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**CENTRAL AMERICAN PROFILE**

Executive Summary

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## Central America -- A Region in Crisis

Central America's basic natural resources -- its land, forests, water resources, coastal areas and fisheries -- are misused and the future economic prosperity of the region's 25 million people is at stake.

Throughout Central America, the overwhelming evidence is that pressures from growing populations and expanding economies are causing people and governments to overexploit the natural resources at their disposal in order to satisfy immediate daily needs, increase employment opportunities, increase current revenues, and avoid difficult political decisions such as the redistribution of productive lands. As a consequence, depletion rates of forests, soils, fisheries, and other crucial resources far exceed renewal rates and secondary problems such as soil erosion, sedimentation of hydroelectric dams and coastal harbors, and water pollution have reached crisis proportions in many parts of the region.

This "mining" of the environment facilitates the short-term subsistence efforts of both people and governments, but has actually contributed to the ongoing long-term decreases in food production, per capita income, and physical well-being that are occurring in many parts of the Central American region during the 1980s. Growing evidence suggests that all of the nations of the region are experiencing direct financial losses and have already sacrificed substantial future economic opportunities as a result of previous careless management of vital renewable natural resources.

To cope with these problems and to alleviate widespread human suffering, the governments of the region, as well as other nations and international assistance organizations that fund Central American development programs, must take steps to help the countries of the region to implement sound natural resources management practices. They must devote more attention to the environmental consequences of many of the development programs in the region. And unless development programs include region-wide approaches to region-wide problems, those programs are likely to be counter-productive in the long run.

Those are some of the findings of the Central American Environmental Profile prepared by the

International Institute for Environment and Development (IIED), a nonprofit organization with offices in Washington, DC and London, England. The Profile was commissioned by the United States Agency for International Development (USAID) and authored by H. Jeffrey Leonard, a senior associate with the Conservation Foundation. This document, the executive summary, contains highlights of the Profile.

At the core of the crisis are two stark facts:

1. **The region's population has exploded.**

There were about 5 million people in the seven countries in 1920. By 1960, 12.5 million. By 1985, 25 million -- a 400 percent increase over 1920. Central America's population has grown at a faster rate than any other region of the world in recent decades and is now growing at a rate of 2.9 percent a year, higher than all of Latin America and equal to that of Africa. If this rate is maintained, the region's population will double again in 24 years. And in Nicaragua, Honduras and Guatemala -- which contain over 60 percent of the region's people -- the annual population growth rate is now about 3.5 percent per year.

2. **This mushrooming population is over-taxing the region's mismanaged and over-exploited renewable natural resource base.**

The problems of rapid population growth are compounded by two other factors that only further increase the strains being placed on the fragile natural resource base of the region. First, the opportunities to earn a living in the manufacturing or service sectors are severely limited by the grave economic situation that prevails in all of these countries. Second, a number of deep-seated political and economic traditions constrain access to the most fertile agricultural lands of the region for the majority of people.

Throughout Central America, these factors have combined to leave the mass of the rural population in a position of dividing up the region's limited resources among more and more people, producing a decreasing amount of the region's basic food requirements, and (especially in rural areas in recent years) suffering declining standards of living by measures of both per capita income and quality of life indices.

In many instances, the only recourse for much of the rural population in Central America in recent years has been to intensify exploitation of the lands and natural resources around them. This has had devastating consequences for the environment throughout Central America.

Many steep and rugged watersheds have been cleared by fire, extension of agriculture and grazing, and other careless land use practices, causing massive erosion, increasing flooding and mudslides during the rainy season, and contributing to reduced stream flows during drier times of the years. Serious land erosion is also occurring on less steep lands, primarily because of extensive clearcutting of forests, overgrazing and compaction of the soil by livestock, and the exhaustion of lands cleared for cultivation. Ironically, however, much of the timber that is being cut in Central America is being burned or left in place rather than being harvested, compounding the squandering of potentially valuable resources.

**Natural  
Resources  
and Socio-  
Economic  
Trends**

The environmental crisis in Central America is integrally linked with a wide array of socio-economic problems plaguing the seven countries of the region: Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama. Consider:

The economies of the region are wracked by declining income and escalating international debt. Agricultural productivity is low, per capita production of basic foods has stagnated or declined throughout the region while export earnings have not increased rapidly enough to permit increased importation of food. Harvests of lobster and other valuable shellfish have declined in many coastal areas of the region in recent years.

High migration continues from rural areas, especially heavily populated hillside areas of highlands, into urban areas of the region. Most governments of the region are trying to develop the fragile Caribbean areas of the region as a safety valve to divert some of these migrants, but in many cases the agricultural production from these newly conquered lands has been disappointing and unsustainable. Although much of the electricity in the region is currently from hydropower, this resource remains underutilized. The hydropower capacity that does exist is seriously endangered by

watershed deterioration and consequent sedimentation in reservoirs and river channels.

The health and quality of life indicators of the countries of Central America also present a depressing picture. For example, mortality rates for infants and children remain high in much of Central America. In contrast to the rest of the hemisphere, communicable diseases, such as diarrhea, malaria, respiratory diseases, polio and tuberculosis are major causes of death except in the urban areas of Panama and Costa Rica. The resurgence of malaria is a particularly serious problem for Central America, especially in conjunction with the appearance of insecticide resistant strains of malaria-carrying mosquitos. Widespread and heavy use of pesticides, many no longer used in the United States, also threaten human and environmental quality.

All of these socio-economic problems are combining today in Central America to make the conditions of day-to-day living for a growing number of people more and more dismal. The Kissinger Commission's bipartisan report of Central America concluded in 1984 that about half of the urban population and up to three-quarters of the rural population in El Salvador, Guatemala, Honduras, and Nicaragua could not satisfy their basic needs in terms of nutrition, housing, health and education. While relatively better off, the populations of Belize, Costa Rica and Panama, particularly those in rural areas, have experienced marked declines in their standards of living in recent years.

**Wasteful  
Patterns of  
of Economic  
Development**

Neither the environmental nor the economic crises that are today threatening to undermine efforts to improve the welfare of the people of Central America were inevitable. Despite the problems caused by international events such as declining terms of trade, a quadrupling of oil prices in the 1970s and tremendous increases in rates of interest owed on foreign debts, all the countries of Central America have a great capacity to provide for themselves. Indeed, on the whole, Central America is extraordinarily rich in natural resources--its volcanic soils are among the most fertile in the world, it has abundant supplies of timber and fresh water, and its coastal waters yield shrimp, lobster and numerous other marine resources.

### Why then the crisis?

When thinking about the economies of Central America, several critical factors must be borne in mind:

1. Most people in Central America are directly dependent upon the natural resource base for their livelihood. In fact, about one quarter of total domestic economic production in each of the seven countries comes from agriculture, forestry, fishing and related activities. This dependency will not be substantially reduced in the foreseeable future, for the manufacturing and service industries in the region cannot provide enough jobs for the fast-growing population.
2. For long-standing social, economic and political reasons, a small minority in each Central American country (except Nicaragua) controls most of the total wealth and arable land. Much of the land best suited for basic food crops is either tied up in large under-used landholdings or is used for cattle raising or export crops such as cotton. This commercial agricultural sector provides substantial employment during harvest times; however, in many areas this employment drops during other seasons.
3. The overwhelming majority of the agricultural workforce in Central America -- small-scale farmers and landless peasants -- is relegated to hilly, marginal or otherwise fragile lands. These subsistence farmers produce most of the foods for domestic consumption; but crops yields are very low by U.S. standards. Few government programs to increase yields or incomes are targeted at these farmers. Many of the governments in the region continue to encourage migration to frontier areas in the sparsely-populated Caribbean areas, often with the help of foreign aid funds. While some of the frontier regions may merit development, much of the frontier lands will not sustain traditional agricultural productivity under large-scale land clearing and the traditional annual cropping practices of small-scale farmers. Thus, the solution to overcrowding in Central America's urban areas and to the increasing marginal existence of poor farmers is not likely to be found in schemes to transport these masses into the frontier areas of Central America. Nevertheless, the frontier developments continue; and as they advance, they permanently destroy primary tropical forests

containing the greatest natural biological diversity on the planet.

Within this context, the steps necessary to create enduring economic progress in Central America can be identified. First, agricultural development is of fundamental importance. Second, although continued production of export crops is necessary to support sagging economies and generate receipts of foreign currency, more attention to improving productivity in subsistence agricultural is critical. Third, although heretofore underdeveloped areas of the Caribbean side of the region may hold significant potential, careless development of these lands is likely to exacerbate current economic and environmental problems in the region.

In short, careful development and efficient management of the region's natural resources is one of the crucial keys to future economic progress throughout Central America. Ironically, however, the record of recent years indicates that virtually all of the economic expansion generated in the agricultural and related industries has come as a result of stepped up exploitation of these resources rather than management of them. Up and down the entire isthmus, these natural resource systems are being mined, squandered, poorly managed, gradually degraded and reduced in numbers and quality. Consider some of the indicators that point to this conclusion:

According to a background report done for the Kissinger Commission, close to half of the farms throughout the region are thought to use land inefficiently or maintain large amounts of land in permanent fallow;

Productivity per hectare of land is low for most crops, with food crop yields in particular reaching as little as one-third of the yields in the United States;

It is estimated that as much as two-thirds of the best agricultural lands in Central America are today being utilized for extensive cattle grazing, at an economic return far below that which they could produce in cultivation of either export or food crops;

Cattle ranching operations use far more land than necessary and are highly inefficient

producers, in part because most of the pasture in the region is left in its native state rather than upgraded and managed.

There is vast waste of cut timber, with only a very small portion of the annual timber cut in the region actually being used for commercial purposes;

Rates of reforestation are very low, amounting to about 7 percent of the annual timber cut across the region;

Little processing is done of raw timber for a wide range of downstream industrial uses, meaning that the region is a net exporter of low-value added timber and a net importer of many high value-added wood and pulp and paper products.

Overfishing is endemic in coral reef, cay, seagrass and other near shore areas throughout the region, so much so that shortages of high value species such as conch, lobster, and shrimp are becoming major problems in many areas;

At the same time, development of continental shelf and deep sea fishing industries in most of Central America continues to lag for a lack of not only capital and expertise, but also a lack of entrepreneurial activity;

There is a large-scale wastage of by-catches of edible finfish and potentially useful trashfish which are caught in conjunction with exploitation of shrimp and other high value marine species.

These and numerous other indicators of economic inefficiency in the natural resource-based industries of Central America are major barriers to future economic development in the region. But they are also major causal factors of the massive degradation of the region's soil, forest and water resources. Unless the dual problems of economic inefficiency and environmental deterioration are addressed simultaneously in the coming decade, little progress can be expected toward improving the level of social and economic development in Central America.

## Environmental Consequences

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Now consider some of the destructive ecological consequences that are related to the misuse and mismanagement of the natural resource base of Central America.

### **Loss of Forests**

The most important ecological change occurring throughout Central America as a result of population and economic pressures is the rapid and continuing conversion of forests to other land uses. Today only about 40 percent of the land area of the seven countries remains forested. That is not unusual in comparison to other regions of the world. What is unusual, however, is the rate at which the Central American landscape is being transformed. For example, it is estimated that two-thirds of all the forests cleared since Central America was settled have been cleared since 1950.

And rates of forest clearing have increased in every decade since 1950. In 1970, 49 percent of Central America was forest and woodland. By 1980 this figure was down to 41 percent -- a loss in one decade of 15 percent of the region's forest cover, or an area larger than the state of Maryland.

Deforestation has its positive side, of course. It can and has provided land for crops and pasture. But forest clearing in Central America has been economically wasteful. Much of the timber being cut is being burned in place or left to rot in the fields. Commercial harvesting of timber contributes significantly to the economy of only one country in the region, Honduras. And even there it is estimated that timber with a commercial value of \$320 million is being burned on site or left to rot each year.

Moreover, most experts now agree that most of the forest lands with the best agricultural potential have already been cleared. Much of the remaining forests in Central America overlie soils that are of poor quality and subject to rapid deterioration.

Another factor: Deforestation may be eliminating plant species that may some day prove to be valuable for pharmaceuticals, plant hybrids or pesticides. About a quarter of the medicines now produced commercially in the U.S. are derived in whole or in part from tropical plants. Collecting, screening and commercializing tropical plants is still a fledgling pursuit in Central America. But there are

indications that at least 15 percent of some 1,500 tree species screened in Costa Rica may be potentially useful in treating cancers.

Belize is the only country in the region that is not experiencing great forest destruction; it is losing less than 1 percent of its remaining forest cover per annum. Reason: Belize has a small population (only 150,000) and the demand for land for cattle and agriculture in the interior has not been strong enough to stimulate the assault on forests that has occurred in every other Central American country. Belize thus has the opportunity to assess its forest resources carefully and protect those forests least suited for agriculture before population pressures force it as well to succumb to haphazard deforestation.

#### Land Degradation

Land degradation is reaching crisis proportions in every country in Central America except Belize. Reasons: extensive deforestation, expansion of cattle raising and agriculture in hillside and mountainous areas and the absence of sound soil conservation and land management practices.

The problem is most serious in the Pacific drainage areas where the majority of the population lives -- about 40 percent of all lands suffer erosion rates high enough to undermine the land's productivity. East of the continental divide, land degradation is most obvious in the interior frontier areas recently cleared for cropping, ranching and colonization. Much of these lands are abandoned after only a few growing seasons.

Most critically affected is El Salvador. By 1984, more than 50 percent of that country's land mass was subject to serious soil erosion or was significantly degraded by the combined forces of forest clearing, cattle grazing and other harmful agricultural practices by peasants and fuelwood gatherers. While other countries of the region may perceive -- usually wrongly -- that they can compensate for the loss of productive land on their Pacific slopes by reaching into lands on the Caribbean side of the continental divide, El Salvador cannot. It has only a Pacific coast.

Land degradation and soil erosion lead, of course, to increased amounts of sediments flowing into fresh water streams, rivers, lakes and coastal bays and estuaries. Example: In Guatemala, the annual soil

runoff in areas still covered by vegetation is estimated to vary between 20 and 300 metric tons per square kilometer. In unforested areas the soil runoff skyrockets to between 700 to 1,110 metric tons per square kilometer.

This sediment load takes its toll downstream. Consider hydroelectric power generation, which has increased more than five-fold in Central America in the past 20 years:

A recent study of Guatemala's new Pueblo Viejo Quixal hydro project found sediments were accumulating considerably faster than originally estimated at the dam site and in the upper basin. If not corrected, the projected life of the project will be shortened and generating capacity will fall. The cost of remedial measures is at least \$100 million.

In El Salvador, heavy siltation in recent years has reduced the generating potential of the Cinco de Noviembre project and has greatly increased the cost of maintaining the power generating equipment. Siltation of reservoirs is already posing problems in newer hydro projects in that country.

In Honduras, hydro projects now under construction, at a cost of almost \$1 billion, will get their water from watersheds with high sediment rates. Yet little has been done to reduce the threat of siltation to these projects.

In Costa Rica, which gets 99 percent of its electricity from hydro projects, the watersheds above virtually every major hydro plant are deteriorating. At one plant the revenue lost because of sedimentation is estimated between \$133-274 million.

The problem extends beyond the borders of individual countries, for many watersheds encompass more than one nation. The Lempa River is one example. Rising in south-central Guatemala and western Honduras, it then flows into El Salvador. It drains 49 percent of El Salvador's territory and provides 93 percent of El Salvador's hydroelectric generating capacity. Yet nearly 8,000 square kilometers of the 18,000-square kilometer Lempa watershed is outside the control of El Salvador, either in Guatemala or Honduras.

Indeed, much of the sediments that are harming El Salvador's hydro plants are coming from Guatemala and Honduras.

Sedimentation has caused other problems too. In Panama, rapid deforestation has led to a doubling of siltation in the lake that supplies water to operate the Panama Canal, the cornerstone of Panama's economy. In Honduras, a rapid buildup of sediments is reducing the capacity of the reservoir that provides water for Tegucigalpa, the capital. In Guatemala, sedimentation reduced the carrying capacity of the Metagua River by 50 percent between 1960 and 1980. This threatens an extensive government-sponsored irrigation program and increasing flooding.

### **Destruction of Coastal Resources**

Because of its unique location -- a narrow landmass separating the world's two great oceans in a tropical climate -- Central America has been endowed with some of the most abundant, beautiful and potentially productive coastal resources on earth. Its coral reefs, mangrove swamps and estuaries provide habitat for commercially valuable shell and fin fish.

But these resources are now threatened too. One problem is overfishing, especially in near coastal waters. In Belize, queen conch catches have dropped 75 percent in recent years since peaking in 1972. Fish catches in most coastal areas of Central America grew in the 1960s and 1970s. They have remained relatively stagnant or have declined since then. In Honduras, conch populations have fallen so dramatically that harvesting for commercial or local consumption has virtually ceased. Lobster and shrimp catches have dropped since 1978 when they topped 5,000 metric tons.

The governments of the region have tried to stop overfishing by limiting seasons for various species, by limiting the number of boats licensed, and by limiting harvesting and controlling poaching.

Another problem is continuing and extensive destruction and degradation of crucial coastal habitats. No matter how effective the attempts to control over-fishing, future supplies of fish in the region may be reduced unless habitat destruction and degradation is halted. This problem is only now being recognized and no major efforts have yet been made by any government in the region to preserve, protect and wisely manage coastal resources.

Mangrove forests are the breeding grounds for most species of fish, shrimp and lobster, yet coastal mangrove forests have been harvested, removed to make way for coastal development, or damaged by man-made pollution at increasing rates in recent years.

In Guatemala, Honduras and El Salvador, mangroves are widely harvested for firewood and for making charcoal. Some areas have been completely destroyed, others degraded. Agricultural runoff also threatens mangroves in El Salvador, Honduras, and Guatemala: the runoffs carry sediment and pesticide residues into the mangrove estuarine waters.

In Costa Rica, mangroves have been destroyed to provide bark for the tanning industry (recently outlawed), for salt production and by coastal development. In Panama, mangrove swamps have been drained, cleared and filled for urban expansion, mariculture activities and resort development.

It has been estimated that a square kilometer of mangrove estuary can produce a commercial yield of \$95,000 per year in fish and shellfish production. Thus, in addition to the ecological damage caused by mangrove destruction, Central American countries have also suffered major economic losses because of mangrove destruction. Belize is the only country in the region where mangroves are not now being significantly degraded or eliminated.

## **Pesticides**

Indiscriminant use of pesticides, many no longer allowed or restricted in the United States -- DDT, DECP, leptophos and BHC, for example -- is one of the most pervasive environmental contamination and human health problems in Central America. Many are extremely dangerous; some are toxic to humans, others can cause cancer or sterility. And the levels used, especially in the cotton-raising areas of the Pacific coast, far exceed recommended doses.

This, of course, is a major economic cost. Indeed, pesticides now account for nearly 50 percent of agricultural costs in some areas.

The pesticide problem is manifold. Field workers wear little or no protective clothing. Some cannot read or do not understand warning labels. Some wash application equipment in irrigation channels or streams. Since most of the workers' homes do not

have running water, workers and their families often bathe in streams contaminated with pesticides. Profligate and careless aerial spraying compounds the problem; in some countries pilots are paid a percentage of the volume of pesticides sprayed.

The heavy use of pesticides over the years in Central America has destroyed some natural insect predators and has led to the emergence of pesticide-resistant insects. This has been followed by increased pesticide applications -- in some areas from a recommended average of 8 applications to more than 40 per year.

Widespread use and abuse of pesticides has caused many poisonings and deaths. In a recent five-year period, some 19,000 pesticide poisonings were medically certified -- 17,000 in Guatemala and El Salvador. But record keeping is poor and it is generally believed that the true human toll is substantially higher.

The U.S. Agency for International Development has reported that there are about 1,800 pesticide poisonings per 600,000 population in Central America each year compared to 1 per 600,000 a year in the U.S. If the U.S. rate were as high as the Central American rate, there would be more than 700,000 pesticide poisonings a year in the U.S.

In some areas, 80 kilograms of pesticide are applied on each hectare of cotton, one of the highest uses in the world. One country, El Salvador, used at least 20 percent of the world's parathion production in a recent year. DDT residues in the tissues of people in cotton-growing areas have been measured at almost seven times higher than levels found in the tissues of urban residents. Very high levels have also been found in milk and meat samples -- in some milk as much as 90 times higher than the residue level allowed in the U.S.

The pesticide problem in Central America has contributed to and has been compounded by a resurgence of malaria in some areas. In 1982, 3,000 cases of malaria were treated in Belize compared to 1,600 in 1980 and 2,075 in 1981. This has made it necessary to continue to use DDT in and around many villages. DDT use is also widespread in Guatemala, Nicaragua, El Salvador and Honduras.

The people of Central America are not the only ones endangered by the gross misuse of pesticides in their region. About 70 percent of all agricultural production in Central America is exported, much of it to the United States. And pesticide use is heaviest on the large plantations, farms and ranches that produce the key export crops -- cotton, coffee, beef, bananas, citrus and sugar cane.

While U.S. inspectors have blocked the entry of Central American meat and crops because of pesticide contamination with increasing regularity in recent years, it is likely that some of these contaminated products escape detection. Thus U.S. consumers may also be exposed to foods from Central America containing high levels of pesticides.

Pesticides also pose a threat to Central America's abundant wildlife. Although no detailed studies have yet been made, a recent Nature Conservancy report noted that the heavy use of pesticides in Central America may be adversely affecting North American birds that winter there. Said the report: "It would be ironic if North American migrant birds were suffering from the effects of heavy pesticide use in their non-breeding quarters, just as they were recovering from such usage in their breeding grounds."

## **Environmental Pollution**

Beyond rampant pesticide contamination, the most serious environmental pollution problem in Central America is water pollution. Most urban areas have some form of centralized sewage collection system -- sewers, canals, or open gutters -- for storm runoff and domestic sewage. But there are fewer than a dozen sewage treatment systems in all of Central America. Thus, most sewage is discharged untreated directly into rivers, lakes or coastal waters.

This creates major health problems for rural populations downstream, since rivers and streams are still widely used for washing and bathing; thus enteritis and diarrheal disorders remain the major cause of death in Belize, Guatemala, Honduras and Nicaragua, as noted earlier.

## Environmental Management in Central America

Each Central American country has at least one government agency or department directly concerned about environmental and natural resources problems. In reality, however, control of natural resource issues is often divided among a variety of ministries and departments. Result: conflicts of interest, duplication of efforts, excessive bureaucracy and general inefficiency. In most countries, natural resources protection is erroneously viewed as secondary to and separate from economic production. Agricultural policy generally takes precedence over environmental policy. Thus conflicts between land use for agriculture and protection of natural resources persist. Indeed, there seems to be little understanding of the need for economic development which can be sustained over the long term through wise management of the natural resource base.

One of the most significant obstacles to natural resources protection in all Central American countries is insufficient and/or poorly trained personnel. In addition to a lack of training institutions within Central America, government salaries are notoriously low. When effective personnel are hired, they soon move on to high-level posts where they earn more. And some of the best natural resources personnel sometimes move to other nations or go to work for international organizations.

In general, most nations in the region have environmental and natural resources legislation. Enforcement is another matter, however. There is little political or financial support to make those laws work. Thus some observers have noted that most Central American environmental laws are worth only the paper they are written on.

## Regional and International Considerations

Both the causes and effects of many of the worst natural resource problems in Central America reach beyond the borders of the individual nations. Natural resource destruction at the local level in one country can have spill-over effects in neighboring countries. Conversely, the ability of one country to control its most pressing natural resource problems may be hampered by the fact that

it shares watersheds, natural ecosystems or migratory biological resources with other countries in the region with less desire or administrative capability to solve the problems.

This greatly magnifies the challenge to individual governments and to international development assistance organizations to reverse the deterioration of the region's natural resource base. One country's laws to control rampant destruction of its coastal and wildlife resources may be meaningless if legal or illegal demand for wood, mangrove bark or exotic endangered species continues in neighboring countries. Efforts to preserve the power-generating capacity of major hydroelectric projects, or to assure the long-term availability of valuable marine resources such as shrimp and lobster, will be successful only if they are undertaken in all countries which share upstream watersheds and critical marine habitats such as mangroves and coral reefs.

### Conclusions

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Economic growth -- and equitable distribution of the fruits of that growth -- are obviously the top priorities for Central America. (The costs will be high: an estimated \$24 billion in outside aid, according to the Kissinger Commission report, just to get back to per capita 1980 gross domestic product levels by 1990.)

Although economic development efforts for Central America must stress industrialization and increasing manufacturing output, much of the region's economic growth will still come from increases in Central America's traditional commodities exports (coffee, bananas, cotton, sugar and meat). (We have already seen how this places enormous stresses on the region's subsistence food supplies by forcing food farmers on to more and more marginal lands.)

The strains placed on the natural resource base may be nearing their limits. Pesticide use on export crops is nearing the point where the additional costs and dangers to human health are not balanced by corresponding increases in yield. Areas opened up for cultivation and grazing have already been abandoned after a few years because of careless management of the land and soil. Thus, major increases in agricultural production are not likely

without new programs to maintain, protect and rehabilitate the region's natural resource base.

While agricultural development in the region continues to stagnate, and human welfare for perhaps a majority of all people continues to decline, the future potential productivity to be gleaned from the region's soil base and remaining forests is being slowly undermined and the waterways of the region are filling with silt and pollution. Moreover, some of the most significant and debilitating health problems facing the region could be substantially reduced with improvements in environmental management--for example, provision of safe drinking water, vector control, and more focus in agriculture to production of basic foodstuffs.

Even the hopes of industrialization are endangered by the deterioration of natural resources. Most of the region's electricity is generated by hydro plants. The region has limited renewable energy sources and little oil (indeed, much of the foreign debt problem is due to the high cost of petroleum imports). Yet, watershed deterioration is already reducing power output from the region's hydro dams through soil erosion and subsequent siltation of reservoirs.

This is not to say that the problem is hopeless. In the future though, public and private economic development projects in Central America must go hand-in-hand with measures to reverse the deterioration of the environment and the region's natural resources base. Unless that is done, substantial resources, public and private, will continue to be wasted and poverty will continue to be the way of life for the vast majority of the people in Central America.

On the other hand, in spite of the severity of the environmental problems throughout Central America, natural resource management programs in the region can only succeed if they are linked closely with other important economic development programs, since a fundamental step toward improving environmental management must be the provision of economic alternatives that help reduce the pressure of expanding populations on the resource base. No government in the region can be expected to pursue major natural resource management objectives if the result would only be to force more rural people into already overcrowded urban areas where employment opportunities are scarce.

Thus, development assistance efforts in Central America must not only emphasize the mutual interdependence between conservation and development goals in the long-term, but should actually pursue such goals in concert. In particular, we propose that the U.S. government, other bilateral donors, the World Bank, the Inter-American Development Bank and other important multilateral development assistance agencies take concerted actions to head off an ecological and economic disaster of massive proportions in Central America in the future.

### A Plan for Conservation-Oriented Agricultural Development

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Agricultural development, as the Kissinger Commission Report stressed, is the most critical key to improved economic and social welfare in Central America. Even though the goal of improving the management of natural resource systems was not explicitly stated anywhere in the Kissinger Commission Report, it is obvious that implementation of many of the recommendations set out by that report to stimulate agricultural development would also lead to better resource management. For example, the Commission made recommendations for U.S. assistance to: encourage elimination of the worst inequities in land distribution; stimulate more efficient use of potentially productive but idle lands; improve legal procedures to guarantee smallholders secure title to their lands; focus agricultural development efforts on improving productive efficiency of small producers of basic foodstuffs; and increase access of small farmers to rural credit programs. To the extent that U.S. development assistance in Central America can help the countries of the region accomplish these goals, it is likely that some of the worst natural resource problems will be eased in the process.

In addition, we recommend the following series of positive development initiatives in the agricultural sector. All the steps recommended in this program can be introduced under current political-economic conditions in most rural areas of the region and rely upon techniques and programs that have already proven to work under the conditions prevailing in the region. Most importantly, this integrated program for increased agricultural development would have the effect of simultaneously creating rural employment, slowing population migration to urban

areas, reducing import dependence for essential agricultural inputs, and greatly improving the status of natural resource management.

1. Rural public works programs
2. Development of local animal feed industries
3. Increased meat production for domestic use
4. Local commodity processing industries
5. Agricultural diversification
6. Campaign to improve crop yields in subsistence sector
7. Better agricultural extension services for small farmers
8. Introduction of mixed cropping and agro-forestry systems
9. Integrated pest management programs
10. Nitrogen-fixing techniques in agriculture

#### Environmental Policies for Development Projects

The major international development assistance agencies that operate in Central America should take a number of important steps to ensure that the projects they sponsor or support do not contribute to greater environmental degradation. All natural resource-based development projects in the region should include as an integral component of the initial project proposal a plan of action to ensure no significant deterioration of the natural resources to be affected. This is only prudent since ultimately the long run productive returns to these investments are going to depend on continuing management of these natural resource systems. In particular, the following policies should be established:

1. Forest management and reforestation programs for all timber harvesting, wood processing, and wood-consuming projects
2. Upland watershed management for hydroelectric and water supply projects

3. Integrated pest management in conjunction with all commercial agricultural projects
4. Mangrove, coral reef and other marine habitat protection in tandem with all fishery development projects
5. Environmental impact analysis and alternative routing studies for all major road-building projects
6. Land capability studies for potential development sites in frontier zones of the Caribbean region

### Improving Regional Environmental Management

No governments in the Central American region currently have available adequate baseline data with which to make important development planning decisions about the uses of their essential natural resources. Furthermore, all countries lack enough specialists trained in environmental sciences and natural resource management to design and implement needed natural resource protection programs. Thus, international donors should also support efforts and capabilities of regional organizations and national governments through improving critical natural resource information and upgrading the human resources to manage natural resources. These should include programs that target:

1. Improved land capability and land use data
2. Land use and development goals for the region
3. Improved institutional capacity for range management
4. Management plans for critical wildlands and watersheds
5. Guidelines for managing special ecosystems
6. Regionwide water pollution monitoring
7. Marine and coastal resource protection
8. Screening of genetic resources on a regional basis

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9. Regional inventory of cultural and archaeological resources
10. Training in environmental sciences and resource management