# A Review of

# Colloquium Summary

# "Poverty and Environmental Degradation: Basic Concerns for U.S. Cooperation with Developing Countries"

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Colloquium Summary

# Poverty and Environmental Degradation: Basic Concerns for U.S. Cooperation with Developing Countries

Sponsored by
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Report prepared by
Janet Welsh Brown

## OVERVIEW

This paper argues that development depends on the sustainability of a global resource base. Thus, sustainable development means the integration of environmental policies with development strategies.

The first section of the paper discusses the costs of environmental degradation. Problems such as deforestation lead to declining food production, increasing food imports, and a negative balance of trade. Water pollution adds to childhood diseases and ultimately death.

The second section of the paper discusses what U.S. policy should be for the next decade. Policies for managing natural resources, planning for population increases, transferring technology and building institutions are discussed.

The third section of the paper addresses strategies for agriculture, forestry, water and sanitation, energy, population control, pollution control, and debt/trade policy problems.

(The following summary is ordered by type of problem (e.g. deforestation, agriculture...). The ways in which U.S. policy can best help implement the recommendations are listed first. Therefore, each topic and its following recommendations or solutions should be implemented by the U.S. within the boundaries of the recommended U.S. policy responses.)

## HIGHLIGHTS

Topic #1: What is an appropriate U.S. response, keeping in mind the definition of sustainable development?

> Sustainable development in U.S. terms is development that is environmentally, economically, financially and institutionally sustainable. U.S. development strategies for programs of cooperation, assistance, advice, and policies for trade and finance should be based on humanitarian values.

With this in mind, the U.S. should single out the following development priorities:

1. Capacity building and training should be uppermost in all aid so that LDCs will eventually be able to manage their own resources.

2. Encouraging policy reforms such as appropriate currency valuation, incentive systems, pricing systems and marketing mechanisms should be a priority.

3. Capacity building and policy reform should be supported by supporting analysis, advice and funding to make the policy transitions politically and economically feasible.

4. Non-governmental mechanisms should be given increasing attention.

## Environmental Problems and Their Effects on Development

### Agricultural Degradation

Development strategies such as encouraging agricultural exports and industrial development lead to the production of export crops. This displaces small, local farmers and leads to intensive monocultures which degrade the resource base. Eventually, food production declines because of the inability of the land to produce. Cropland in the Third World is predicted to shrink by 18% by the end of the century. This would lead to a loss of productivity of 29%. All of this will happen while nearly 900 million people will be born in LDCs and will need to be supported by that land.

Recommendations:

1. Development aid should focus on the rural poor which did not benefit from the Green Revolution style development of the past.

2. U.S. aid should support low-input agriculture.

3. The U.S. should use its political and economic strength to encourage large multilateral institutions (such as the World Bank) to make these priorities as well.

4. Geographically, aid should go to the most needy first. Specifically, Sub-Saharan Africa, then Mexico and Central America.

5. Technology will need to be extended to the poorest rural farmers, often women.

6. Equity can best be achieved through land reform. Issues such as security of tenure over natural resources, tenurial rights for women, and the management of common property hold particular significance.

Curbing Excesses of the Green Revolution

Recommendations:

1. Output prices should be raised to encourage production growth.
2. Impediments to production need to be eliminated.
3. The appropriateness of inputs should be judged on minimizing environmental damage as well as increasing food production efficiency.
4. The U.S. and the EEC should work in tandem on:
    a. the reduction of farm input subsidies,
    b. enforcing pollution laws concerning farm damages caused by chemicals, sediment ...,
    c. switching from agricultural price supports to direct income transfers for farmers,
    d. multinational negotiations to reduce export subsidies and import restrictions that reinforce domestic prices.

Deforestation

Deforestation leads to fuelwood shortages and soil erosion. Food must then be imported as well as timber since food production will decline. There is often a vicious circle between development and deforestation. For example, cattle ranching was promoted as an answer to raising foreign exchange in South America. Because of the nutrient poor soils of the tropical forests, cattlemen must move to new lands every ten years or less. This leads to imported fuelwood and less than expected revenues from cattle exports.

Recommendations:

1. Find and encourage innovative ways to increase local fuelwood supply such as growing trees for a cash crop (farm forestry).
2. Decentralize seedling production and distribution programs.
3. Support the strengthening of forestry and agroforestry research and extension.
4. Integrate tree planting with soil and water conservation programs.

Water Pollution

Sources of unpolluted water is often scarce in developing countries. Therefore, unclean water is used. Those most suceptible to the diseases, such as children and farm animals, suffer accordingly. For example, 80% of childhood deaths in LDCs are due to water related diseases.

Recommendation: Encourage more appropriate technologies such as decentralized community-based systems, stand pipes and hand pumps.

Inefficient Production and Use of Energy

Energy costs are the largest single part of national development budgets for the most part. Therefore, this takes the largest portion of foreign exchange. Furthermore, energy needs will continue to grow. Since the use of energy often causes serious environmental degradation (whether it is the soil erosion caused by dams or the risk of a nuclear factory), the solution must concentrate on efficiency and renewable sources of energy.

Recommendations:

1. Upgrade stoves, furnaces, boilers and kilns used in agriculture and manufacturing to be more energy efficient.
2. Require that state of the art technology for efficiency and pollution control be a prerequisitie for international assistance.
3. Perform feasibility studies to exploit natural gas instead of oil.
4. Do not support nuclear energy with development assistance at this point.
5. Enhance fuelwood supplies through reforestation and agroforestry.
6. Promote mini-hydroelectric development, solar and wind energy.
7. Encourage that energy subsidies be dropped since they encourage wastefulness and future energy insecurity.
8. Use foreign assistance to cushion the transition to more realistic prices and protect the poor from price increases.
9. Provide incentives for increasing efficiency and decreasing costs in conventional power plants and factories.

Population and Environmental Degradation

An increasing population strains scarce agricultural resources. This often leads to the inappropriate use of land for farming. Urban migration caused by the inability of the family farm to support more people leads to stress on water, waste and power facilities.

Recommendations:

1. Encourage mutually reinforcing strategies such as family planning combined with health programs for mother and child.
2. U.S.A.I.D. should mesh population assistance programs with other relevant socioeconomic and educational programs.
3. National leaders must promote reduced fertility.
4. The U.S. should resume the leadership in training and contraceptive development that has been given up during the Reagan era.

Pollution

There are several non-governmental appproaches to pollution control.

Recommendations:

1. Utilize American entrepreneurs and U.S. non-governmental organizations (NGO's).
2. Transfer the design advice, regulatory experience, monitoring techniques, equipment and training from the U.S. to developing countries.
3. Establish an intermediary agency to identify opportunities, establish contacts and reduce transation costs for American entrepreneurs and NGO's.

Trade and Debt Crises and Environmental Degradation

In times of economic stress, conservation takes a backseat. Austerity measures lead to unemployment and subsistence farming. This strains the limited natural resources. Often primary exports are encouraged as a source of foreign exchange, leading to deforestation and pushing the poor onto erosion prone lands. By postponing dealing with environmental problems, the future costs will be higher and the problems harder to solve.

Recommendations:

1. Strategies must be financially sound, protective of the economically weak, and they must not destroy the resource base.

2. International lending should enforce the criteria listed in the first recommendation.

3. Commercial banks and government sponsored agencies should be given incentives to enforce these criteria.

4. Natural resource programs should be exempt from national budget cuts.

5. The U.S. should lower tariffs on labor-intensive imports from developing countries.

6. The U.S. Congress should reconcile agricultural surplus exports under P.S. 480 with development goals.

7. More creative financing methods such as debt swaps should be explored.

U.S. Policy in the 1990s

Proposals from The World Resources Institute
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# POVERTY AND ENVIRONMENTAL DEGRADATION:

# BASIC CONCERNS FOR U.S. COOPERATION WITH DEVELOPING COUNTRIES

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J.W.B.

# U.S. POLICY IN THE 1990s

## INTERNATIONAL COOPERATION FOR ENVIRONMENTALLY SUSTAINABLE DEVELOPMENT

In the 1970s, critics of the U.S. environmental movement--critics in the United States as well as the Third World -- often called environmentalism "a luxury of the rich." Most poor countries thought they would have to choose between development and environmental protection, between jobs and the environment.

We now understand better. In fifteen short years, environmental protection has gone from being a luxury of the rich to being a requirement for the poor. Leaders of even the poorest countries -- countries with the most fragile lands, or the most problematical rainfall, or the most crowded urban barrios--understand full well that future development depends on the sustainability of the resource base. Today many, if not most, would agree with Tanzania's Julius Nyerere that "environmental concern and development have to be linked together if the latter is to be real and permanent." For their part, most environmentalists have reached a better understanding of the necessity for poor countries to achieve economic growth and provide a better life for their people.

Professional jargon commonly characterizes U.S. relations with Third World as "we" and "they," "haves" and "have nots." We seem to have all the information, the cash and the know-how, and they have all the problems. Such simplistic analysis will neither protect U.S. interests nor provide for Third World

development. For the fact is that both the industrialized and developing world share some ominous problems:

- In agriculture, we are converting more and more prime farmland to other uses. We face such common problems as soil loss, aridity or water-logging and salinization, rising costs of inputs, and pollution from runoff. In a world with enough food to feed everyone, more people go to bed hungry and malnourished than ever before.
- In the woodlands, we are parties to rapid deforestation, reduction of fuel and lumber supplies, loss of soil fertility, destruction of habitat. By 1980, it is estimated that between 25 and 40 percent of all original tropical forests had been lost, with untold damage to fragile ecosystems and loss of species, the richest concentration of which is found in tropical forests.
- In energy, the world experiences diminishing supplies of both non-renewable and renewable fuels, and rising environmental and health costs. At the same time, we face a quintrupling of world energy demand and unbearable burdens on the atmosphere.
- In population, the earth will need to feed, educate and support another billion people before the end of the century, putting additional intense pressure on both urban and rural resources. Even for countries that

have developed policies to solve their population problems, there is still a resource problem of how to meet the needs of people already born.

In the 1990s industrialized and developing countries will have to face these problems together. On one earth, ever smaller even as it grows more stressed and more crowded, there is an inextricable connection between us and them, between the haves and the have-nots, between the problems of poverty and the problems of the environment. The times call for burden-sharing with the developing countries. The answers lie in the search for sustainable development, which Our Common Future, the report of the World Commission on Environment and Development, defines as the integration of environmental policies and development strategies in order to "meet the needs and aspirations of the present without compromising the ability to meet those of the future."[1]

## I. DEVELOPMENT COSTS OF ENVIRONMENTAL DEGRADATION

The consequences of poor resource management manifest themselves differently in different countries. But whatever the variations, the impacts will eventually be measured in economic terms. For example, demand for household fuel constitutes a clear threat to economic development in many countries. It has denuded forests near rural villages and around the cities. With the loss of tree cover comes increased erosion and lower crop yields. Where dried dung is used in place of scarce fuelwood,

the soil is robbed of natural replenishment. The resulting loss in soil fertility reduces harvests by an estimated 14 million tons of grain a year -- more than all food aid from all donors to all developing nations.[2]

Deforestation proceeds apace. Some 80,000 square kilometers, an area roughly four times the size of Massachusetts or 60 percent of North Carolina, are lost to non-forest uses each year. Another one and a half times as much is damaged. Of the 33 countries that are currently exporters of industrial wood products, 23 will probably become importers of forest products by the year 2000. Fuelwood shortages affect an estimated 1.5 billion people in 63 countries. Commercial lumbering, land clearing to make way for cattle farms, and peasant use of the forests for fuel and fodder all threaten the remaining natural forest, which in tropical climates is highly susceptible to damage from human activities. Each year runoff from 160 million hectares of degraded upland watersheds contributes to soil erosion, declines in agricultural productivity, downstream silting and flooding, and destruction of fishing grounds.

For some countries with mounting oil import bills, hydroelectricity is the most promising means of providing power for industrial and residential users, and often water for irrigation as well. But the environmental, health, and other costs of hydroelectric dams can be high. Accelerated siltation behind dams, due to deforestation and soil erosion, is the most expensive kind of environmental neglect. If a reservoir designed

to function for 80 years silts up in 25, economic calculations of costs and benefits are thrown completely off. The loss of electric output alone runs into the billions of dollars. In the Dominican Republic, for example, the large Tavera Dam, completed in 1973, has already lost 40 percent of its dead storage capacity and 10-14 percent of active storage due to siltation. In India, terrible rates of deforestation in the Himalayan foothills have already reduced the estimated life of the Tehri Dam from 100 years to 30 or 40. In China, the Sanmenxia Dam silted up completely within four years of its completion.[3]

Nor is siltation the only cost. The Food and Agriculture Organization (FAO) estimates that 20 percent of irrigated lands are waterlogged or excessively saline, or both[4] which means additional costs in lowered agricultural productivity. Health costs for treating malaria and schistosomiasis often climb drastically after dam construction, because the mosquitos and snails that carry these diseases proliferate in the standing waters of irrigation canals. Egypt spends an estimated $560 million a year treating and preventing schistosomiasis. Harder to quantify, but nonetheless real, are losses associated with the dislocation of those whose lands are flooded out (often tribal people or extremely poor peasants) and with species extinction in submerged tropical forests.

Clean drinking water is also in short supply. Throughout the developing world, water polluted by sewage and industrial wastes causes disease and death. Eighty percent of childhood

deaths is due to water-related disease. Only 50 percent of the people in developing countries have access to safe drinking water, and four out of five had no sanitary facilities -- not even a pit or bucket latrine -- in 1980. Once ground water is contaminated it can take decades, even centuries before natural processes eliminate the pollution. In a fundamental sense, health, too, is an environmental matter in developing countries.

The costs in human life, health care, and agricultural losses due to pesticides and pest resistance are also rising. Some 10,000 people die each year and 400,000 suffer acute effects from pesticide poisoning, while the number of pesticide-resistant species is growing (from 25 in 1974 to 432 in 1980).[5]

Soil loss everywhere has an important adverse effect on agricultural production, but it is especially worrisome in the Third World, where food production often cannot keep up with population growth and food imports can represent a significant fraction of national budgets. No part of the developing world has been spared. In Guatemala, 40 percent of the productive capacity of the land has been lost to erosion, and some areas of the country have been abandoned because agriculture is no longer economic. In Turkey, planners estimate that 75 percent of the land is affected, 54 percent severely so. In Africa, overgrazing, overfarming, and overcutting -- all pushed by rapidly growing populations -- have so reduced the productivity of the land that nearly a score of countries are prey to famine whenever the rains fail. In much of Haiti, there is no topsoil left at all.

Each year, 6 million hectares of drylands are added to the 1.3 billion hectares that have already been moderately or severely decertified. A 1984 FAO assessment predicted that, without conservation measures, the total area of rainfed cropland in the Third World will shrink by 18 percent (544 million hectares) by the end of the century because of soil erosion, salinization, depletion of nutrients and organic matter, pollution and deterioration of soil structure. Total loss of productivity would amount to 29 percent.[6] In the same period, another billion people will be added to the world's population, and more than 90% will be born in developing countries.

Environmental degradation and growing population together can undo the gains of national development, as is apparent when one looks at specific countries. Egypt, for instance, has already lost the struggle to meet the food needs of its rapidly growing population. Despite substantial gains in food production over the last 20 years, per capita production has declined. The amazing growth of Cairo (10 million residents, and still growing) and other urban areas, all of them along the fertile shores of the Nile River, encroaches steadily on farmland. New industries also take their share. Government policies that favor cotton and other commercial cash crops reduce the areas left for growing food. At the same time, desert sand from the west encroaches on fertile soils at several places along the Nile valley. Soil along the Nile itself is eroding at much faster rate than before the construction of the Aswan dam. Increased soil salinity, the

result of poor irrigation practices, threatens most of the irrigated lands and reduces productivity further. The charge for all this against Egypt's development hopes is staggering: wheat and flour imports cost the government $1 billion in 1986.[7]

The Central American states undertook ambitious development programs in the 1960s and 1970s to raise their standard of living and bolster their economic independence. Though there were marked differences from country to country, they all embarked on development strategies based on agricultural exports and industrial development to achieve import substitution. Only a handful of industries have succeeded, and the debt undertaken in the process is today the single largest impediment to growth. The production of export crops -- principally coffee, bananas, sugar, cotton, and cattle -- was modernized with large investments in mechanization, pesticides and fertilizers. Throughout the region, farmers who rented or farmed small plots without title were divested of their farms to make room for the export crops. These crops accounted for one-half to two-thirds of export earnings in El Salvador, Honduras and Guatemala, but intensive monocultures have degraded the resource base, and the shift in land use meant a decline in food production. In the Costa Rican lowlands, for instance, small-scale agriculture virtually disappeared before the banana plantations in the 1960s, while corn production declined 87 percent in 6 years. In Nicaragua in the same years, it was cotton, whose huge sales to Japan made it the leading export.

Each of these crops had its environmental costs, but it is deforestation for cattle ranching that has caused the most destruction. From 1960 to 1980, Central America's forests declined from 60 percent to 40 percent of the territory -- with two-thirds of its cultivated land in livestock. Since 1963 the World Bank has lent funds for cattle ranching to every Central American country except El Salvador, and has provided more credit for livestock than for any other kind of agricultural activity. The Inter-American Development Bank (IDB) also recognized cattle production as "highly suited" to the region and a promising earner of much-needed foreign exchange. But the planners did not understand that the luxuriance of the tropical forests was deceptive, hiding nutrient-poor soils unsuited to cattle raising. The amount of land necessary to support one animal quickly rose from one hectare in the first years of production, to 5-7 hectares. After 10 years or less, cattlemen must move on to new forest lands to support their herds.

Today, the highest rate of deforestation in the hemisphere is found in Central America. Fuelwood is already in short supply, and some countries will be forced to import lumber in a few years. Dams and rivers silt up faster than expected as soil is carried off.

Central America's development strategy exacted a high price in debt for the state and land alienation and poverty for the poor. And the land, chief natural resource of the region, has been profligately spent without sustainable return. Far from

fostering economic independence, the development strategy of the past generation has left the Central American states more dependent than ever on the United States and the rest of the industrialized world.[8]

## The Poverty-Environment Connection

Our Common Future underlines the connection among poverty, international policy, and environmental degradation. The report emphasizes that "poverty itself pollutes the environment... Those who are poor and hungry will often destroy their immediate environment in order to survive." They will cut forests, overgraze grasslands, overuse marginal land, and crowd into congested cities. The cumulative effect of these changes, "is so far-reaching as to make poverty itself a major global scourge."[9]

Nowhere is this connection more graphically illustrated than among the famine-ravaged people of Africa who have grown so familiar on U.S. television screens in recent years. Their plight, to quote again from Our Common Future,

> "...illustrates the ways in which economics and ecology can interact destructively and trip into disaster. Triggered by drought, its real causes lie deeper. They are found in part in national policies that gave too little attention, too late, to the needs of smallholder agriculture and to the threats posed by rapidly rising populations. Their roots extended also to a global economic system that takes more out of a poor continent

than it puts in. Debts they cannot pay force African nations relying on commodity sales to overuse their fragile soils, thus turning good land to desert. Trade barriers in the wealthy nations -- and in many developing ones make it hard for Africans to sell their goods for sonable returns, putting yet more pressure on ecolo systems Aid from donor nations has not only been i..dequate in scale, but too often has reflected the priorities of the nations giving the aid, rather than the needs of the recipients."[10]

## II. U.S. POLICY: A NEW VISION FOR THE 1990s

To correct these problems of ingrained poverty and severe environmental degradation will not be easy. It will require a new vision, a vision of world partnership to take care of our common future, a new concept of burden sharing to sustain this earth, its people, and its environment. Tinkering with outmoded assumptions, institutions, and relationships will not be enough to meet the problems of the 1990s and beyond. Nothing less than sustainable national development, development on which coming generations can continue to depend, must be the goal on all continents.

Sustainable Development

The term "sustainable development" has been used by different people to mean different things. AID tends to use it to mean a project can be sustained financially after foreign assistance has been terminated. Environmentalists use it to focus on ecological sustainability. By sustainable development in the Third World, we mean national development strategies that are environmentally sustainable, economically and financially sustainable, and institutionally sustainable. No development strategy which draws more heavily on the natural resource base than can be maintained over the generations is sustainable. Agricultural or energy programs cannot be considered sustainable if they use up nature's capital, denude the hillsides, deplete the soil, destroy spawning grounds and fisheries, or otherwise deny the future productive capacity of the biosphere.

Similarly, programs that cannot be funded over the length of time necessary to bring self-sustaining results or are dependent on long-term foreign financing are not likely to be financially sustainable. Economic policies that distort the market or create incentives for destructive practices are not sustainable. Food prices that drive farmers from production, trade barriers that too long protect inefficient manufacturers, technologies heavily dependent on uncontrollable world oil prices -- these and other policies and practices cannot be sustained economically. Nor will a strategy be institutionally sustainable (except, perhaps, at the cost of politically unacceptable dependence on outside

assistance) without well-trained people, analytical capacity, and strong institutions for planning and delivering services.

The notion of sustainability thus links the environmental, economic, and institutional aspects of a country's development operations, though not in strictly parallel ways. A development strategy which is not sustainable in an environmental sense is not economically sustainable either. And a strategy which appears financially and economically sustainable, may not, necessarily, over the generations, be environmentally sustainable. And to be both environmentally and economically sustainable, a strategy must be built on sound analysis, able to rely on appropriate institutions for planning and delivering services, and carried out by adequately trained individuals, at all levels. To make the necessary best use of limited natural and human resources, national policies must fit environmentally and economically suitable practices together.

The concept of sustainable development is not a static one. It implies limits, but they are not absolute. Indeed, the productive potential of the resource base is relative to the size and growth of the population, the state of technology and degrees of social organization brought to bear. Managing natural resources (the air and water and land as well as the oil and minerals under it) and planning for population increases, selecting and developing the right technologies and marshalling social skills and shaping institutions -- together, these are the factors that lead to sustainable development.[11]

U.S. Response

The vision of sustainable development determines much of the agenda for U.S. policy toward the Third World in the 1990s, especially for its programs of cooperation, assistance and advice, but also for its trade and fiscal policies. Improvement in the lot of Third World people, particularly those who are at the bottom of the social and economic scale, is the most practical way to meet the two great, interconnected challenges of our time -- the challenges of world poverty and global environmental degradation. It is the economic and ecological foundation on which sustainable national, and indeed international, development can proceed.

In responding to this challenge, the United States reflects the deeply held humanitarian values of the American people. Like many other countries, the U.S. seeks to promote its political and economic interests around the globe in various ways. But there should always be an important place in U.S. policy and U.S. actions where we act internationally at our most altruistic and most farsighted. Concern for the poorest of the poor and for the global environment are concerns that have broad popular support in the United States. These concerns are the pillars on which to build a revitalized program of international cooperation which can command long-term public support for the necessary budget outlays in the U.S. Congress.

Development Cooperation Priorities

The U.S. foreign assistance program will not command the popular support it needs if it does not seek the best returns on its limited development dollars. A consensus is emerging among those concerned with sustainable development on the kinds of activities that will provide these returns.

First and foremost, capacity-building to enable countries to better manage their natural resources is essential. In many countries, this means the strengthening of environmental ministries and agencies through improvements in their monitoring, analytical and research capabilities, and enhancing their ability to interact effectively with the planning, finance and agriculture ministries that have traditionally had more power and prestige, or, alternatively, integrating environmental considerations into the work of the planning and other ministries. Regional and local institutions responsible for implementation need strengthening as well, as do key private institutions.

Training, at all levels, is of the highest priority -- from economists who shape macro policies to community participants who must keep agricultural records or account for development funds, from truck drivers and repair persons to computer programmers and business managers. USAID evaluation files are full of evidence that "micro-managing" development projects with lots of foreign consultants is not likely to engender a sense of local "ownership" or to ensure continuity after foreign funds have

expired. A better investment of U.S. tax dollars lies in helping countries to help themselves.

Institutional development, education and training are areas in which the United States has some comparative advantage and where the investment dollar, by leaving skills behind, goes a long way. Indeed, as capacity building proceeds, USAID should expect to a much greater degree than in the past to fund local costs rather than foreign exchange costs, including the greater use of qualified local and other Third World specialists as trainers, consultants and managers of projects. In these respects, the United States might also help the World Bank to change some of its rules.

Second, the role of policy reform must be emphasized. Among the key lessons of the 1980s is the importance for development of certain kinds of macroeconomic policies--currency valuation, incentive systems, pricing and marketing mechanisms, to name just a few. For example, when government price controls set food prices too low in order to favor city dwellers, farmers become discouraged and production suffers. Artificially high currency valuations encourage proliferation of imports and dependence on foreign technology. In environmental matters as well, some national policies undercut the possibilities for sustainable development. For example, subsidies on pesticides can promote excessive use, thereby threatening human health, polluting water resources, and hastening the growth of pest-resistant species. Investment

incentives, tax and credit subsidies, farm pricing policies, and logging concessions in public forests often intensify forest exploitation and/or encourage uneconomic conversion of forests lands to other uses.[12]

But changing macroeconomic policies often involves painful adjustments and temporary dislocations which can impact most heavily on the poor. To ease these burdens as well as to encourage developing countries to stay the course on policy reform, the United States and other well-to-do countries must collaborate by providing analysis, advice and necessary transition funding. In this, as in other measures, the United States must move in consort with other donor nations and agencies, for in most countries the level of U.S. development assistance is not high enough itself to leverage major macro policy changes. The need for better consultation is a common refrain. Particularly important is U.S. consultation and leadership in the IMF and World Bank to assure that policy reform efforts support the concept of sustainable development.

And third, there needs in many countries to be a greater reliance on non-governmental mechanisms. Many an experienced development assistance professional in the foreign aid business, and indeed Third World officials themselves, have expressed frustration and disillusionment with the notion that all development must be engineered and controlled by centralized ministries. National development, of course, remains the responsibility of national governments. Without appropriate

national policies and allocation of development funds, sustainable development cannot take place. But the recent encouraging examples of Third World NGO and private business contributions to development -- sometimes in countries heretofore rigidly committed to centralized social philosophy -- should be built upon in the coming decade. The U.S. and other donor countries need to explore imaginatively with developing country planners the ways in which indigenous non-governmental entities -- local community organizations, women's societies, and private entrepreneurs -- can contribute to sustainable development.

## III. STRATEGIES FOR SUSTAINABLE DEVELOPMENT

USAID has been a leader -- along with The Netherlands, Canada, and the Nordic countries -- in its insistence on assessing the environmental impact of development projects. World Bank President Barber Conable last year reaffirmed the Bank's commitment to environmentally sustainable development, and provided increased staff and money for environmental activities. But the gap between profession and practice remains wide, in part because the task is so difficult.

The following sections outline appropriate strategies in the interrelated areas of agriculture, forestry, water, energy, population and environmental pollution -- areas which are essential to economic growth, the quality of human life, and conservation of the resource base and its future productivity. Recommendations for making international trade and debt policy

more responsive to the needs of sustainable development are also included.

A. Agriculture

Until recently, the "modern" agricultural sector was seen in many countries as the answer to both increased food production and the need for export-earning crops. As a result, the rural policies and programs of Third World governments overwhelmingly favored the better-off farmers working on well-endowed lands that were amenable to big increases in productivity. This sector received the lion's share of national and international research attention, infrastructure buildup, credit and a variety of subsidies, as well as the greatest bilateral and multilateral assistance from donor institutions. The result was the Green Revolution. There is wide awareness in the developing countries and international agencies that agricultural assistance now needs to focus on the rural poor who did not benefit from earlier strategies and who may even be worse off than before.

1. Low-input agriculture.

The rural poor are a heterogeneous group, but they share certain characteristics: limited assets, environmental vulnerability, and lack of access to services and land. A combination of population pressure, insecure title to land, and lack of credit and technical assistance forces poor farmers and herdsmen onto more and more fragile lands. They rely on

uncertain rainfall in drylands, highlands, and forests -- areas that are difficult to farm.

Most of sub-Saharan Africa and remote areas of Asia and Latin America fall into the low-resource category. Here, per capita production has been declining and hunger is a critical problem. Furthermore, the consequences in resource degradation are severe -- desertification (in arid Africa) and deforestation and soil erosion (in moist, mountainous Central America, for example). Major policy changes, indeed a new development strategy, will be required to insure food and livelihood for the rural poor, and to restore and protect the water, land, and forests on which their survival literally depends.

In some respects, raising productivity of smallholders and alleviating rural poverty will be harder to achieve than the gains of the Green Revolution. The main actors will have to be the affected groups -- the millions of men and women who farm the land, non-governmental organizations capable of organizing community activity, and local and regional governments. The strategies required are information- and management-intensive, and will require organizing and implementation by people who really know the local agricultural and social systems. They require politically difficult decisions. And they take place in a world economy that is unlikely to grow as fast as it did in the 1960s and 1970s.

Policy Recommendations.

The primary emphasis for U.S. and other international assistance should be to promote sustainable agriculture and food security by strengthening smallholder agriculture and increasing rural employment and income. This will require intensive application of techniques to improve productivity on farms as small as half an acre. But it must also include attention to other means of increasing rural employment and income, such as improved transport, distribution and marketing, and support for small-scale, rural-based industries based on efficient and sustainable use of soil, water, and forests. Energy development (see below) must be an integrated part of such efforts, as will continued soil and water conservation, watershed rehabilitation and management, aquaculture, and agroforestry.

The United States can help with research and training assistance, institution-building, and policy reform. It can also take the lead to remove the bias against smallholder agriculture still found in the project- and policy-based lending of the World Bank and the regional development banks. For its bilateral rural development programs, we propose that the United States should target poverty and environmental degradation where they are most severe. This criterion suggests concentrating U.S. programs first of all in sub-Saharan Africa, where per capita production is likely to grow hardly at all before the end of the century,[13] and in South Asia, with its heavy concentration of poor people. Latin American and Caribbean countries (especially our nearest

neighbor, Mexico, and troubled Central America), which have severe problems of environmental degradation and deep pockets of poverty despite their mostly middle-income status, should be the second important set of partners in projects and programs that will improve the productivity and sustainability of agricultural and forest lands.

a. Capacity Building

Research The United States has one of the world's foremost agricultural research and extension systems. It should now put this magnificent system at the service of sustainable agriculture by establishing cooperative U.S.-developing country programs of research and training devoted to small-scale, low-input agriculture. (Other terms emphasizing various aspects of this kind of agriculture are "resource-poor," "regenerative," "rainfed," "dryland," "smallholder," "marginal," "subsistence," and so on) The effort required will be no less than that which went into the Green Revolution -- development of new high-yield drought- and disease-resistant dryland crop varieties, new crop mixes, new rotation and tillage methods, nitrogen-fixation techniques, new applications of fertilizer and pest-management systems, new systems of water conservation, storage and processing of foods, incorporation of trees into farming systems, livestock management, and natural forest management.

The United States should work closely with Third World research and extension institutions to incorporate local farmers,

fishers, and herders into the research and diffusion process. Because biological systems vary widely even within countries, the site-specific experience of local practitioners must be incorporated into the research and experimentation. Because many of the barriers to changing rural technology appear to be social and institutional, social science analysis will be an important part of any research agenda.

The United States should also persuade the Consultative Group on International Agricultural Research (CGIAR) to intensify its attention to low-input agriculture. Initially focussed on major cereal crops and well-endowed farming regions, this international research network has already begun to consider dry, semi-arid, upland, and other difficult environments as well as agroforestry, root crops, coarse grains, and other semi-subsistence crops. Its Technical Advisory Committee has recently formulated useful recommendations regarding agricultural sustainability, emphasizing that the entire research program should be pervaded by this consideration.[14] To achieve this in practice, the success indicators of agricultural research must be revised to take into account environmental considerations such as the system's contribution to maintenance and renewal of soil fertility, biological diversity, conservation of water, etc. In addition to allocating more research effort to the improvement of resource-poor, low-input agriculture, CGIAR should include in its research on high-input cropping systems an investigation of their environmental impacts and costs. Without such information,

comprehensive and unbiased assessment of their total productivity is impossible.

Finally, the United States should help both Third World and international research institutions to understand that perverse agricultural forestry and other incentives can affect farmers' land use practices and choice of technology. For example, research agencies in many countries are working on integrated pest management programs at the same time as national pesticide subsidies undermine the likelihood that such programs will be adopted. Again, research institutions are attempting to develop less erosive cropping systems, but crop pricing or input subsidies may undermine farmers' incentives to preserve natural soil fertility. Our cooperative research agenda must include major effort to improve the quality of policy analysis and research.

Extension No less important than appropriate research priorities is extension of the resulting technology to farmers. In most countries, extension workers reach marginal farmers, especially women, much less effectively than they do the better-endowed, more educated farmers. Nor are they prepared to teach very much about sustainable technologies. The United States should apply its extensive experience in training extension workers to help strengthen and expand programs designed to reach marginal farmers and women. Once the results of research on low-input agriculture warrant, the United States should organize projects on a greatly expanded scale to train extension workers

in appropriate farming technologies and to extend this knowledge to smallholders.

Institutional Development There is great variation among developing countries in the strength of their planning, research and training institutions and in the systems through which they deliver information, goods and services to the rural sector. But it is a safe generalization that even in the best endowed of countries, the institutions will be weakest when dealing with the remote, the rural, the poor, and the marginal. It is an appropriate role for the United States and other donors to invest heavily in the institutions necessary to do that. In some countries, this means developing policy-analysis units in the planning ministry, or building and equipping national environmental monitoring systems, biological research laboratories or agroforestry experimental field stations. In almost all countries, it will require finding ways to help nations build and strengthen local governments, local transportation, local community organizations.

b. Policy Reform -- Access to Land

In addition to tackling the subsidy questions discussed earlier, the United States must do what it can to foster smallholder access to land. The Food and Agriculture Organization (FAO) says that land redistribution and tenancy reform are the "most fundamental of anti-poverty measures."[15] It stands to reason that poor people will not plant and tend trees

that they do not have the right to enjoy and use, that poor people will not invest meager savings and heavy labor in conserving soil and water on land to which they do not have secure title. And yet, in 1979 there were an estimated 30 million agricultural households who were landless, and another 138 million near-landless. In every region of the world there are countries whose need to prevent deforestation and improve agricultural productivity is impeded by the fact that the majority of rural people are virtually landless. In developing countries where land ownership is highly concentrated in the hands of a few -- a problem endemic in South Asia and Latin America -- the best U.S. technical and policy advice on agricultural strategies will not achieve sustainable development unless we are willing to support governments' efforts to achieve equity through land reform and tenancy rights. Special attention must be given to the roles and rights of women, who are the primary resource managers in many developing countries.

The United States, in its AID program and through the international agencies, should help national governments to redistribute land and to invest more heavily in land titling and registration, since greater security of tenure over natural resources improves incentives to good management. Similarly, codification of tenancy agreements (rather than ineffectually outlawing them, as some countries have done) will secure the rights of both parties and make possible incentives for greater productivity -- providing codification does not make exploitive

relationships permanent. The tenurial rights of women, who manage much subsistence farming, may also need to be strengthened. In some cases it will be necessary to change "homesteading" laws to discourage forest clearance, or to reform tax laws to discourage large under utilized holdings. And through the International Fund for Agricultural Development (IFAD) and other development agencies, the United States should encourage national governments to emphasize the strengthening and development of local institutions for the management of common-property resources such as community woodlots, grazing space, and so on.

## 2. Green Revolution Agriculture

The Green Revolution package of improved seeds, heavy inputs of fertilizers, pesticides, water, energy, machinery and agricultural credit -- much of it deliberately subsidized to stimulate production -- led to astonishing productivity increases in parts of Asia, Latin America and North Africa and, for some countries, to substantial foreign-currency earnings from the export of commodity crops.

But the very policies that brought these benefits have led farmers to practices that can have severe environmental consequences. Green Revolution farmers often use underpriced irrigation water inefficiently, which can result in increased salinization, waterlogging and pressure for ever larger-scale water diversion. To maintain soil ferlility they excessively

apply subsidized chemical fertilizers which run off the land and pollute streams, lakes and estuaries. And they have come to rely on heavy chemical pesticide spraying rather than on an integrated approach to pest management that is more effective and economical in the long run. Scarce foreign exchange requirements are often involved. The policies that lead to these kinds of economic distortion and environmental stress need to be corrected in the coming decade.

Policy Recommendations

The United States needs to put its weight behind policy reform to curb some of the excesses of Green Revolution agriculture. The rationale for the heavy input subsidies provided to farmers as an incentive to adopt Green Revolution technology has disappeared. These days, production growth can usually be better encouraged by raising output prices, eliminating impediments to production, and ensuring that inputs are used efficiently with as little environmental damage as possible. The United States can help by providing assistance and training in policy analysis, including examination of pricing policies, agricultural taxation, marketing arrangements, and the like. In particular, subsidies on water, chemicals, energy and mechanization should be examined and in most cases significantly reduced. Development assistance may also be needed to restore waterlogged and degraded soils. This technology may be more expensive and require more sophisticated techniques than most developing countries could manage on their own, but it is cheaper in most cases than building new irrigation systems.

### 3. Agriculture in the Industrialized Countries

While these changes are being undertaken in developing countries, some very important changes need to be pursued back home by the United States and other industrialized exporters of agricultural products, especially grains. Subsidies that support agricultural export surpluses from these countries depress and distort world prices. Furthermore, the extraordinary requirements of industrialized agriculture for energy and chemical inputs have environmental consequences of their own. The strategy for agricultural policy reform in industrialized countries should thus be based on ecologically and economically sound principles. Among the recommendations that meet these criteria are: (1) reduction of farm-input subsidies; (2) application of the "polluter pays" principle to off-farm damages caused by chemical, sediment, and other agricultural effluents; (3) switching from agricultural price supports to direct income transfers to farm households based on need; and (4) pursuit of multinational negotiations to reduce export subsidies and import restrictions that reinforce domestic prices.[16] Since international competition in grain exports drives many subsidization policies, it is particularly important that the United States and European Economic Community countries work toward these principles in tandem.

B. Forestry

Tropical deforestation is proceeding at such a rapid pace that significant development attention must be committed now to forestry issues. Natural forest management and reforestation programs are needed if pressure on the remaining natural forests is to be relieved, the environmental benefits of forests and farm trees in protecting soil and water resources are to be maintained, commercial forestry is to be sustainable, and the fuelwood, fodder and other needs of the rural poor are to be met. However, forestry problems and needs cannot be addressed in isolation. A sustained commitment to forestry, agriculture, energy and related rural development programs is required. Agroforestry -- the integration of food crops and trees in farming systems -- has particularly great potential. River-basin and watershed management must also be an integral part of rural development planning.

Policy Recommendations

In particular, U.S. forestry programs for developing countries must pay greater attention to innovative ways to increase local fuelwood supplies. From 30 to 98 percent of all energy consumed in individual developing countries comes from biomass, mostly trees,[17] but the costs and difficulty of collecting fuelwood have escalated. Tree plantations may successfully produce wood for commercial use, but experience in many countries indicates that government-sponsored reforestation schemes are contributing little, if at all, to local fuelwood

supplies. Nor does agro-forestry yet contribute as much to local fuelwood supplies as do small woodlots, border plantings, etc. Most farmers will not plant trees simply to produce fuelwood; land, labor, and capital are too scarce for that, and fuelwood prices are still too low. In many rural areas, fuelwood can still be collected as a free good from the remaining natural forests. Nevertheless, farm forestry -- the growing of trees as a cash crop on farms to supply a market -- has the potential to increase fuelwood supplies as a by-product of higher-value tree products such as poles, sawn wood, fruit and other non-woody products from "multi-purpose" trees. Most countries need policies that will encourage good forest management, the development of woodlots and on-farm tree planting. They need assistance also for programs to provide seedlings and to organize, train and pay extension workers.

Across Africa, Asia, and Latin America, forests are being lost at roughly 10 times the rate at which they are being replaced. In sub-Saharan Africa the rate is 29 to 1! Much of the reforestation that is needed to help close this gap will have to be done by small farmers. The United States should assist developing countries to reform policies that lead to forest destruction and discourage sound forest management, and to support programs that encourage tree planting on farms and throughout rural areas. This should include decentralized seedling production and distribution programs, strengthening of forestry and agroforestry research and extension, and integrating

tree planting with soil and water conservation programs. NGOs and local communities have a major role to play in reforestation efforts and should be a focus of U.S. assistance.

C. Water and Sanitation

Water is a precious natural resource whose economic value and importance for development is sometimes underestimated by Washington policymakers. It is crucial to agriculture and forestry. Its uses touch every human need: drinking water and food, personal hygiene, sanitation, electricity, industry, transport, and recreation.

World-wide, the supply of fresh water is ample for human needs, even though demands on it are growing rapidly. But water supplies are not evenly distributed and much is wasted. Sometimes, water shortages are the result of drought or natural disaster, but often there are human causes: disruption of hydrological cycles by deforestation and loss of soil cover, overuse of ground water, or excessive erosion.

Irrigated agriculture accounts for 70 percent of worldwide water use, but water for drinking, hygiene, and sanitation represents a second major use of fresh water. Clean water, and enough of it, is a primary requirement for basic health. About 80 percent of childhood deaths in the Third World result from water-related diseases, and chronic diarrhea caused by water-borne organisms is a common cause of malnutrition. In 1983, three years into the United Nations International Drinking Water

Supply and Sanitation Decade, the goal of universal access to clean water and sanitation was still far from being met. The World Health Organization (WHO) reported that only 49 percent of the people in developing countries had access to safe drinking water, and only 20 percent to toilets or latrines. Despite some improvements in the intervening years, population growth has left still larger numbers without coverage. And industrial pollution is a growing problem. In India, for example, 70 percent of all surface waters are still polluted. As the Yamuna River flows through Delhi, it daily picks up a staggering load of 200 million liters of raw sewage and 20 million liters of industrial wastes. It is now apparent that the Decade's efforts will fall far short of their goals. Thus it is important for the United States, through its aid programs and through its influence in the multinational agencies, to support continued effort through a second decade.

Perhaps the most important accomplishment of the first water decade was the understanding that more appropriate technologies -- moving away from Western-type systems of piped household water and water-borne sewage toward decentralized community-based systems, stand pipes, hand pumps, and so on -- could reduce wastage of water, cut costs by an estimated 90 percent, and make the UN Decade goals reachable. On the basis of this insight, the World Bank has developed three packets of training materials (for decisionmakers, technical, and community people) and an international training network. The Dutch, German, French and

British aid agencies have gotten behind this effort, and the Bank has been lending about 5 percent of its portfolio for these purposes.

Policy Recommendations.

The United States, too, should reorient its Water and Sanitation for Health, or WASH project, away from expensive and wasteful conventional technologies and toward the low-cost technologies now being embraced by other agencies and developing countries. This will require not only technical assistance and finance and materials for water systems, pumps, piping and maintenance, but also support for broad-ranging public education. Decentralized local sanitary systems of collecting and processing wastes both by composting and anaerobic digestion need to be developed, perhaps in combination with fertilizer and energy production. The technology exists, but the social organization and rewards often do not. For the most part, these systems will be developed and controlled by municipalities, but in some cases there may be room for entrepreneurs as in Patna, India, where a sanitary latrine linked with biogas production and sale of slurry for fertilizer is a profitable business.

D. Energy

We propose that U.S. development cooperation in the 1990s greatly increase its emphasis on energy for development. No other sector is so important to the needs of the environment and to every stage of development. In most developing countries,

energy is the largest single part of the national development budget and takes the largest share of foreign exchange, thereby restricting their ability to import other goods and technology for industrial and agricultural development. Even the recent decline in world oil prices has not affected the overall demands of the energy sector on foreign-exchange earnings. Furthermore, the needs for energy in developing countries have only just begun to grow.

At the household level, almost every strategy for increasing household income, particularly rural farm income, will necessitate changes in energy use -- more efficient use, and increased use of modern energy and/or energy-intensive commodities like fertilizer. Low-income urban families even in middle-income countries spend up to 30 percent of their budgets on cooking fuel. And in rural areas, fuelwood and agricultural residues are still the staple household energy source for more than half the people. Each day, women and children must search ever farther afield through degraded and denuded forest to find enough. In some areas of acute fuelwood shortages, families are eating fewer meals per day and changing their diet to include fewer cooked foods.

At the same time, the production and use of energy has direct and serious environmental effects and costs that developing countries cannot ignore. The burning of fossil fuels and, to a lesser extent, the destruction of forests lead directly to the increase of carbon dioxide ($CO_2$) in the atmosphere and the

associated rise in the earth's temperature through the "greenhouse effect." Air pollution from vehicles, factories and power plants is damaging health, buildings, crops, and forests, even in the poorer developing countries. As noted earlier, huge hydroelectric dams have their own set of environmental costs. And the demand for fuelwood adds substantially to deforestation and associated soil loss in tropical areas. On the health side, smoke from family cooking fires takes a very high toll in respiratory diseases and damage to the eyes.

Very large amounts of energy will be required for Third World industrialization, agricultural development, and residential use by rapidly growing populations. But if developing countries were to use energy at the rate of industrialized countries, five times the present global energy use would be required. Clearly, the planet's ecosystem cannot sustain increases of this magnitude.

In view of a rising environmental consciousness as well as the staggering capital costs of expanding energy production, the threat of rising oil prices, and the need to protect export earnings from the demands of the energy sector, the time may be ripe for a radical change in patterns of energy investment for developing countries. From 1972 to 1980, multilateral and bilateral agencies spent $14 billion on energy development. Ninety percent of this money went for generating and distributing electricity from very large power systems, 5 percent for fossil-fuel exploration, 3 percent for renewable energy sources, and

less than 1 percent for energy efficiency. Though developing countries will continue to need power generation and will continue to build plants, the relative percentages of international energy investment need to be changed to place greater emphasis on efficiency and renewables. It is in the interests of the United States and other industrialized countries, who are the heavy users of energy and gross contributors to atmospheric deterioration, to share the burden of making the necessary transition to renewables.

One of the lessons we learned when oil prices rose precipitously in 1973-74 was that "new" energy capacity can be found in conservation -- and more cheaply than building new capacity. Thus, the U.S. economy was able to grow by 30 percent between 1973 and 1986 with no growth in U.S. energy use. Comparable changes in energy efficiency were experienced in Europe and Japan, permanently altering our assumptions on the relation between energy and development.

The opportunities for savings through more efficient energy generation, transmission, and consumption are at least as significant in developing as in industrialized countries. Cost-effective efficiency improvements are also the most environmentally benign source of additional energy capacity.

In particular, greater attention must now be given to energy for rural development. Though energy planners and developers have paid little attention to household technology, there are substantial savings to be had, for example, through widespread

use of improved cook stoves. Primitive technology is not necessarily either cheaper or more efficient. The Tanzanian woman cooking in an earthen pot over an open flame uses eight times as much fuel as her affluent neighbor with a gas stove and aluminum pot. A wick dipped in kerosene gives only one-hundredth the light of a 100-watt electric bulb while using the same amount of energy. Renewable substitutes and greater efficiency of use have much to contribute here in meeting growing energy needs.[18]

Throughout the developing world extensive use is made of traditional fuels -- wood, coconut, and rice husks, bagasse left over from crushing sugar cane -- in agricultural processes and industrial plants. These renewable fuel resources are burned to cure tobacco, boil down sugar, and dry foods. Converted to steam, their heat is used in dozens of manufacturing processes. And everywhere these renewable resources are used most inefficiently. The technology employed dates mostly from the 1920s and 1930s. It is unbelievably wasteful of fuel and therefore more polluting than necessary. There are significant economic and environmental savings to be realized from upgrading these technologies.

Policy Recommendations

U.S. energy policies both at home and overseas should adhere to certain basic principles. They should (1) promote least-cost energy planning; (2) promote energy conservation and efficiency in production, transmission, and use; (3) employ the cleanest, least polluting, economically viable technologies available; (4)

undertake a major program of coordinated research, development, and demonstration projects to ensure the rapid development of renewable energy sources and improved technologies for their use; and (5) overhaul policies -- pricing regulations, taxes, research support -- in support of the above. In each of these respects, U.S. cooperation and investment in Third World countries should emphasize capacity-building -- i.e., training, research and analysis, and institution-building that increase national self-reliance.

1. Least-cost energy planning

USAID should help cooperating countries to plan the least-cost strategies to meet their energy needs -- for energy production, transmission, and use in the urban industrial sector, and for decentralized energy production for rural development. Major investments in institution-building and training will be required. The report of the World Conference on Environment and Development proposes strong energy-planning entities for all countries, and on a regional basis as well. The United States should support those efforts and help provide the training necessary to get them off the ground.

2. Conservation and end-use efficiency

The United States, through USAID and the multinational banks, should support moves toward greater energy efficiency as a way of buying time for development of renewables. For example, at a small fraction of the billions spent on conventional energy assistance, the United States could support a massive program to

develop and market improved woodstoves -- based on experience in smaller programs it has already supported in several countries. The economic, environmental and health savings are obvious. In many countries, a viable private industry can be developed (they already exist in Thailand, Kenya and India, for example) using domestic materials. But where the cost of stoves is out of reach of the rural or urban poor, distribution should be financed by other means, with international assistance if necessary. And the use of more efficient stoves will slow the rate of forest destruction, giving the world a better chance to catch up on replacing the trees.

Second, the United States should take major initiatives to help Third World countries upgrade the stoves, furnaces, boilers, and kilns that are so widely used in agricultural and manufacturing processes. Technical assistance and financial support will be required to design, manufacture and maintain more efficient systems. This should include improved kilns for charcoal manufacture, briquetting techniques to make more efficient use of residues like peanut husks and coffee hulls, and better technology for curing tobacco and other crops. More efficient use of traditional fuels can greatly enhance the supply of process heat and steam, and even make practical the generation of electricity.

Third, the United States should encourage Third World governments, international banks, and other investors to support the production or purchase of energy-efficient new machines,

appliances and transport. Extraordinary savings could be had. One study for Brazil has shown, for example, that investments totalling less than $10 billion over the period 1985-2000 in more efficient refrigerators, street lighting, lighting in commercial buildings, motors, and variable-speed drives for industrial motors would eliminate the need to construct 22$GW_e$ of electrical capacity costing $44 billion.[19] The United States and the World Bank should also provide assistance to countries to overcome institutional barriers to greater energy efficiency. Electric utilities may need to be persuaded of the need to incorporate power generated from multiple sources, or they may need help in developing an end-use approach to the planning, financing, development and marketing of energy.

3. Use of the cleanest, least-polluting technology

Because conventional power plants have the potential for contributing to global warming and cross-frontier pollution, the United States and other industrialized countries have a mutual interest in assuring that Third World countries employ the best available technologies, and in sharing the cost burden if necessary. The United States should, both through its bilateral programs and its leadership in the multilateral agencies, help developing countries improve the efficiency of conventional power plants. This might include retrofitting of existing plants and/or training to improve maintenance. For new plants as well as other aspects of energy development, state-of-the-art technology for both efficiency and pollution control should be a

condition of international assistance. The United States should seek agreement on this principle with other exporting countries lest U.S. energy-efficient, clean technologies be at a disadvantage competing in the world market.[20] In some countries, there will be environmental and/or economic reasons to subsidize purchase of more efficient equipment or new fuel sources, especially renewables.

Natural gas can be used for many of the same purposes as oil, and it is easier to burn cleanly. In some instances there are already natural gas discoveries that are not being exploited, but most sedimentary basins in developing countries have barely been explored. USAID support could make a valuable contribution at the feasibility stage, with the subsequent development costs sought from multilateral or private sources. In countries with significant gas resources (including Malaysia, Tunisia, and Sudan, among many others), the United States should use its considerable comparative advantage to help governments in exploration and development. Programs to encourage U.S. oil and gas independents to overcom initial information and other barriers, and possibly ways to insure risk capital and dividend flows, could create a profitable role for the U.S. private sector. For example, U.S. companies in partnership with people experienced in rural industry and agriculture could help develop small-scale decentralized options hitherto ignored.

Nuclear energy, in our opinion, does not at this stage deserve development assistance support. It is capital-intensive,

and until safety and disposal problems can be overcome, cannot meet environmental or economic standards. It should be considered the energy source of last resort, to be used at some time in the future when the environmental and safety problems have been overcome.

4. Renewables

U.S.-sponsored demonstration projects should support developing country efforts to develop renewable sources of energy. Insofar as possible, they should emphasize reliance on local materials, technology, and manufacturing so as to reduce the need for foreign-exchange outlays for energy investments.

Various forms of assistance are appropriate. For example, the United States should expand and accelerate its existing tropical forestry efforts in order to enhance fuelwood supplies through reforestation and agroforestry. Where feasible, it should promote mini hydroelectric development such as USAID supported in Thailand; these small dispersed dams minimize transmission costs and can be developed and managed with local labor and control. The United States should also promote solar energy (including wind) where practical -- i.e., for water heating and pumping -- and support the improvement of local manufacture of solar-thermal and solar-electric technologies. Development assistance can promote the "modern" use of traditional fuels such as wood and particularly agricultural residues and wastes which can be digested to make flammable gas (methane) and liquid fuel (ethanol), but international assistance

is required for research and development in order to develop applications and overcome the social, institutional, and organizational constraints.

5. Policy Reform

The United States should, through the IMF, World Bank, and bilateral assistance agencies, seek the economic rationalization of energy policies in developing countries. Of special concern are the handsome energy subsidies for both fuel oil and electricity found in many developing countries. Such pricing policies can lead to profligate wastefulness and future energy insecurity. At the same time, they contribute to air pollution and $CO_2$ buildup. Since rolling back subsidies is always politically difficult to do, foreign assistance might in some circumstances be used to cushion the transition to more realistic prices and protect the poor from the effects of price increases.

Policies may also need to be developed to provide incentives for increasing efficiency or cutting fuel costs to the builders and managers of conventional power plants and factories.

In addition, policy reform in industrialized countries can have important benefits in developing countries as well as in industrialized ones. For example, aggressive efforts to improve automotive fuel efficiency -- through already available technologies -- could help forestall a rise in the world price of oil and lessen the environmental impact of exhaust fumes worldwide.

Needless to say, the United States cannot accomplish any of these policy and program changes except in cooperation with the developing countries and other donor countries. Alone, we simply don't have the leverage or the ability to withstand less high-minded competition. It will be especially important to cultivate likemindedness in the Japanese, who are already significant actors on the development scene, and to work with the European, Chinese and Soviet bloc countries who, like ourselves, are major contributors to the greenhouse effect caused by burning of fossil fuels.

E. Population

Even as land deteriorates, the developing world's population continues to grow. Since World War II, the world's population has doubled, from 2.5 billion to 5 billion, with roughly 85 percent of the growth coming from the developing world due to health improvements that cut death rates sharply. Africa alone faces one million more mouths to feed every three weeks, and food production, now increasing at a rate of 2 percent yearly, has failed to keep up with the 3 percent rate of population growth. Kenya, with one of the world's highest growth rate (3.9 percent a year) will have to create almost 11 million jobs by 2000 just to accommodate those already born.

Barring unforeseen disasters or miracles, we will have another billion human beings with us by the end of the 1990s. And United Nations medium projections, which assume fairly rapid

but by no means certain declines in birth and death rates, foresee a further doubling of the population -- 95 percent of it in the Third World -- by the time stabilization is reached, at about 10 billion, toward the end of the 21st century.

Mention of Third World "population pressure" conjures up visions of too many people pressing on too few resources. In reality, population growth rates and the effect of people on resources and the environment are both hugely affected by levels of technology, social organization, cultural tradition, and national and international policy. One must be wary of generalizations.[21]

The surest and most direct impact of larger population will be on agricultural resources. To feed that projected 10 billion adequately will require three times the basic calories consumed today, equivalent to about 10 billion tons of grain a year. To produce that much, all the world's current cropland would have to be farmed as productively as Iowa's best cornfields, or about three times the current world average. Recent developing country achievements and emerging technologies suggest that the goal can theoretically be met. But the challenge is enormous, and the population figures lend an urgency to food production that cannot be denied.

It is not just numbers, but also population distribution that has important resource and environmental effects. In the Philippines, for example, wanton logging by favored concessionaires has pushed slash-and-burn cultivators onto

unstable hillsides, accelerating erosion. In the Amazon Basin, road building and government incentives, along with extreme poverty, have propelled people farther and farther into the fragile rainforests. In Kenya, since arable land is now almost fully under cultivation, the rapidly growing rural population is being forced onto ecologically fragile, less viable areas, bringing desertification behind them.

A second inexorable population shift, to the cities, contributes to a different kind of environmental stress. In 1985, there were 28 cities in developing countries that had over four million people. By the end of the 1990s, there will be 50 such cities. According to the projections to 2025, it is expected that 85 percent of the population increase in the Third World will be in urban areas.[22]

Third World cities are growing so fast that water, waste and power facilities cannot keep up. Vast squatter communities spring up on hillsides and gullies and in industrial areas. Such communities are often gradually upgraded, but the pace of urban growth brings a continual immigration from the countryside. The health problems in such cities are truly environmental in origin. They result from lack of clean water and sanitation, compounded by emissions from poorly maintained vehicles and uncontrolled industrial pollution. The lack of waste treatment, regulations and controls cannot be blamed wholly on population growth. However, the spontaneous unplanned and uncontrolled growth of the urban areas makes dealing with the problems that much more difficult.

Policy Recommendations.

Around the world, one country after another, faced with undeniable numbers of mouths to feed and services to provide, has instituted policies to slow population growth. The most successful of these programs -- in such island countries as Barbados and Sri Lanka and in vast continental China -- have featured mutually reinforcing strategies. They offer full access to family planning information and services, combined with programs to improve health (particularly of mothers and children), to raise the standards and hopes of the poor, and to educate the people (especially the women). In their example lie the clues for U.S. policy in the 1990s. As the report of the World Commission on Environment and Development has said, "developing country population strategies must deal not only with the population variable, but with the underlying social and economic conditions of underdevelopment," education and employment (especially for women), and shelter and sanitation.

The United States urgently needs to resume its traditional leadership in family planning programs, and USAID must try to mesh its population assistance programs more clearly and deliberately with the other relevant socioeconomic and education programs it supports.

The United States used to be the leading supporter of family planning programs in developing countries. For 20 years we have also been the largest donor to international programs. But policy changes during the Reagan Administration have seriously

weakened U.S. support for family planning. Funding for international family planning has been cut from $290 million in 1985 to $235 million in 1987, a nearly 20 percent reduction. The budget request for FY 1988 is $226 million. These cuts urgently need to be restored, and budgets increased as necessary.

The Reagan Administration took the occasion of the International Conference on Population in Mexico City in 1984 to announce that U.S. funds may not be provided to any foreign organization that has any involvement with abortion, even if its abortion-related activities are supported by private or other non-U.S. funds. This policy resulted in the withdrawal of U.S. support for programs of the International Planned Parenthood Federation in December 1984, and subsequent cuts and then elimination of the U.S. contribution to the United Nations Fund for Population Activities (UNFPA). These, too, need to be reversed.

But the traditional U.S. leadership role was not just financial. Sharon Camp, of the Population Crisis Committee, points to the U.S. role in providing technical leadership in the development of effective birth control systems. She sees the current policy as eroding this stance. "Most of the expertise in family planning -- biomedical research on contraceptives as well as attitudinal studies -- has traditionally been housed in U.S. institutions," she said. In addition, the United States has been the top supplier of inexpensive, high-quality contraceptives.

The national family planning programs which the United

States should once again promote and support will have several ingredients. They must be voluntary, and should be part of all primary health care programs. National leaders must play a strong, prominent role in promoting the benefits of reduced fertility, and be backed by vigorous public education using whatever media is available (newspapers, billboards, radio, and television). There must be a sufficient number of trained workers and an adequate supply of low-cost contraceptives. Funding levels, including the U.S. contribution to the UNFPA should be restored to earlier levels, and increased as necessary to do the task. And they must be coordinated with health care and other programs designed to meet basic human needs and give people confidence that their children will survive.

F. Pollution Control

In most developing countries, efforts to control pollution resulting from industrial processes are grossly inadequate or totally absent. Industrial water pollution is the most critical ecological threat in East Asia, for example. In Latin America, mining (lead, silver, zinc) is the leading source of water pollution. In Mexico City, a combination of industrial and vehicle emissions produces air quality so bad that breathing it is equivalent to smoking two packs of cigarettes a day.[23] Levels almost this bad are found in city after city in the Third World. Even in cities that do not have heavy concentrations of industry, vehicular emissions are a major cause of air pollution.

Regulatory requirements, where they exist, are often unenforced due to budget or other constraints.

Policy Recommendations

Pollution control is a field in which the United States has considerable comparative advantage. We have design advice, regulatory experience, monitoring techniques, equipment and training to offer. If the United States were to establish some intermediary agency to identify opportunities and develop contacts, thereby reducing transaction costs for American entrepreneurs, U.S. private companies may also have a constructive role to play.

## IV. THE WORLD ECONOMIC CONTEXT OF SUSTAINABLE DEVELOPMENT

Despite some growth in the economic power and influence of some Third World nations in recent decades, the factors that shape the world economy are still beyond the control of the developing countries so seriously affected by them. World finance, debt, and growth are still controlled by the seven to ten most powerful industrialized countries. The value of the dollar still determines the cost of key imports, including oil. A one-point increase in the U.S. interest rate still adds billions to the debt-service costs that debtor nations must pay each year, often more than they receive in foreign aid. While world trade actually increased by 4 percent in 1986 (and rose again in 1987), non-oil commodity prices dropped by 10 percent and are now at their lowest in 50 years relative to the price of

manufactured goods, [24] making it ever harder for developing countries to earn foreign exchange for imports and debt-servicing. Trade barriers intensify the problem.

Indeed, capital is now flowing from the poor to the rich countries, rather than the other way around. Even Africa, the poorest of the continents, has a net flow of cash to the North. In 1987, total developing country principle and interest payments exceeded new lending by $29 billion! This imbalance was compounded by capital flight from developing to industrialized countries and by the failure of private investment and commercial bank lending to resume after the debt crisis of 1982. Thus, while the industrial powers debate the nature and size of development assistance, there is a troubling awareness in the Third World that the trade, debt, and financial decisions made by these same powers far outweigh the significance of foreign assistance in determining their development progress.

This awareness is reflected in many voices. The Bangladeshi Ambassador to the United States jokes wryly that his country would happily give up U.S. development assistance if the United States would eliminate its barriers against jute imports. At a 1987 meeting of non-governmental representatives from developing and industrialized countries -- all of them committed to improving the conditions of Third World poor people -- the message from the Third World was that non-governmental organizations in the industrialized countries can most constructively promote Third World development by encouraging a

more supportive policy environment in their own countries, that macro policies governing the terms of trade have a bigger impact, for good or bad, on development than does the provision of international development assistance.[25] And Overseas Development Council analysts like Stuart Tucker and Richard E. Feinberg, testifying before Congress provide the data that document that conclusion.[26]

Environmental Implications

The trade and debt crises are more closely connected to the problem of sustainable development and deteriorating environment than is at first apparent, because these crises appear to be hastening the deterioration of resources on which long-term growth depends. On the one hand, large new capital-intensive development projects will get much more careful scrutiny and most will probably not get built, which may ease the pressure on natural resources. Misguided programs like the Indonesian transmigration scheme have been scaled back, and some budgetary subsidies have been cut. But at the same time, Third World colleagues warn that financial stringency is slowly undermining hard-fought recent gains in resource conservation and environmental protection. While available information is mainly anecdotal, the following points are frequently made:

- Conservation usually takes a back seat in times of economic stress. As economic conditions have worsened in developing countries, and as debt pressures mount, there has been a tendency to ignore environmental

planning and conservation measures in both industrial and rural development projects.

- The austerity measures that have been required under IMF adjustment programs and World Bank structural adjustment agreements include government cutbacks in investments and operating expenditures. These are likely to fall disproportionately on fledgling, weak environmental and conservation agencies and programs. This is undermining the earlier efforts that have been made to bring ecological considerations into development planning and projects.
- Austerity measures and general recessionary conditions also have led to sharp declines in per capita incomes and increases in unemployment. This puts more pressure on the natural resource base as more people return to subsistence farming and rely on scarce forest and water resources.
- Pressures to expand primary commodity exports can lead to increased deforestation and to expansion of cash cropping on available good lands, thus further marginalizing the rural poor and forcing them to poorer, erosion-prone lands.
- Tariff rates that rise with each successive stage of processing (e.g., tariffs on yarn are higher than those on cotton) discourage processing and increased earnings on Third World commodity exports. They require higher

volumes of commodity exports to make up the difference, which may in turn flood world markets and lowers world prices, forcing countries to put still more strain on an already pressured resource base, accelerating a downward spiral of poverty and environmental degradation.

- In countries that must postpone dealing with air and water pollution problems (which have now reached crisis proportions in some Third World countries), future public health and clean up costs, as we have discovered in the United States, will be staggering.[27]

In sum, the resource base, already battered, is being required to pay for debt and trade imbalance in ways that will achieve neither financial nor environmental nor development goals. To assume that this situation can continue is foolishly short-sighted and promises greater impoverishment of future generations.

A. Strategy -- Debt/Trade/Development

To be of long-term value, solutions to the Third World trade and debt crises must meet three criteria: they must be financially sound; they must be protective of the economically weak; and they must not destroy the resource base. Although detailed recommendations regarding trade and debt are beyond the scope of this paper, some recommendations designed to meet these criteria should be mentioned. For example:

- All international lending -- for projects, policy and restructuring -- should meet exacting standards of sustainability. The World Bank, under the direction of President Conable, has recommitted itself to firm environmental standards to govern its lending. The United States, which has been a major supporter of these efforts, should continue to monitor and strengthen this trend, and should, in concert with other donor members, press for similar changes in the regional banks.
- Commercial banks also must clearly understand that environmentally unsustainable projects are bad financial risks. Government-sponsored guarantee and insurance programs such as the Overseas Private Investment Corporation (OPIC) should make awards only after assurance that the activities involved contribute to sustainable development.
- Along with nutrition, health, and education budgets, certain natural resources programs (e.g., forest and watershed management, coastal fisheries, and soil conservation) should be exempt from national budget cuts taken in the name of structural adjustment.
- With regard to trade, Third World countries should not be forced to generate increased exports just by exploiting natural resources more heavily. Rather, in view of their desperate employment needs, they need

better reception for their labor-intensive exports. If developing countries are not permitted to export labor services in the form of value added to commodity exports and other goods, they are likely to export them as migrants.

- o International agricultural surpluses exported under P.L. 480 and similar commodity programs should never, except in the case of emergencies such as famine, be distributed in ways that undermine developing country production of food crops. They should be used always in food-for-work and other food aid programs that offer incentives to conserve fragile resources, replant deforested areas, and encourage sustainable agriculture.

Finally, the United States should actively explore the several creative proposals that have been floated by developing country leaders, environmental NGOs, and progressive business and banking officials to swap debt for other development and environmental ends. Some proponents advocate the creation of a global fund to purchase debt and convert it to development purposes, a fund in which developing countries would participate in the management. A study organized by the United Nations Development Programme and World Resources Institute and supported by the aid agencies of the United States and Canada, is exploring the feasibility of a new international conservation financing program. In addition to financing debt-for-nature swaps and

other innovative funding mechanisms, this facility will seek to co-finance environmental projects and sustainable development with public and private funds. Blocked funds might be used for similar purposes.

Such swaps could have enormously beneficial effects on the environment. They can be a catalyst. They can provide the impetus and leverage for widespread improved management of natural resources. The Conservation International's Bolivian experiment bears close watching in this regard. It has already brought competing economic interests (cattlemen, indigenous Indians, forestry people) together in a regional planning exercise. Though the specific Beni Reserve in question is quite small (335,000 acres), the policies and programs developed around it could strengthen the management of the entire surrounding forest (4 million acres), and thus affect natural resources management in the whole Province of Beni (10-12 million acres), the whole northeast quarter of Bolivia.[28]

Debt swaps could assure ample, steady financing for conservation efforts in some countries and thus be the salvation of the environment. The amounts may be small in terms of overall debt, but a mere 2-3 percent of the Latin American debt in local currencies that could be programmed over 15 years would enable the countries to accomplish fantastic things to conserve and manage resources wisely and to protect unique biological areas. What many Latin countries need in order to accomplish their environmental ends is access to large amounts of predictable

local financial resources that will pay for running the parks and reserves they create. For the swaps to work the U.S. Treasury will need to make the necessary changes in the laws and regulations governing commercial banks. A combination of provisions for taking loan losses and charitable gifts should provide appropriate incentives.

Even in the early exploration and promotion of these concepts, advocates of these ideas must move with the fullest participation of the developing countries, lest the specter of U.S. corporations, banks, and private voluntary organizations (PVOs) acquiring large pieces of developing-country real estate provoke condemnation of the idea as some new form of colonialism. So far, the key national and international agencies that have a potential interest in these swaps -- the World Bank, IMF, USAID, the Japanese -- are not behind the concept at all. Imagination and leadership on the debt issue is coming instead from some Third World finance ministers and from the U.S. private sector--from banks, investment houses, and NGOs.

Advocates should also recognize that debt/environmental swaps might accomplish a great deal on the environmental side, and still make only the smallest dent in a developing country's debt. They must therefore be accompanied by other debt relief measures as well if the net resource flow from the developing countries is to be stopped and development and economic growth resumed.

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B. The Resource Management Connection

Beyond these specific recommendations, it is important to recognize that productivity increases from careful management of the natural resources sector, which looms very large in the economies of most developing countries, can provide a part of the answer to the debt and trade crises. More effective use of locally available resources can simultaneously reduce the need for foreign investment, save and earn foreign investment, expand domestic production, and reduce resource deterioration. Consider some examples:

- About 15 percent of debtor country imports are for food. Improvements in domestic agricultural productivity are needed to meet the needs of expanding populations, and, as the examples of India and China make clear, they can markedly improve trade balances. Even where net food exports are not a realistic possibility, reductions in food imports are.
- A good example of making better use of available resources is in the area of irrigated agriculture. The FAO anticipates investments of $100 billion over the rest of the century to expand irrigated areas, but if current irrigated areas attained their production potential through better management, only limited expansion would be needed.
- Another 15 percent of imports by developing countries is for fuel, and more than 90 percent of external

financing for energy has gone to hydro and conventional power projects. Yet, all available studies indicate that the potential for sharp improvements in energy efficiency in developing countries -- from Brazil to Kenya -- is enormous and represents the least-cost approach to balancing energy supply and demand. Also, in many countries, biomass energy systems offer excellent promise in reducing oil imports.

- Surprisingly, developing country imports of forest products exceed $10 billion annually and are increasing steadily. Many countries such as Mexico and Nigeria, which should be able to supply their own needs, are major importers. In other countries, industrial forestry has been neglected to the point that exports are in decline.

## V. CONCLUSION

Thus, the thrust of this analysis is that the United States, acting in consort with other donor nations and in cooperation with developing ones, should strive to help developing countries achieve large sustained productivity increases from the existing resource base and to make the most efficient possible use of petroleum and other vital imports. But it must be recognized that the economic growth necessary to mitigate poverty and protect the resource base cannot take place without financial resources adequate to the task. It follows, then, that the

United States should also provide leadership to bring debt relief and to generate new lending for sustainable development purposes. Our final recommendation is thus addressed to our fellow environmentalists -- and that is, that they should join wholeheartedly in the constituency that favors adequate foreign assistance budgets and increased international lending for sustainable development.

## REFERENCES

1. The World Commission on Environment and Development, Our Common Future (New York: Oxford University Press, 1987) 80. This volume is an indispensible primer on the relation between environment and development.

2. World Resources Institute and International Institute for Environment and Development, World Resources 1986 (New York: Basic Books, 1986) 3.

3. Marc Reisner and Ronald H. McDonald, "The High Costs of High Dams," in Andrew Maguire and Janet Welsh Brown (ed.), Bordering on Trouble: Resources and Politics in Latin America, (Maryland: Adler & Adler, 1986) 270-307.

4. Food and Agriculture Organization, Agriculture: Toward 2000 (Rome: FAO, July 1987) 24.

5. The World Commission on Environment and Development, Our Common Future 126.

6. The World Commission on Environment and Development, Our Common Future 125.

7. Nazli Choucri, Dimensions of National Security: The Case of Egypt, a case study written for the World Resources Institute, 1988.

8. James Nations and H. Jeffrey Leonard, "Grounds of Conflict in Central American," in Maguire and Brown (ed.), Bordering on Trouble 55-98.

9. The World Commission on Environment and Development, Our Common Future 28.

10. The World Commission on Environment and Development, Our Common Future 6.

11. The World Commission on Environment and Development, Our Common Future 8-9.

12. Robert Repetto, "Creating Incentives for Sustainable Forest Development" Ambio, Vol. 16, No.2-3, 1987, 94-99.

13. Food and Agriculture Organization, Agriculture: Toward 2000, Chapter 1.

14. Robert Repetto and Mohammed El-Ashry, "Towards Food Security and Sustainable Agricultural Development", draft proposal to World Food Council and the United Nations Environment Programme,

citing Sustainable Agricultural Production: Implications for International Agricultural Research: Draft Report of TAC Continuing Subcommittee II, Washington, D.C. October 1987.

15. Food and Agriculture Organization, Agriculture: Toward 2000, Chapter 18.

16. Robert Repetto and Mohamed El-Ashry, "Towards Food Security and Sustainable Agricultural Development."

17. Energy 2000 - A Global Strategy for Sustainable Development, A Report to the World Commission on Environment and Development (New Jersey: Zed Books 1987) 28.

18. Jose Goldemberg, Thomas B. Johannson, Amulya K.N. Reddy, and Robert H. Williams, Energy for Development, (Washington, D.C.: World Resources Institute 1987)

19. Jose Goldemberg, et al., Energy for Development 55-58.

20. Energy 2000 - A Global Strategy for Sustainable Development, 51.

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

22. Robert Repetto, Population Bulletin, 11.

23. David DeVoss, "Mexico City's Limits," in Maguire and Brown (ed.), Bordering on Trouble pp 13-54.

24. Jose Goldemberg, et al., Energy for Development, 15-16; Richard E. Feinberg, Overseas Development Council "Third World Debt: Toward a More Balanced Adjustment," Statement before the Subcommittee on International Debt of the Committee on Finance, United States Senate, March 9, 1987.

25. Peggy Antrobus, quoted in Curry Foundation Reports, Vol. 5, No. 1, Winter 1988 (Washington, D.C.).

26. Richard E. Feinberg, Testimony before Subcommitte on International Debt of the Committee on Finance, U.S. Senate, March 9, 1987.

27. James Gustave Speth, World Resources Institute, "Environmental and Resource Management and the International Debt Crisis: Some Perspectives and Proposals", Speech delivered at Conference on The Debt Crisis, Carter Center of Emory University, April 7, 1986.

20. Personal communication from Charles Steele, Conservation International, November 6. 1987.

WRI COLLOQUIUM

**U.S. POLICY IN THE 1990s: INTERNATIONAL COOPERATION FOR ENVIRONMENTALLY SUSTAINABLE DEVELOPMENT**

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