its having chaired the preparation of this report. This option avoids having to set up a new EOP unit. However, it carries with it the danger that global resource policy needs may become submerged beneath the unit's existing priorities. Properly structured, the functions under discussion might become a major part of a new EOP planning arm recommended by the National Academy on Public Administration -- an Office of Policy Research and Analysis.
- Splitting the functions, with Oceans and International Environmental and Scientific Affairs (OES) in the Department of State serving as the operating arm for policy development, and some other unit, presumably

within the EOP, handling government coordination. OES has extensive staff expertise in many of these areas. However, this scheme suffers from the possibility that these important issues may become submerged and coordination may not be as effective as required.

- Assigning responsibility for policy development to a designated individual. Another way of insuring at least some degree of coordination of policy analysis is to assign responsibility for Presidential advice and policy analysis and coordination to a particular person, such as a Special Assistant to the President. The individual would require a small staff. A separate center for coordination of data gathering and analyses would have to be established elsewhere in the government.

In carrying out its mandate, the Federal Coordinating Unit would be ideally placed to serve as the center for coordination of data and modeling efforts described in the previous section. One of the office's duties would be to issue a biennial report to the Congress and the public.

Periodic reports on global population, resources, and environment would be an effective means to focus concern and effort on long-term global issues. Because of the magnitude of the task, a report no more than once every 2 years is as frequent as could be expected. The

report should contain the most current information on global population, resource, and environment problems and issues; the status of federal programs and actions which address these problems; new priorities (if different from the previous report); recommended program changes; and new program initiatives.

In addition, the Federal Coordinating Unit could undertake a number of tasks mentioned elsewhere in this report, such as preparation of other reports on global conditions and trends, coordination of various interagency task forces on global issues, providing funding for nongovernmental efforts, and coordinating a public awareness program.

Recommendation: A Federal Coordinating Unit should be established, preferably within the Executive Office of the President, with the mandate to coordinate ongoing federal programs concerning global population, resources, and environmental issues; to evaluate long-term trends in these areas; and to report to the President with recommendations for action. A staff of about 30 and an annual budget of about $6 million would be adequate to perform the full range of coordinating activities.

2. Action-forcing devices

Creation of the Federal Coordinating Unit is certainly the most important measure to insure that the government gives continuing priority attention to long-term global population, resource, and environment issues. Because of the seriousness and complexity of the problems, other measures are warranted to energize and bolster the efforts

of those charged with responsibility for global issues and to insure that action is being taken. Following is a list of "action-forcing" mechanisms that could be very useful. This is not to say that all are necessary or equally valuable. Some may be judged more effective than others. What is needed is a selective mix of the following action-forcing devices.

A Presidential message emphasizing the significance of problems, directing federal agencies to take specific action, and proposing legislation. A Presidential message publicly highlighting long-term global population, resource, and environmental issues is generally a very effective means of getting agencies to take action.

A Global Population, Resources, and Environment Commission. A commission, modeled on the Civil Rights Commission, composed of prominent individuals outside the government but appointed by the President could be created and required by law to monitor, evaluate, and report on the government's progress in addressing the issues.

Internal federal agency coordination. To mobilize federal government resources fully, federal agencies must be attuned to long-term global population, resources, and environment problems and be willing and able to act on them. Relevant federal agencies could establish a coordinating and policy office for long-term global population,

resources, and environment problems. This office would be responsible for insuring the integration of long-term global considerations into agency decisionmaking and for coordinating agency policy with the goals of the Federal Coordinating Unit.

Budget review. The annual budget review process should be used to insure that agencies are adequately addressing long-term global issues in their programs. All agencies are habituated to working within the budget cycle, which affords an occasion for periodic review and evaluation of progress. The budget process has an impact available in no other part of the government, and OMB attention to global issues is critical to assuring a coherent federal response. The Federal Coordinating Unit and the Office of Management and Budget should work together to review agency programs in terms of how they address or affect global population, resource, and environment problems. OMB should designate specific points of contact for global issues at a high level within OMB.

Each federal agency should be required, in its annual budget request, to identify recommendations made to it by the Federal Coordinating Unit and by the Global Population, Resources, and Environment Analysis Institute and to state what actions have been taken toward implementing those recommendations.

Government employees. Agency decisionmaking and performance vis-a-vis global population, resources, and environment issues are more likely to improve if its employees are educated about and rewarded for actions affecting these issues. Possibilities include: where relevant, making action on long-term global issues part of the performance evaluation criteria for the Senior Executive Service (SES); adding courses on global population, resources, and environment to the curriculum of training courses that SES personnel take; adding similar courses to the curriculum of the Foreign Service Institute; and making changes so that federal employees from domestic agencies who serve abroad are rewarded for such service, instead of being penalized (in terms of advancement), as is often the case now.

Legislative direction. Legislation which contains a mandate to all government agencies to pay attention to global population, resources, and environment issues in their programs and decisionmaking is one permanent way of focusing attention throughout the government. Legislation formalizing the mandate of the government, giving substance to our national commitment by creating the Federal Coordinating Unit suggested earlier, and creating the public-private Global Population, Resources, and Environment Analysis Institute described subsequently is recommended.

As with other government programs, Congressional oversight and evaluation should be maintained.

A blue-ribbon commission. A blue-ribbon commission on Global 2000, chaired by the Vice President and consisting of select Members of Congress, business leaders, educators, local and state government officials, and prominent citizens, would be appointed by the President under the Advisory Committee Act. The Commission would be charged with conducting hearings throughout the country to discuss legislative and other implementing mechanisms recommended in this report, to obtain the views of the public, and to prepare a report to the President with final recommendations.

Congress. In addition to the legislation suggested above, continued attention by the Congress to global population, resource, and environment issues is crucial. The nature of the political process is such that a premium is placed on responding to near-term problems and concerns. Current legislative proposals often fail to receive scrutiny in light of their long-term global implications. The Congress should undertake a vigorous effort to mobilize its long-range analytical capability in its major legislative research organizations in order to incorporate an assessment of global resource impacts into legislation. House of Representatives Rule X(Cl.2(b)(1)), which reads in part: "each [standing committee other than Budget and Appropria-

tions] shall . . . on a continuing basis undertake future research and forecasting on matters of jurisdiction of that committee," should be pursued. The role of the Office of Technology Assessment (OTA) and the General Accounting Office (GAO) in these issues should be encouraged.

Recommendation: The Executive Branch and the Congress should adopt action-forcing devices, selecting among the above measures, to insure that continued priority attention to long-term global population, resource, and environmental issues is given by the federal government.

3. Funding for technical assistance

Many federal agencies conduct programs and have expertise that have a strong relation to global population, resource, and environment issues (for example, the Environmental Protection Agency and the Departments of Agriculture, Commerce (NOAA), and Interior). The United States has traditionally managed assistance to developing countries through the Agency for International Development. This centralized administration has permitted the development of coherent strategies within countries. In addition, technical expertise is made available to higher income countries and some organizations, usually by means of transferring funds through the State Department to the agency offering technical assistance.

Yet agencies are hampered from putting their expertise to use in other countries where it will benefit that country and, ultimately, the United States by budget

restrictions, tight personnel ceilings, and cumbersome bureaucratic processes. EPA, for example, can offer technical assistance to another country only if it is reimbursed, either by that country (which in some cases is prohibitive) or by a lending agency (such as AID). Suppose, for instance, that a higher income developing country like Brazil, where there is no AID mission, requests technical assistance from EPA in planning for a new petrochemical plant with cost effective means of handling hazardous waste. EPA could respond only if Brazil paid cash on the barrel head or offered some quid pro quo of equal value. Yet it might be very much in the general interest of the United States -- and the world -- for an industrializing country such as Brazil to plan a hazardous new industry with the best possible technical advice.

Even when funds are available to reimburse the agency lending technical experts, the transaction may not flow smoothly. For one thing, tight personnel ceilings in the lending agency may make it difficult to free experts when they are needed. In fact, it is often hard for an agency with a mission which is principally domestic to justify adequately in its budget process requests for positions and funding to provide scientific and technical assistance to other countries. The small piece of such a

program belonging to one individual agency may get lost in the budget shuffle even though the capability of the U.S. government overall to respond to such requests is clearly important. Sharing our technical expertise can not only help to control global pollution and reduce world resource demands but can also benefit the United States politically -- far out of proportion to the cost.

Recommendation: To make technical expertise of U.S. agencies more readily available to other countries, budget allocations by program areas should be established for this purpose. The different agencies which work in that area could then be given shares of the allocation, with coordination through the International Development Cooperation Agency and the Department of State.

In addition, the budget process in general should be evaluated to determine how it can be made responsive to long-term global issues, including consideration of the merit of centralizing budget and management of global population, resources, and environment issues dispersed in the several agencies. The approach could be similar to that of OMB Circular A-51, which centralizes budgeting and management of the U.S. Antarctica program.

4. Assessing impacts of U.S. government actions abroad

The U.S. government should take special care that its own actions affecting critically important resources in other countries are well considered. Executive Order 12114, issued in January 1979, calls for environmental review of certain major government actions which have significant effects outside the United States. They include actions with exceptionally important effects on

human health or the environment in foreign countries, actions affecting "innocent bystander" countries that are not party to a U.S.-sponsored project, and actions with impacts on the global environment that belongs to no one nation but to the world in common. Only the last of these actions -- those affecting the global commons -- calls for a full environmental impact statement. For the others a concise environmental review or some other type of brief assessment may be done. These environmental review procedures are applicable only to major actions of U.S. government agencies, not to activities of private business or foreign governments.

Federal agencies' experience under the order for more than one year has shown its practical value. Actually, some agencies, such as AID, already had and continue to use more extensive environmental reviews than the order requires. Others, such as the Export-Import Bank, are now preparing brief reviews of certain projects that they intend to support, such as chemical plants that may have toxic effects on human health or the environment. These environmental review procedures are working well.

One section of E.O. 12114 calls for concise reviews of major federal actions significantly affecting "national or ecological resources of global importance," as designated by the President, or in the case of resources protected

by international agreement, by the Secretary of State. No such designations have yet been made.

This report emphasizes throughout the global importance of maintaining the earth's renewable resource base. The President's designation of certain major life support systems as globally important resources under E.O. 12114 is highly desirable, practically and symbolically. It would assure careful advance consideration of major U.S. government actions that might adversely affect critical life support systems. And it would underscore the importance that the United States, in concert with other nations, attaches to protecting the earth's carrying capacity.

On the basis of one year's study, extensive scientific advice, and criteria developed for designations, the Council on Environmental Quality and the Department of State are recommending that the President designate three biomes or major ecosystems as globally important resources under E.O. 12114. They are tropical forests, prime croplands, and coastal wetland-estuarine and reef ecosystems.

Recommendation: The President should designate tropical forests, prime croplands, and coastal wetland-estuarine and reef ecosystems as natural or ecological resources of global importance under E.O. 12114. In addition, the Inter-agency Task Force on Biological Diversity should identify resources in other ecosystems or biomes which should be designated because of their global importance to biological diversity.

5. Private sector involvement

The solution of Global 2000 problems requires that the flexibility, creativeness, and international acceptability of the private sector be used to the fullest possible extent. Universities, "think tanks," citizen groups, and industry groups are often better suited than government to suggest innovative measures, carry out analyses, and implement elements of programs. The United States is fortunate in having a large number of very active organizations of this type.

The government would benefit greatly from cross-fertilization with the thoughts and ideas of the private sector concerning long-term global population, resource, and environment issues. Yet careful, discriminating use by the U.S. government of nongovernmental resources is infrequent. Many agencies may not be aware of the full range of talents in the private sector.

To ensure the best, most creative thought on long-term global population, resource, and environment issues, a partnership between the private sector and government should be formed. To accomplish this, the Population, Resources, and Environment Analysis Institute, a hybrid public-private institute, should be created. A useful model for such an institute appears in H.R. 11678 and H.R. 12055, identical bills introduced in 1978 by Congressman Dingell and others to establish an "Institute for Long-Range Energy Analysis."

The new Institute, a counterpart of the Federal Coordi-

nating Unit, would have several roles, all designed to enlist private sector talents in the solution of global problems. A principal part of the Institute's mandate would be to supplement and strengthen the government's capabilities to make meaningful projections. The Institute would enlist other nongovernmental organizations to create and improve models and other analytic tools. A nongovernmental "Forum for Global Models," patterned after the Energy Modeling Forum, should be established as a way for modelers to gather periodically to discuss and criticize each other's work. Such a Forum would provide a means for good work to be recognized as well as an avenue for advancement of modeling.

In addition, the Institute should supplement the government's integrated policy analyses and should stimulate independent analyses of long-term global problems. It should maintain close relations with capable nongovernmental organizations in the United States and other countries as well.

Recommendation: The Global Population, Resources, and Environment Analysis Institute, a hybrid public-private institution, should be created, governed by a board appointed from both sectors and receiving funding from both sectors. Included in the efforts of the Institute should be a Forum for Global Models.

C. International Initiatives

Given its vast resources, scientific and technological know-how and achievement and the active participation of the private sector, there is much that the United States can do

internationally to address long-range global population, resources, and environment problems. In addition, as a large consumer of the world's resources, the United States has an obligation to examine its own actions and attune its policies and programs appropriately to the global context.

Clearly, however, actions by the United States alone are not enough. Every country, North and South, East and West, must examine its own role in long-term global population, resources, and environment problems and act accordingly. In addition, international organizations must expand their concerns to meet these challenges.

This section will outline institutional steps which the United States can take internationally, or influence others to take, to address global population, resources, and environment problems. It bears repeating that an essential condition for U.S. influence on these issues is a demonstration of our own commitment to action.

1. Encouraging other nations' assessments of global problems

U.S. efforts through The Global 2000 Report and this report to assess trends and develop responsive policies and recommendations have proven an extremely useful experience. It has drawn attention to the importance of anticipating long-term global problems, identified institutional weaknesses and areas of ignorance, highlighted critical global issues in need

of urgent attention, and raised government and citizen awareness of the serious problems lying ahead.

The educational process of preparing an assessment of long-range global issues and developing responsive policies is well worth recommending to other countries. Already, in fact, The Global 2000 Report has inspired other countries (for example, Canada and Japan) to begin similar analysis. Still other countries may wish to make such analyses in order better to define their perspective on the issues and work more fruitfully on long-term global issues in the international community.

Recommendation. The United States, following upon the work that it did in Global 2000 and this report, should encourage other nations to prepare appropriate evaluations of global population, resource, and environment issues and their role in them.

2. State Department

In recognition of the significance of global population, resources, and environment issues, the State Department has placed Global 2000 issues high on its list of priorities. The Department has already urged attention to these issues in many international fora, from the UN General Assembly to summit conferences.

Recommendation: The State Department should persistently emphasize global population, resources, and environment issues at every appropriate opportunity, drawing the attention of other countries and international organizations to the problems and pressing for remedial action.

3. International organizations

The active, effective involvement of UN agencies, the multilateral development banks, and regional organizations in global population, resource, and environment problems has been described in many places throughout this report. Continuation and improvement of these diligent efforts is indispensable. The United States should work closely with international organizations to improve their resource, environment, and population programs, addressing specific problems where changes may be needed. For an effective voice in influencing these programs, the United States must sustain its own policy and resource commitments to the programs and conduct periodic, high level reviews to produce modifications and additional commitments as necessary.

Recommendation: The United States should encourage and work with international organizations to assess their global population, resource, and environment programs and consider new approaches to deal more effectively with these issues, particularly to develop better coordination among international bodies in dealing with these complex interrelated issues.

The United Nations. Because it is a forum for all countries of the world, the United Nations and its affiliated organizations must play a key role in addressing global population, resources, and environment issues. Much of this report underlines the importance of the efforts of the UN Environment Programme, the UN Development Program, the Food and Agriculture Organization, the UN Fund for Population Activities, the UN Education, Science, and Culture Organization, the World Bank, and many others.

The UN Environment Programme. As the UN agency principally concerned with international environmental problems and the relationship between environment and development, UNEP has been a key factor in raising environmental consciousness in the Third World. It is at the forefront of global resource and environment issues and has the potential for playing a central role among international organizations in these issues.

UNEP's chief activities fall under three headings: global assessment of environmental-resource problems, development of coordinated management and control of such problems, and support of related information and educational activities. The United States should seek to strengthen UNEP in all three areas.

First, added financial and technical assistance is needed for UNEP's environmental assessment function (Earthwatch), specifically for the Global Environment Monitoring System (GEMS), which collects worldwide information on the dispersal of pollutants and the condition of natural resources (e.g., forests, desertification). Increased contributions would enable UNEP to help developing countries strengthen their monitoring and assessment capabilities and fill critical gaps in global environmental data. A special U.S. contribution may prompt similar efforts by other donor countries.

In addition, a U.S.-based Earthwatch regional center

should be established as an adjunct to UNEP data collection efforts. The U.S. center could take on monitoring of some specific problems such as water, oceans, or the pollutant and health aspect of the GEMS program on a worldwide basis. The center would be of use to domestic monitoring efforts as well. Creation of the U.S. center can be expected to stimulate other countries to establish such centers.

To give practical support to UNEP's environmental management efforts, the United States should support UNEP's Caribbean Action Plan. Building on the highly successful experience with a similar project for the Mediterranean, this comprehensive draft plan is part of the UNEP regional seas program. The Caribbean Plan directly affects U.S. interests. It is intended to provide a framework for development that incorporates environmental safeguards in the entire Caribbean region (including the Gulf of Mexico).

In addition, the 1982 UNEP Conference should be expanded to be more than a ceremonial occasion. The 1982 Conference marks the 10th anniversary of the Stockholm Conference on the Human Environment and the founding of UNEP. The Conference should seek to focus world attention on global population, resource, and environment problems and could assess the need for a large world conference on these issues. The 1982 Conference should also include a fresh evaluation of UNEP's role and how it can be supported and improved. In preparation for

the Conference, the United States should prepare its own evaluation of and recommendations for improving UNEP's role.

Recommendations:

- The United States should increase its contribution to UNEP (on the order of a 10 percent increase in present funding -- about $1 million annually over 5 years) for the specific purpose of improving the Global Environment Monitoring System.

- The United States should establish a regional Earthwatch center as an adjunct to UNEP's data collection program.

- A U.S. voluntary contribution to UNEP for the Caribbean Action Plan is desirable to help establish an effective program. This one-time contribution might be on the order of $2 million.

- The United States should urge that UNEP's 1982 Conference focus attention on global population, resource, and environment issues. The Conference should also include a fresh evaluation of UNEP's role.

Regional organizations. Regional organizations such as the European Community, Organization of American States, Association of Southeast Asian Nations, Organization for Economic Cooperation and Development, Organization for African Unity, and Arab Development Bank are actively interested in global population, resource, and environment issues. Some contribute assistance and expertise. Others provide a regionally indigenous forum for encouraging sound development without the resentments sometimes accorded outsiders.

Recommendation: The United States should encourage and assist appropriate regional organizations in their programs bearing on global population, resource, and environment issues.

4. Nongovernment organizations

Although action of international organizations is indispensable to resolving global population, resource, and environment problems, international nongovernmental organizations (NGOs) can also make important contributions. Often they do not have the political constraints of government entities and are able to bring an additional degree of energy and creativity to problem solving. A prime example of the valuable role of NGOs can be found in the World Conservation Strategy, which, although funded by UNEP was primarily written by the International Union for Conservation of Nature and Natural Resources. Another good example is the innovative methods of the International Planned Parenthood Foundation to further family planning.

Recommendation: The talents of international NGOs should be systematically drawn into international efforts dealing with global population, resource, and environment issues.

5. Bilateral agreements

The United States is party to a number of science and technology, environmental, and other bilateral agreements with other countries which may provide avenues of communication and action. For example, cooperative action on specific projects under the environmental agreements with China and the USSR may provide a means of moving forward to cooperation on global population, resource, and environmental issues.

Recommendation: The United States should inventory the full range of its bilateral agreements and develop recommendations on how they can be used effectively in dealing with global population, resource, and environment issues.

6. Transnational corporations

Transnational corporations also play a major role vis-a-vis global population, resource, and environment issues. Corporations have resources and expertise beyond the capability of governments which must be enlisted if the global challenges are to be met successfully. A cooperative relationship between industry and government on these issues is to the benefit of all. Constructive proposals from business for business involvement in these issues are found in the Contribution of Transnational Enterprises to Future World Development, prepared by the Industrial Sector Advisory Group to the UN Conference on Science and Technology for Development in 1979. Corporations engaged in business in other countries as well as in the United States have a responsibility to tailor their activities to take into account global population, resource, and environment problems.

Recommendation: The United States should call upon multinational corporations based in the United States to join with the U.S. government in developing and pursuing appropriate measures to deal with global population, resource, and environment issues.

7. Additional studies

Several issues relevant to this chapter merit serious further study. Among them is the possibility of establishing an International Academy of Sciences, which would provide a forum for exchanging views and reaching scientific consensus on global population, resource, and environment issues.

Another critical issue concerns what the national security implications are of global population, resource, and environment issues. Projections in The Global 2000 Report and other studies of resource impoverishment, environmental degradation, and possible scarcities of food and other resources in the next century could mean increasing international instability and rising risks of political crises. The dimensions of the national security threat have not been closely analyzed, however.

Recommendation: The United States should undertake the following studies:

- o National security implications of global population, resource, and environment issues
- o The role of trade in Global 2000 issues
- o The possibility of establishing an International Academy of Sciences, perhaps as an adjunct to the UN University, as a means of furthering scientific consensus on scientific issues of global importance.

D. Public Awareness

The Global 2000 Report makes it clear that current values and policies must be altered substantially in order to sustain the productive capacity of the earth's biological systems. Public awareness and better understanding of complex world population, resource, and environment problems can help build the necessary public climate for responsive citizen and government action to address the problems. Important as it is to inform the public of long-term global problems, information alone is not enough. The public must also take an active part

in the process of finding solutions. Such participation is an essential part of maintaining the level of public interest and support necessary for the far-reaching, long-term actions needed to alter present trends.

1. Dissemination of Global 2000 findings

Present efforts to find solutions to global population, resource, and environment problems are beginning to go beyond a rather limited group of government officials and private organizations. For example, the Committee on the Year 2000 has been formed to advocate effective responses to the rapidly growing pressures on the earth's natural resources; members include former high officials of government and leaders in business and the media. Such efforts must be expanded to include a broader range of organizations and interest groups as well as the general public. A far broader and more general knowledge of the issues identified in The Global 2000 Report is needed.

Recommendation: The U.S. government should maintain a continuing public awareness program, probably through an interagency public affairs task force, to publicize and encourage dialogue on the connections among global population, resource, and environment issues; foreign and domestic policy decisions; and the global economy. The program should also include efforts aimed at foreign audiences.

2. Major public conference on global population, resource, and environment issues

Another effective means of increasing public awareness and expanding thought and discussion on global problems would

be to plan for a major national conference devoted to the issues of America's responsibilities of stewardship to our own and the globe's natural resources. The conference should be held in mid-1982 and should involve comprehensive national participation. Such conferences held in the past proved very effective in focusing attention on resource management issues. One precedent is the first National Governors' Conference convened by President Theodore Roosevelt in 1908 to examine this country's stewardship of natural resources. Another precedent is the Mid-Century Conference on Resources for the Future, which followed the report of the President's Materials Policy Commission (The Paley Commission) in December 1952. Then President-elect Eisenhower served as the keynote speaker for the 3-day conference in which 1,600 people participated. It is timely to convene another such conference, this time on global resource issues. The conference should involve:

- All relevant federal government agencies
- State Governors
- Members of Congress
- Representatives of Congressional organizations (e.g., the General Accounting Office, Congressional Budget Office, Office of Technology Assessment, Congressional Research Service, and relevant committees)
- Representatives from business and agriculture
- Other private groups.

The conference could be prepared under the guidance of a blue-ribbon commission, as described earlier in this chapter. The commission could arrange for reports, conduct hearings around the country, and engage in other appropriate activities to stimulate debate on global population, resource, and environment issues.

Recommendation: The United States should convene a major national conference in 1982 to consider and discuss trends in and options for dealing with long-term global issues.

3. Educational materials

Because the perception and understanding of long-term global trends are relatively new and changing rapidly, few educational materials are available which reflect current knowledge in this area. There is a need for new curriculum and training aids and other educational materials to assist educators wishing to provide "holistic" instruction emphasizing the interconnections among global population, resource, environmental, security, and economic concerns.

Recommendation: The Secretary of Education, through the existing Federal Interagency Committee on Education, should take the lead role in developing a federal government program to improve the educational materials on global population, resources, and environmental issues.

4. Business awareness

American business has much to contribute to global resource management. Some segments of business will have a special interest in global resource issues because of their relation to long-term sustainability of economic activities.

Recommendation: Business leaders should establish a Global Population, Resource, and Environment Business Advisory Committee to increase awareness of and concern for Global 2000 issues and to develop a plan to address these problems by the business community.

E. Conclusion

The recommendations of this report are responsive to and flow directly from the findings of The Global 2000 Report. That report served the valuable purpose of increasing government and public awareness, in the United States and abroad, of long-term global issues. It sounded a warning that policies and institutions must be changed to avoid serious population, resource, and environment crises by the turn of the century.

The issues discussed throughout this report pose a unique challenge to the people of the United States to work together with other people to provide a better future for our children and grandchildren. This report contains suggestions for beginning to meet that challenge. The recommendations of this concluding chapter on institutional responses of the U.S. government are procedural and thus may lack a certain immediacy or excitement. Yet, in many ways, they are the most important in this report. If implemented, they will provide a lasting framework for the necessary changes in U.S. policies and decisions which, together with similar decisions in other nations, will shape our national future and the future of our planet.

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