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COUNTRY PROFILES:
ENVIRONMENT AND NATURAL RESOURCES

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Environment and Natural Resources for Central America

Introduction:

An analysis of the natural resource problems of Central America is included in this package because of the contributions it can make to a general understanding of the natural resource-related opportunities and constraints underlying patterns of economic growth and development. It is our assessment that the natural resources concerns listed below play an important role in governing the prospects of sustainable economic growth and social stability for the region. Principal areas of economic impact from these problems include forest products, water resources, agriculture and tourism making up approximately 26% of gross domestic product for the region.

Natural Resource and Environmental Concerns in Central America

Belize

The remarkable growth of the timber industry and the corresponding failure of agriculture to expand until relatively recently are vital to an understanding of the natural resource problems of Belize. While causing environmental problems which are less acute than their Central American neighbors. For over 200 years, timber was the principle economic activity of the country with agriculture receiving little attention. With the begging of this century, the remaining accessible stands of forest with valuable tree species were nearly exhausted and the timber industry began a sharp decline. As no attention was given to renewing the nation's forest resource of logwood, mahogany and pine. Consequently, Belize found itself without a viable economic base. Today it struggles with its efforts to build an economic base in agricultural production with an inventory of soils and other agriculturally related resources that is mediocre at best.

— Logging of the most commercially valuable trees — mahogany, logwood, and pine — has been extensive. In most areas that are accessible to the logging industry, nearly all of the large, harvestable specimens of these trees have disappeared. Progress in reforestation has been limited and hampered by the loss of extensive areas of coastal forest to destructive hurricanes. Associated environmental problems of the pine logging industry include disease and fire protection.

— Belize controls what is reported to be the second largest coral barrier reef in the world (after the Great Barrier Reef of Australia). As an active recreation tourist attraction, it ranks with the most spectacular in the Western Hemisphere. The beginning of a major tourist industry can be forecast for the coastal reaches of the country with the attendant problems of urbanization, pollution and destruction of those very scenic and ecological values which are the basis of the industry. To date, there is no apparent plan for the sustained utilization of the coastal areas, islands and keys for touristic purposes. Coral reefs subjected to sewage wastes and disturbance from construction will not survive. Unless concerted action is taken to address these problems in advance, Belize will find that it has lost yet another key industry to haphazard exploitation.

— Short of road building material, Belize has in the past reportedly turned to dismantling its Mayan temples and pyramids for stone to serve as road construction ballast. The inability of the Government to exploit these priceless archeological sites or even protect them from destruction is a cause for concern in terms of the future of Belizean tourism and international scientific and historical research.

Guatemala

Guatemala is a country divided into several distinct geophysical zones. A broad coastal plain in the south abuts an area of rugged central highlands which in turn give way to the northern zone of moist tropical forested lowlands. The country's population of 6.6 million is primarily divided between aboriginal indians (41.4%), the dominant group in the Central Highlands and ladinos (58.6%) found in the east as well as the Caribbean and Pacific coastal plains. The population growth rate for Guatemala is given as probably the third highest in Central America at 3.1% behind El Salvador and Honduras.

— The demand for agricultural land in the Highlands has led to the clearing and development on very steep mountain slopes. The almost inevitable loss of soil to sheet and gully erosion is robbing the soil of its potential to economically produce crops. While there are agricultural technologies such as terracing, contour farming and trenching which help to maintain soil productivity, social acceptance of these alien approaches to farming is limited. Further, the Government of Guatemala is not able to effectively provide technical and financial assistance to assure that these farming methods are put in place.

— Increasing population pressures in the Central Highlands has caused a migration to the north to the agricultural frontier bordering on the Peten region. While the soils are generally poor, the lack of potential for expansion in the Highlands, depleted soils and lack of firewood for

domestic purposes is proving to be a strong stimulus for migration. The agricultural technologies used in the Highlands are not useful for successful and sustained crop production in the lower, much moister regions of the Peten. The result is a human wave of settlement which must continue to advance on the jungle in order to maintain at least subsistence levels of agricultural production, leaving behind lands suitable only for temporary grazing and fallow.

— More rapid runoff from denuded mountain slopes leading to a decrease in ground water supplies and contamination from inadequate human waste disposal has been instrumental in causing serious water quality and supply problems for urban areas of Guatemala. Water treatment facilities in Guatemala City draw their supply from underground sources. Because of shortages, these facilities can operate only 12 hours a day. Bad connections in the distribution system, along with leaky illegal taps and discontinuous service adversely affect both supply and quality.

— Pesticide use in Guatemala is growing at a remarkable rate. Primarily used in cotton production along the south coast, the overall demand for pesticides has grown in other sectors, most particularly coffee and malaria control. Resistance of pests to various chemical agents has been noted. However, the Guatemalan farmer has few alternatives but to continue to increase his usage and expenditures on pesticides. In some areas, pesticide treatment costs have risen to as much as 50% of total production costs. Contamination of meat and milk have been noted with levels of pesticides at as much as 90 times that allowed by U.S. standards. Between 1972 and 1976, 26% of 685 meat samples were found to have been contaminated beyond levels accepted by importing countries. The malaria-bearing anopheles mosquito has gained resistance to primary malaria control chemicals like DDT in some areas. Unless substitute chemicals are used, usually at a higher cost and with greater risk to applicators, higher incidences of malaria are experienced. Harder to document are the increases in acute and chronic human reactions to pesticide toxicity.

— The Pueblo Viejo hydro-electric project in Guatemala will require over \$100 million (in 1982 prices) in additional structures to reduce the siltation of its reservoir. Subsequent studies have shown that if watershed management had been considered as an integral part of the original investment, the sedimentation rate of the reservoir could have been reduced by over 50%, perhaps avoiding the need for expensive remedial engineering to control siltation.

Honduras

While relatively low in population density (33 people per square kilometer), Honduras suffers from serious constraints in terms of

available land appropriate for agricultural development. For example, the country is perched on land 75% of which is on slopes of 25% or more. Honduran natural resource problems stem from two fundamental sources: the failure of traditional agricultural systems to use land in a lasting and efficient manner, and the failure of modern administration to establish or enforce sound environmental policy. These problems are currently reaching crisis proportions due to the ever increasing exploitation of marginal lands by a rapidly expanding population and the implementation of more ambitious natural resource exploitation programs, particularly in forestry.

— Honduras is experiencing an annual loss of \$300 million worth of hardwood timber. Illegally set forest fires, deforestation and erosion affect the productivity of the forestry sector. Improper valuation, cutting and sawing of forest resources leads to a loss of as much as 90% of marketable broadleaf timber and 50% of pine timber. Shifting agriculturists, primarily small farmers, deforest an estimated 80,000 hectares annually.

— A loss of vegetative cover in upper reaches of watersheds threatens a decrease dry season water supplies for cities such as Tegucigalpa and hundreds of villages vegetative cover. In the Sula Valley, over an area of 370 square kilometers, improper land use (deforestation of protection forests on steep uplands followed by annual burning, overgrazing and/or slash and burn agriculture) has lead to flooding damages to agriculture and infrastructure averaging \$33.5 million annually. Floods resulting from Hurricane Fifi, exacerbated by improper agricultural land use, were the worst on record as were the resulting losses of life and property.

— Erosion threatens the operation and useful life of hydro-electric reservoirs because of excessive sedimentation and siltation. Erosion rates of 100 to 500 tons of soil per hectare per year have been recorded in Honduras, filling reservoirs and stream channels and increasing the risk of flooding while reducing the useful life of infrastructure like the \$650 million El Cajon dam.

— Excessive dependence on chemical pesticides has led to the failure of modern crop protection techniques and a substantial risk to human health, fisheries and wildlife.

El Salvador

In the midst of civil strife, natural resource depletion continues to be a major development problem. High population densities (205 persons per square kilometer) and rapid population growth rate (approximately 3% per annum) cause immense pressures on the resource base.

— Although forests once covered more than 90% of the country, less than 15% of the forest cover remains and most of this is highly degraded. Less than 2% is believed to be undisturbed. Perhaps as an omen for the rest of Central America, commercial forestry has completely vanished as an economic activity.

— Soil loss or damage due to inappropriate land use is believed to represent a serious threat to the economic recovery of the agriculture sector. Soils over large sections of the northern mountains have been irreversibly destroyed by erosion, gully formation and laterization. Soil loss or damage also has been extensive in the volcanic cordillera.

— Almost all economically important species of native flora and fauna are now extinct. There is little hope that reintroductions will succeed because appropriate habitats are highly fragmented and subject to constant human pressure. Consequently, an important source of food, fiber and building materials is no longer available to rural communities and farmers.

— The Rio Lempira has been intensively developed for hydro-electric power generation but with little regard for watershed management. Poor land use has led to the accelerated siltation of the Fifth of November dam, reducing its useful life to approximately half that originally forecasted in 1954. By 1977, its volume had been so reduced by siltation that it had no regulatory capacity. Deterioration of the watershed's vegetation and soils also has caused accelerated runoff and diminished water storage in the watershed, thus reducing the generating potential of the overall hydro-electrical system. These same factors are taking their toll on the newer and larger Cerron Grande dam.

— Water pollution threatens the water supplies of San Salvador and other key urban centers. Human wastes mixed with agricultural runoff are dumped into most if not all of the nation's rivers and lakes, thereby making them unsafe for human consumption. Nonetheless, chronic water shortages in San Salvador prompt farmers to wash their produce in these open sewers, thereby passing back to consumers the risk of serious disease problems.

— Pesticide runoff from agricultural crops is threatening to destroy the important coastal fisheries industry. These chemicals are used extensively on key export crops (particularly cotton) in a losing, dangerous and expensive battle to control resistant pests.

Nicaragua

Nicaragua's natural resource problems stem from an absence of environmental and land use planning, aggravated by the destructive

effects of the 1972 earthquake and the 1978 civil war. Virtually all natural vegetation has been cleared for agriculture on the heavily populated Pacific slope, and the inappropriate land uses which has replaced it have led to severe soil erosion, localized desertification and soil depletion, resulting in a failure to obtain maximum production from the land. The largely unpopulated and extensively forested Caribbean slope represents a renewable resource of substantial potential, but one which must be developed with great care in order that it might reach its full productive potential. Its fragile soils would quickly be ruined by the pressures of the traditional agriculture and massive deforestation that accompany uncontrolled colonization. It is not at all clear that the current Government of Nicaragua, like many of its Central American neighbors, has either the capacity or the foresight to develop their Caribbean slope in an appropriate manner. Information on the natural resource base of Nicaragua is limited. However, we see the following as key areas of concern:

— As the effectiveness of pesticides for cotton pest and malaria control has declined, the amount of pesticides used and the incidence of pesticide poisonings has increased, especially in relationship with cotton production. Chemicals used for control of malaria have lost their efficacy, and the country is experiencing a resurgence of malaria in those areas where resistance has developed.

— Logging of the upland pine forests has not been followed with effective reforestation. Uncontrolled colonization and growing demand for firewood are diminishing Nicaragua's remaining forest reserves.

Costa Rica

Costa Rica's economy traditionally has been based on agricultural production. Native forests have been extensively cleared and converted to farmland, both for subsistence crops such as corn and beans, and cash crops for export, particularly coffee. Within the past two decades, a very strong trend has developed to convert both forest and cropland to cattle pasture. Soils near the traditional population center surrounding the capital of San Jose have been the most heavily used, followed by those of the Pacific slope in general, the next most populous region. Recent road construction on the Caribbean slope has stimulated further clearing and cultivation there, particularly by small farmers seeking to colonize new frontiers. Among its most pressing problems, we see the following:

— Although forests once covered almost all of Costa Rica, they have now largely been cleared for agriculture. Most of the fallen timber is not put to any economic use, but is burned or left to rot in the field. Part of the responsibility for this wastage can be attributed to colonization

and land tenure laws which bestow benefits for clearing forests but not for conservation. The failure to develop an effective timber marketing system is also a major cause. Effective economic incentives for reforestation are limited and reforestation is virtually nonexistent.

— Probably more serious than the loss of the forest resource is the marked deterioration of the soil resource. The most widespread problem is loss of soil fertility after years of annual cropping with inappropriate agricultural technologies, followed by conversion to weedy and generally unproductive pasture. Intensively used areas, particularly on the Pacific coast, also suffer from flooding, landslides, and sheet and gully erosion. Land degradation problems originate from inappropriate land use methods and result in the loss of value in the investments made in productive infrastructure such as roads, irrigation, community services, and the like.

— Through strong foresight, internal leadership and external assistance, Costa Rica has made great strides in the improvement of its "nature-based" tourism. It has moved to set aside land as national parks, wildlife and forest reserves to attract tourism as well as conserve its rich ecological heritage for future generations. However, current government budget crises have made it impossible for Costa Rica to effectively manage its reserves. Squatters are invading unprotected park lands, removing tree cover, and establishing small farmsteads, thereby beginning the cycle of cropping, pasturage and abandonment seen in many parts of the nation outside the park systems.

— With international funding, the Costa Ricans have developed the Arenal hydro-electric facility with the dual objectives of providing irrigation water to the Pacific coast and generating electricity for the nation grid. Initial engineering forecasts for the project gave the useful life of the reservoir as around 400 years. However, spurred by construction activity at the dam site and drawn by newly created access to an otherwise inaccessible location, settlers have begun to clear the land in the watershed of the reservoir for farming on the area's highly erodible volcanic soils. New preliminary estimates of the reservoir life, taking into account these settlement patterns, suggest that it may be a productive investment for not much more than 40 to 50 years unless expensive remedial dredging actions are taken or the settlers are removed from the watershed.

Panama

Panama's most critical natural resource problem today arises out of the process of uncontrolled colonization. Social and cultural conditions are leading to the widespread destruction of the country's largest reserves of tropical forests. At present there is little public awareness of

environmental deterioration in Panama. There still exists an attitude that tropical forests are a symbol of underdevelopment and as resources in their natural state do not render any economic benefits. The issues of natural resource management and utilization are not supported nor even perceived by the general public and national development plans reflect this attitude. Most development strategies are focused on fulfilling the immediate social needs for employment, education and food production. Some of the key resource problems facing Panama are:

— The watershed of the Panama Canal is one of the most striking examples of hypersiltation in the World. The lake, which is the primary supplier of water to operate the Canal, would lose 80% of its storage capacity by the year 2020 if siltation rates existing before the AID bilateral Watershed Management project were to continue. Factors leading to the decision to undertake the AID project were the fact that siltation rates had doubled over a ten year period due to extensive, uncontrolled and inappropriate land development for small farmer crops and pasturage. This impact threatens to eventually close the the Canal, especially during the dry season.

— Removal of mangrove tree stands along the coast for low grade timber uses threatens to destroy the nursery habitats of Panama's important shrimp fishery. Already overfished by too many licensed shrimpers, the removal of the habitats will make it certain that there will never be enough to satisfy both national and international trade demands for marine fish, shellfish, lobsters and shrimp, with a potential loss of up to \$75 million in annual revenues along with an undetermined number of jobs both onboard and ashore in packing, processing and sales support services.

— As the Panamerican Highway moves deeper into the Darien region bordering on Colombia, the very moist tropical area known as the Darien Gap is likely to be breached by land colonists from both countries looking for new lands to settle. The U.S. Department of Agriculture has warned that the completion or near completion of the road link to South America will lead to the spreading to Central America of the dreaded cattle disease known alternately as Aftosa or Hoof and Mouth Disease. Currently free of this disease, Central America, Mexico and the South Western U.S. would be hard hit by the cost to cattle production from losses of livestock. Although the road is some distance from being completed, there are reports that settlers from the Colombian side of the border are penetrating the region, bringing their cattle with them. No reports of Aftosa have been received as yet. However, as the area at the head of the highway is rather like a "no man's" land with trackless swamps, deadly tropical diseases and even drug runners from Colombia, it is not surprising that statistical data are not available from the Panamanian agricultural service.

— Following the pattern of agricultural frontier development for Central America, Panama is seen as nearing the limit of its undeveloped land reserve. First, colonists have cleared the land of its tree cover to plant subsistence crops according to the "slash and burn" approach. After several years, soil fertility has been lost so the productivity of labor investments is so low that additional land is cleared for new crops while older parcels are converted to pasturage for beef cattle. After a few more years, the land is no longer able to support even extensive grazing of cattle and the next most recent field is turned over to grazing uses while the farmer moves on to develop other nearby forested area for crop production. By this incremental process, the forests of Panama are being depleted at an accelerating rate of 36,000 hectares each year. Timber being cleared from the land is left to rot in the field or being burned for its mineral content while lumber for construction is being imported from Honduras and the U.S..

B I B L I O G R A P H Y

(Available on request from IAC/DR/EST)

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