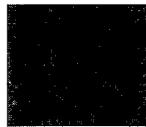


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i. FOREWORD

Since its creation in 1989 the Central American Commission on Environment and Development (CCAD) has been known for the promotion and establishment of a regional institutional structure to support the democratization of Central America and environmental management. It has provided a new framework for cooperation between official national institutions, thus strengthening international cooperation. The Central American Alliance for Sustainable Development (ALIDES) has emerged as a result of this effort, of moves towards the development of a regional agenda, and of preoccupations which demanded peace in the region, and the setting out on the road towards a regional agenda.

The Commission is pleased to present the State of Environment and Natural Resources in Central America – 1998 in collaboration with international and regional organizations and those of Central American countries. It represents a first endeavor to make relevant information available to decision and policy makers and the general public on the conditions, trends and problems relating to the environment and natural resources of the region.

In this first attempt, the advances made in the section on Central American biodiversity are the result of priorities established by regional leaders in compliance with international (UNCED '92, CITES, etc.), regional (Central American agreements on forests, protected areas, climate change and toxic waste), and national (environmental and natural resources policies and laws) commitments.

With these priorities and commitments in mind, a process of updating information on forests, wildlife, coastal and marine resources and conservation areas was initiated. It can thus be assured that the information presented herein is based on the latest available statistics.

The challenge to CCAD and collaborators will be how to bring information on each of the other thematic areas included in this report up to the same level. It is recommended that the same participatory process be undertaken so that year by year information on these areas is updated, and that over a relatively short period this will be on a par with that available on Central American biodiversity.

ii. INTRODUCTION

Significant changes have come about in Central America over the last decades.

Peace processes can be characterized by the achievement of a better balance in fundamental issues necessary for the integral development of Central America at political, social and environmental levels. The desire to seek this balance was reflected in the establishment of the Central American Alliance for Sustainable Development (ALIDES) by the region's leaders.

A new international order based on democracy and a free market, two of its principal mainstays, will be instrumental in the fight against poverty, corruption and drug trafficking.

Within the framework of globalization, the economic development of the region must respond to certain fundamental priorities which include the reduction of poverty and improved human development for Central Americans. These will be achieved through the conservation and sustainable use of natural resources and greater environmental quality so as to satisfy the needs of current and future generations.

Some of the key trends in the change process being carried out in Central America – in addition to the peace process, the strengthening of democracy, modernization of the State and improvements in the carrying out of justice – are those structural adjustment measures aimed at reducing the size of State bureaucracy, improving tax collection systems and the privatization of some services which have traditionally been provided by the State, such as communications systems, energy generation, transport and others which are key to attaining greater levels of efficiency and quality.

The freeing of trade, the opening up of markets and the provision of incentives for investments and the movement of capital are important trends throughout Latin America and the world. Economic globalization as well as the globalization of communications have resulted in the integration of large economic blocks such as the North American Free Trade Agreement (NAFTA) between Canada, the United States of America and Mexico. This agreement has made a considerable contribution towards the integration of the Central American block, through the opening up of greater commercial opportunities for participation as a region.

iii. EXECUTIVE SUMMARY

Since Esquipulas, Central America's open environmental integration process represents an example of willingness and firm decisions on the part of different sectors of Central American society to face the challenges of the next millennium. This process has involved the creation of an institutional framework from which it can develop, as well as a series of mechanisms to facilitate civil society participation and institutional support for sustainable development.

The general framework which makes such a process possible is the Central American Alliance for Sustainable Development (ALIDES), which is considered to be the response of Central Americans to concerns for the economic, social and environmental impacts of development during this, the last decade of the millennium.

Following the achievement of peace and the opening up of Central America's democratization process, governments reactivated the integration process which had been interrupted by the armed conflicts of the 1980s. The 19th Summit of Central American Presidents resolved to revise and strengthen this process and its institutionalization within the ALIDES framework signed in 1994.

In this manner a series of adjustments were made to the agenda for integration, to the bodies and institutions in order to guarantee sustainable development, the appropriate use of natural resources and the rationalization of public expenditure, giving rise to civil society participation, an open attitude towards regionalization, and the fight against poverty and corruption.

Central America counts on the Central American

Commission on Environment and Development (CCAD), created at the Costa del Sol presidential summit (El Salvador, 1989), for the implementation of the Central American Alliance for Sustainable Development.

One of CCAD's objectives is to ensure the furtherance of the Alliance through the "environmentalization" of the region's political, economic and social agendas, and the strengthening of countries' capacities to comply with the regional and international commitments, among which the agreements on forests, biodiversity, climate change and Agenda 21 are to be mentioned.

The Commission benefits from technical advisors on forests and protected areas. For operational purposes they carry out their tasks jointly under the auspices of the Central American Council on Forests and Protected Areas (CCAB-AP). National Councils for Sustainable Development (NCSA) also exist and have the function of consolidating ALIDES' principles and proposals at the national level.

The achievement of sustainability in Central America is conditioned by the overcoming of a series of obstacles of a structural nature inherited from production and consumption models which are inequitable, unfair and exclusive. Such is the case of inadequate human settlement patterns, rapid population growth, and high levels of poverty. The level of poverty increases with environmental deterioration and influences it, as does the weight of foreign debt on national economies.

In the rural sector, the concentration of land is greater than that shown in statistics, as frequently the best land is

occupied by those who have the means and the technology at their disposal for their exploitation, consigning the needy to poor quality land found mainly on slopes. This represents just one of the causes of deforestation and the high levels of erosion and soil loss which are affecting the region.

Related to the foregoing are the persistent health and nutrition problems causing high death rates which could be reduced through improvements in food, the quality and supply of drinking water, and by facilitating access of people of limited resources to adequate medical care.

Other problems which constitute important challenges to sustainable development relate to the unsatisfied demand for education, gender inequality with regards access to education, and school desertion. A series of problems also exist relating to air, water and soil pollution in towns by sulphur dioxide, nitrogen dioxide and carbon monoxide, other gases, lead and other heavy metals, as well as different toxic substances, untreated sewage and erosion.

However, in rural areas soil loss is the norm due to lack of land planning, mining and the construction of hydroelectric dams; and pesticides, which are used massively and indiscriminately in agriculture, endanger human populations and ecosystems.

Other factors inhibiting regional development are changes of a structural nature (land holdings for example) and prevailing economic conditions which include price fluctuations on the international market, and changes in economic and fiscal policies which have a direct impact on land use.

Each agro-exporting cycle involves a change process: land use conversion and new agricultural frontiers. Such is the case of extensive cattle ranching, coffee production, banana enclaves, plantation of African palm and citrus, and cotton on the Central American Pacific seaboard.

The advance of the cattle and agricultural frontiers towards more humid areas with greater forest cover has been responsible for the high deforestation rates in the 1970s and 1980s (431,000 ha/year). The consequences of such incursions include low yields, a greater incidence of pests and diseases as well as the early abandonment of recently deforested land.

Subsistence agriculture is responsible for the sustenance of almost half of the total of farms in the region and as such has a social function of the highest order. This activity is represented by the small farmer producing basic grains, and who, to a lesser degree, is involved in cattle ranching.

The reduction in economic growth which affected the region in the 1980s resulted in a gradual reduction in international prices of the main export products, conflicts over fossil fuel and difficulties in accessing capital. Together with the politico-military crises, this situation resulted in a reduction in per capita energy consumption despite Central America's abundant resources.

Energy supply has been approached through a focus on rural electrification of the subsector under the responsibility of State electricity enterprises. This approach has not been seen to be effective in solving the problems of domestic demand, partial deforestation due to the search for firewood, and the growing consumption of fossil fuels.

The demand and dependency on fossil fuels is growing, with transport, energy transformation, industry and domestic use being the sectors responsible for the highest consumption.

Deforestation, watershed deterioration and biodiversity loss are also related, though not exclusively, with fossil fuel consumption. Ozone layer depletion, ever increasing natural disasters, as well as the potential impact of climate change are becoming increasingly serious issues.

A legal framework, inspired by both former legislation within the countries as well as the emergence of international conventions and agreements, has been created with the aim of reversing, mitigating, and controlling environmental problems affecting the region. Nonetheless, in spite of having approved general environmental legislation in practically all nations in the 1990s, regulations are fragmented and relate to individual natural resources rather than having a more holistic focus.

Current legislation is deficient, incongruent, duplicated and superimposed in its essence; the majority of laws are not regulated and have gaps with regards environmental dispositions and regulations. One recently created figure in Central America are the Ombudsmen ("Defensorías de los Habitantes") which have benefitted from an active participation in the defence of human rights within a healthy and ecologically balanced environment.

The Convention on Biological Diversity (CBD) which resulted from the Rio Earth Summit in 1992, is among the region's most valuable legal instruments. This convention defines biodiversity as "the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems."

The biodiversity concept in Central America is based on this nucleus of biological characteristics which provides the basis for a definition with a broad range action and impact in the policy, economic, social, ethical of judicial fields, in recognition that the true wealth of this region lies in its diversity and high level of endemism in plants and animals alike. All Central American countries have ratified the CBD as part of a global policy framework.

Regional action has also been concentrated on supporting the Agreement on Biological Diversity and the Protection of Priority Wildlands in Central America. Regional priorities have been established in accordance with different national and local objectives in view of the fact that the conservation of all biological diversity would be difficult.

State restructuration processes have had their impact on biodiversity conservation, as have regional coordination processes through the CCAB-AP with projects such as the Mesoamerican Biological Corridor and the establishment of national structures for the consolidation of national protected area systems. Nonetheless, the State's capacity to control has been weakened as a result of policies to reduce personnel, unsatisfied needs with regard training and a lack of clarity in the means to carry out control functions.

Apart from the State, other actors, related directly to the use and conservation of natural resources both within and outside protected areas, also exist. These include men and women, small farmers and indigenous populations in rural areas, non-governmental organizations and the private sector which function and relate to each other in different ways. Matters relating to gender and equity take on a special relevance with regards compliance of ALIDES' mandate within this dynamic framework.

The exploitation of natural resources has taken place in a variety of different ways throughout the history of regional development. With regard wildlife, the most widely spread practices have involved subsistence and sport hunting, commercial capture and collections, reproduction and use in captivity, recreational and tourist use, as well as traditional forms of use associated with specific vernacular cultures.

Both timber and non-timber products of forests and their vegetable components have also been exploited, as well as a wide variety of services and activities such as bio-prospection in search of natural active ingredients for the development of new pharmaceutical products and chemicals for agricultural use.

Over recent decades the needs of indigenous and small farmer populations in zones influencing protected areas

have been recognized as these are sites of great biological diversity. These same populations have taken initiatives to manage or jointly manage resources with a view to protecting them and facing development needs through participatory actions and local management.

A Central America without forests would be unimaginable. The region's forest coverage for 1996 was 181,233,790 ha, representing 35 per cent of total territory and approximately 60 per cent of what should be covered by forest. This leads us to believe that around 13 million hectares of land with forest capacity are being used for other activities.

At the same time, forests are disappearing at a rate of 388,000 ha/year. Between 1990 and 1995, 2,284,000 ha were lost for diverse and complex causes, which range from specific cultural patterns to the structural adjustment of economies. The forests are destroyed for the production of food, wood or firewood.

The use of firewood for cooking varies from 33 per cent in Belize to 85 per cent in Guatemala, with an average regional consumption of 62 per cent. Thus, out of a total production in 1996, 92 per cent was used for firewood and just eight per cent for industrial purposes. At the same time national markets absorb up to 80 per cent of wood production, which leaves barely 20 per cent available for international trade. It would thus be incorrect to assume that the exploitation of forests and clearance for agricultural purposes are the only factors responsible for forest loss in Central America.

Nonetheless, the poverty of the region's countries, in addition to underdevelopment and population increases, the lack of alternatives, and employment and production opportunities, represent more significant causes of this reduction.

A process of information gathering in the forest sector took place between 1995 and 1996 and resulted in various studies. These included Restrictive Policies in the Forestry Sector; Reviewing Accounts in the Central American Forestry Sector: An Analysis of Planning and International Cooperation within the Sector; a third one which updated national forest sector reviews carried out between 1992 and 1996; and finally a study which dealt with the identification of criteria and indicators for sustainable forest management in the region. These updating processes revealed the lack of recent reliable biophysical data and basic statistics on the region's forests.

Despite the region's relative abundance of endemic species, Central American wildlife is seriously reduced and affected by the loss of natural habitat and the over exploitation of

resources. In many instances this situation is exacerbated by legal and illegal traffic of wildlife and its products. Such traffic is mainly focussed on traditionally used species such as iguanas, parrots, alligators, marine turtles, as well as orchids, bromeliads, song birds, frogs, toads, snakes, tarantulas, butterflies, sharks, lobsters, shrimps, and mahogany wood.

Obstacles to the effective control of traffic include limited institutional capacity, especially in the application of Convention on International Trade in Endangered Species of Fauna and Flora (CITES) on the part of the public sector; the control of trade in other species not covered by CITES; and increased poverty in rural areas which is responsible for increasing pressure on this resource.

Wildlife possesses more than just a high aesthetic and cultural value for Central Americans. Historically, this resource has been of considerable economic importance. Nonetheless, little research has been carried out in the region with regard to the distribution, ecology and biology of wild species, rendering estimations of the current status of populations and the impact of their use difficult.

Regarding coastal marine resources, Central America has 6,603 kilometers of coastline, representing close to 12 per cent of Latin American and Caribbean coasts. Along these are found 567,000 ha of mangroves, 1,600 km of coral reefs, and some 237,650 km² of continental shelf which are responsible for multiple activities of economic and social importance.

The Central American coast is characterized by numerous peninsulas, gulfs and bays which favor high physiographic diversity. Extensive intertidal zones and well developed coastal barriers exist around large coastal lagoons.

Coastal cliffs are absent from the Guatemalan Pacific coast, while in El Salvador, Nicaragua, Honduras and Panama they are partially developed, and in Costa Rica highly developed ones are found. On the Caribbean side, the coast tends to be very flat and cliffs are nonexistent as a result of less drastic geological and geomorphological processes.

More than one fourth of the region's population is located on Central America's coastline which produces at least US\$750 million through fisheries which are directly responsible for providing work for over 200,000 people, while at least 250,000 people from indigenous communities live in coastal zones and depend directly on their resources.

Central America possesses eight per cent of the world's mangroves and the second largest coral reef with an extension of 1,600 kilometers. These special coastal characteristics are responsible for tourism – one of the most

important economic activities – which is focussed in these areas.

As far as the protection of wildland areas is concerned, there are approximately 110 protected areas and some 65 associated protected areas in Central America which provide shelter to a representative array of the most important coastal ecosystems.

A lack of information, limited technical and financial capacity, as well as a marked fragmentalization of countries' development policies, have been identified as limitations to the integral management of coastal zones.

The tool used by countries to ensure the conservation and management of protected natural resources has been the creation of National Protected Area Systems (SINAPs), and at the regional level these have been brought together under the Central American System of Protected Areas (SICAP) which has a total of 704 protected areas, of which 391 have been officially declared and 313 are at the proposal stage.

Despite the considerable efforts of the respective countries, and in recognition of the fact that the majority of ecosystems and ecoregions present come under the umbrella of SICAP, it is also recognized that protected areas are under serious threat as the result of a complex set of economic and social factors.

These same protected areas are lacking a range of resources which renders their management and control difficult if not impossible. These include insufficient human and economic resources, poor institutional coordination and presence necessary for their adequate management, a lack of planning tools, little support from civil society, and areas which are extremely small. One of the policies adopted by States in order to face these harsh realities has been the establishment of minimum or priority systems which, in some cases, do not even cover the current number of declared areas.

While this situation demonstrates the recognition on the part of the States of their limitations, it also underlines and reinforces the need to incorporate and commit other sectors and actors in protected area administration and management.

The Central American System of Protected Areas has a wide variety of categories – at least 20 – according to the country concerned, and each SINAP has decided to use its own system of categories, these being the same in some cases as those used in national legislation. This situation has made it difficult to ensure coherence between specific management objectives and characteristics of the respective protected areas. However, efforts are currently

underway to establish a uniform system of categories for the region which will allow a clearer panorama of the conservation objectives of the different protected areas.

Thirty-two sites of international interest; 17 RAMSAR sights, eight World Heritage Sites and eight Biosphere Reserves are to be found among the Central American System of Protected Areas.

The areas that make up the SINAPs are generally small, and these tendencies are reflected in the latest formal declarations. While areas of less than 10,000 ha increased

by 23.4 per cent between 1992 and 1996, no areas greater than 50,000 ha were established over the same period. According to figures for 387 declared protected areas, 33 per cent of them cover an area of less than 1,000 ha, 70 per cent are under 10,000 ha and only four areas exceed 500,000 ha (in Guatemala, Honduras, Nicaragua and Panama).

Of SICAP's 704 protected areas, only 32.5 per cent (229 areas) have an institutional presence. But this in no way guarantees an adequate management of the area as on many occasions it is not even possible to meet the basic needs of field personnel for the carrying out of their duties.

1. THE PROCESS OF CENTRAL AMERICAN INTEGRATION AND THE ENVIRONMENT

Central American Context: Analysis of the Situation

Central America has a population of 34 million (UNFPA, 1997) and an annual growth rate of approximately 2.3 per cent. It is estimated that the total population will reach 59 million by the year 2025. The highest rate of growth is 2.8 per cent (Guatemala and Honduras) and the lowest is 1.6 per cent (Panama). Approximately 49 per cent of the population live in urban areas and 51 per cent in rural areas. Life expectancy at birth in the region varies between 65.6 years (Guatemala) and 76.6 years (Costa Rica). Literacy varies between 55.7 per cent in Guatemala and 94.7 per cent in Costa Rica (Marozzi, 1997).

Per capita gross domestic product (GDP) for 1995 varied between US\$440 in Nicaragua and US\$2,820 in Panama. All countries of the region are dependent on international trade and foreign transfers and the level of industrial development is below average for Latin America. Exports are centered on agricultural products and raw materials, and the import of fossil fuels, capital goods and finished manufactured products.

The economy of the region has been severely shaken by political and military conflicts. This situation has promoted important population migrations from the isthmus towards Mexico and the United States. Peace processes had been finalized by 1997 and governments elected by popular vote. Ironically, the signing of the peace treaties forced the replacement of the flexibility of the international financial organizations present during the conflicts by greater

demands with regard to resource allocation. Priorities ranged from education to the size of the state to the payment of high interest rates.

These demands are difficult to meet partly because economic reactivation had been mortgaged by the foreign debt since the beginning of the 1980s. The country with the lowest foreign debt is Guatemala with US\$2,071 million, while Nicaragua, at the other extreme, has a debt of US\$11,694 million. Further, it is increasingly the case that external funding goes almost directly to the servicing of these debts.

According to Costa Rica's former president, Oscar Arias, the achievement of peace and the establishment of democracy – independent of the cost of the efforts – constitute just one step on the road towards justice; without justice, peace and democracy are not permanent. For this reason, and at this historic stage for the region with an end having been put to wars in which the bases of political democracy have been established, governments are concerned with perfecting democratic institutions and achieving sustainable development.

The peoples of Central America could be inclined towards accepting that their aspirations for material well-being be postponed in favor of a strengthening of democracy. However, it is necessary to warn that if misery continues, a return to violence and social and political instability is not only possible, but also inevitable (Arias Sanchez, 1993).

Governments have oriented their economic reforms towards the privatization of the principal institutions in order to resolve problems of poverty in the region. Guatemala has already sold concessions for radio broadcasting and the administration of railways; it has privatized electricity companies and it is expected to auction off Guatel, the national telecommunications company. For the first time in its history, in August 1997 the country sold US\$150 million worth of bonds on the international market (La Nacion, 1997).

El Salvador, which put an end to 14 years of civil war in 1992, is reforming its social security and tax collection systems. Next year Nicaragua aims to sell its state telephone system, and has already brought 19 factories to its free trade zones. Investors bought US\$500 million worth of Nicaraguan bonds in 1997 (Idem). Panama started to reform its pension plans and at the same time privatized highways, ports and electricity companies, and in May sold almost half of

the state telephone company to England's Cable and Wireless plc for US\$652 million. In September of the same year it sold 30-year bonds for US\$700 million.

Other Central American countries, which have not suffered such widespread conflicts, are also benefitting from the region's "re-birth". Honduras is eliminating some protectionist tariffs and liberalizing its financial system, while preparing telephone and electricity companies and ports for privatization. It has already started signing agreements with private cellular telephone companies.

Costa Rica has taken measures to liberalize trade and has offered tariff advantages to foreign companies which establish their enterprises in the country. In 1997 Intel Corporation selected Costa Rica for the development of a new factory worth US\$450 million. This country also plans to sell bonds for the first time (Idem).

Table 1.1
Socioeconomic Aspects of Central America

	Belize	Guatemala	El Salvador	Honduras	Nicaragua	Costa Rica	Panama
Population(millions)	0.2	11.2	5.9	6.0	4.4	3.6	2.7
Poverty (% of households)	25.5	86.0	50.0	65.0	74.0	17.0	50.0
Unemployment (%)	13.0	39.4	55.0	40.0	62.0	21.0	58.0
• Open	14.0	6.0	10.0	8.6	23.5	4.2	13.0
• Underemployment		33.4	45.0	31.4	36.5	16.8	45.0
Literacy (%)	70	55.7	70.9	72.0	65.3	94.7	90.5
Child mortality (x1 000 births)	47.0	40.0	51.0	53.0	30.0	13.0	21.0
Per capita GDP (US\$)	2,680	1,360	1,680	660	440	2,720	2,820
Inflation (%)	4.7	10.0	9.3	29.0	15.6	19.8	1.8
Foreign debt (US\$ millions)	180	2,071	2,000	4,068	11,694	3,300	5,500
Per capita income (US\$)	2,642	480	1,400	590	425	2,300	2,130
Exports (US\$ millions)	143	1,502	1,200	866	491	2,252	510
Imports (US\$ millions)	2,585	2,647	1,825	1,014	858	3,100	2,350
Life expectancy (years)	74	65.6	69.3	68.4	67.3	76.6	73.2

Sources: Revisando Cuentas en el Sector Forestal Centroamericano. Updated by O. Segura, 1996, and updated by M. Marozzi, IUCN, 1997; IDB (1996), WB (1996), MIA Council (1990); Sistema de Información Económico Energético. Economía General, 1995; Economic Commission for Latin America and the Caribbean (ECLAC); Estudio Económico de América Latina y el Caribe 94-95; UNFPA, 1997. State of the World's Population, 1997; UNDP, 1997. Human Development Report.

Integration Process

The Central American integration process covers distinct periods in the history of the region. One of the most recent dates back three decades to when the first steps were taken toward the establishment of the Central American Common Market (MERCOSUR), which was interrupted by the development of armed conflicts in the region. Various important lead institutions survived this period, such as the Permanent Secretariat of the General Treaty on Central American Economic Integration (SIECA) and the Central American Bank for Economic Integration (CABEI).

After the pacification and democratization of the region and the establishment of the New World Order, the Central American Governments have reactivated the integration process with the establishment of regional blocks so as to ensure the isthmus' role in the panorama of global integration in political, economic, social and environmental aspects.

At the 19th Summit of Central American Presidents which took place in Panama on July 12, 1997, it was agreed to review and strengthen the Central American integration process, and in particular the institutional structure on which it depends. The international environment commitments made with the signing in Nicaragua in October 1994 of the Central American Alliance for Sustainable Development (ALIDES) made the introduction of these changes both necessary and urgent so the region would be in a

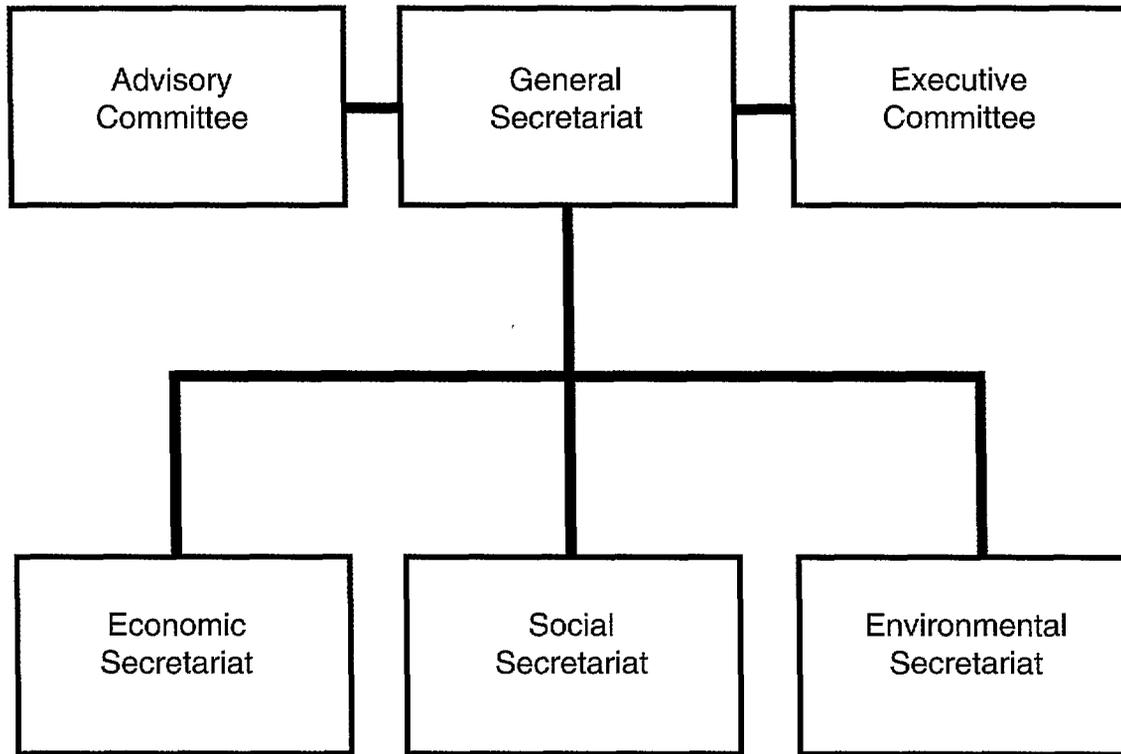
position to face the challenges of the next millennium in an efficient and effective manner.

To this end, the agenda for integration and its respective bodies and institutions require changes that will facilitate civil society participation, an open regionalism, and the fight against corruption and poverty. In general, what is sought is support for the institutionalization of the region's sustainable development, an appropriate use of natural resources and the rationalization of public expenditure.

The executive secretariat of the summits of the president depends on the Central American System for Integration (SICA) which is in turn responsible for the regional integration process. It is made up of the following institutions:

- a) The Central American Parliament is the region's legislative body.
- b) The Supreme Court of Justice is SICA's judicial body, and is responsible for guaranteeing the judicial security of the process and the control and legality of the adoption and implementation of decisions.
- c) The Unified General Secretariat provides specialized support of the diverse sectoral fora involved in regional integration and cooperation. The Unified General Secretariat comprises the General Secretariat and three thematic secretariats: Economic Structure, Social and Environmental.

Structure of the Unified Secretariat



The General Secretariat takes direct charge of matters relating to political and legal matters, security (including natural disasters), communications and dissemination, information, administration, and also has a documentation center. It will also have a unit responsible for international cooperation.

The functioning of SICA is based on the following thematic lines:

Economic affairs: Transport infrastructure (air, sea, land, and rail); energy and mines; telecommunications; macroeconomic policy (financial, monetary, fiscal and exchange mechanisms); regional economic integration; scientific and technological development; agriculture,

livestock and fisheries; tourism development; external commercial policy and industrial development.

Social affairs: Education, culture and sports; health, nutrition and social security; housing and human settlements; labor and social welfare; and local development.

Environmental affairs: Conservation and sustainable use of natural resources; global themes such as biodiversity, climate change, toxic wastes, and the promotion of the participation of different sectors of the region in natural resources and biodiversity; sustainable management of watersheds and water resources; environmental health and pollution control; environmental impact assessment and energy (conservation of energy sources).

Central American Alliance for Sustainable Development (ALIDES)

The Central American Alliance for Sustainable Development (ALIDES) has materialized in response to preoccupations with development and its economic, social and environmental impact in the decade of the nineties.

During the Ecological Summit which took place in Managua in October 1994, the Central American presidents and the Belizean prime minister declared that the new direction being taken by the region should be translated into respect for the dignity inherent in individuals, the promotion of their rights, a respect for nature, and a constant improvement in the quality of life, and a change in attitude and conduct with regard to production and consumer patterns. The Alliance was signed with the achievement of these objectives in mind, and comprised a new framework for regional integration and cooperation which includes seven basic principles for Central Americans.

From the perspective of its principles and objectives, the Alliance offers an innovative approach and a call for regional dialogue which provides the region with the possibility of analyzing in depth its development model. It represents a regional development strategy agreed to by the Central American presidents whose fundamental objective is to improve the quality of life for Central Americans within an integrated framework aimed at achieving political, economic, social and environmental sustainability for the region.

Among the fundamental characteristics of ALIDES are: the integral development focus on political, economic, social and environmental concerns, and the need to strengthen participatory processes involving different civil society sectors so as to ensure the realization of these commitments. Another characteristic is the search for a more effective

Box 1.1

PRINCIPLES OF THE ALLIANCE FOR SUSTAINABLE DEVELOPMENT

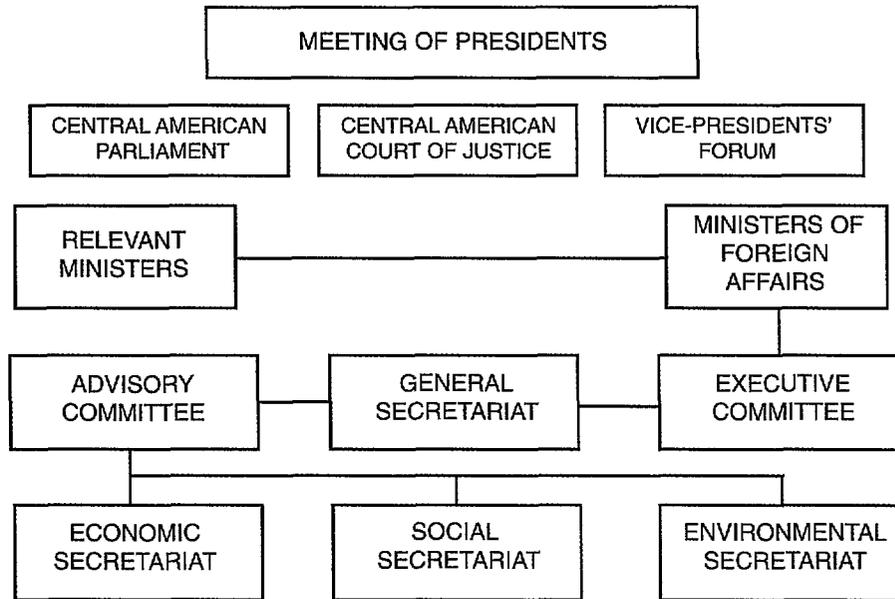
- Respect for life in all its forms
- Improvement in the quality of life
- Respect for the vitality and diversity of life on earth and its sustainable use
- Promotion of peace and democracy as the basic requirement for human coexistence
- Respect for the region's multiculturalism and ethnic diversity
- Achievement of greater levels of economic integration between the region's countries and between them and the rest of the world
- Intergenerational responsibility with regard to sustainable development

Source: CCAD

articulation between the region's sustainable development agenda and priorities established at national and local levels.

Regional leaders agreed on the establishment of National Councils for Sustainable Development (NCSD) to assist in implementing the Alliance's mandate. These councils are important multisectoral bodies which enable follow up to the UN Conference on Environment and Development and the promotion of national policies, programs and projects relating to the sustainable development strategy defined by the Alliance.

ALIDES ORGANIZATION



Central American Commission on Environment and Development (CCAD)

The Central American Commission on Environment and Development (CCAD) was created by the Central American presidents at the Costa del Sol Summit (El Salvador) in 1989 within the framework of the Esquipulas II Peace Plan Agreements, through a pact signed in Costa Rica by the presidents of El Salvador, Guatemala, Honduras and Nicaragua in the same year. This agreement was ratified by the Legislative Assemblies of each country and entered into force on June 14, 1990. In June of the same year the Central American presidents signed a constitutive agreement for the CCAD to include Panama and Belize with the same rights and obligations.

The Commission comprises government authorities in the environment and natural resource fields from the seven Central American countries. These make up the supreme decision making body of the Commission. It has an Executive Secretariat, the headquarters of which is currently located in Guatemala. In addition to the countries of the isthmus, Mexico has followed the process since the outset as an observer, and the

Dominican Republic has also recently joined the initiative.

The presidency of CCAD is rotated among member countries and held for one-year periods counted from the date of the signing of the Commission's Constitutive Agreement (June 14th). On this date a plenary meeting is held with the participation of the distinct Councils formed within the CCAD framework: Forests, Protected Areas, Climate Change and others. Ordinary meetings of CCAD are held four times a year during which resolutions are adopted in furtherance of the environmental commitments of ALIDES.

The CCAD agenda is focused on carrying out environmental commitments of the Alliance and ensuring that these are integrated into all political, economic and social fields. It is also CCAD's task to strengthen the capacity of Central American countries in the furtherance of regional and international commitments, including those relating to forests,

biodiversity, climate change and Agenda 21. The actions described below are examples of initiatives promoted by the Commission.

Between 1989 and 1990 the Central American Tropical Forest Action Plan (PAFT-CA) was initiated. This provided a better regional understanding of the forest sector and was the first process to involve the region's principal actors in this sector in an active and organized manner.

In 1992, within the context of the UN Conference on Environmental Development, the Central American Environmental and Development agenda was drawn up. Its aim was the adoption of a new ethic which would ensure a society which is more worthy and just, more participatory and democratic, and where development, in order to be sustainable, takes into consideration people's needs for a healthy and clean

environment and offers diverse and better opportunities for future generations.

The 12th Summit of Central American Presidents was held in Managua, Nicaragua in June 1992, within the framework of sustainable development. This occasion marked the signing of the Agreement on Biological Diversity and the Protection of Central American Priority Wildlands. During this same year the Regional Agreement on the Transboundary Movement of Hazardous Waste was signed as there was evidence of the interest of some people in importing dangerous waste to the Central American region (CCAD, 1992). The following year marked the signing of the General Treaty for Central American Economic Integration (Guatemala Protocol), the Central American Agreement on Forests, and the Regional Agreement on Climate Change at the 14th Presidential Summit.

REGIONAL AGREEMENT ON THE TRANSBOUNDARY MOVEMENT OF HAZARDOUS WASTE

Signed at the Presidential Summit of December 1992 in Panama. Declares the import of hazardous waste as an illegal and criminal act, referring the determination of corresponding penal sanctions to national legislation.

AGREEMENT ON BIOLOGICAL DIVERSITY AND THE PROTECTION OF CENTRAL AMERICAN PRIORITY WILDLANDS

Established by Central American presidents in June 1992. Oriented towards biodiversity conservation and the protection of priority wildlife areas. The Central American Council on Protected Areas is created and comprised of directors of protected area services in each country.

REGIONAL AGREEMENT ON FORESTS

Signed at the end of October 1993. Represents an important step towards the establishment of a World Forest Convention within which Central America seeks its own model, based on cultural diversity and natural wealth, through decentralized and participatory mechanisms, with social sectors assuming their corresponding responsibility as part of a common interest.

REGIONAL AGREEMENT ON CLIMATE CHANGE

Signed at the end of October 1993, it establishes the states mandate to protect climatic system for the benefit of present and future generations on a basis of equity, and according to responsibilities and capacities, so as to ensure that food production is not threatened and that the states' economic development continues.

Principal Achievements of the Environmental Integration Process

The endorsement of the Agenda 21 Earth Summit agreements by the Central American presidents marked an increase in environmental political discourse and a higher profile for such matters. This was confirmed with the formalization of ALIDES and the commitments made at Volcan Masaya in October 1994.

Among the region's main achievements within the Central American integration process, the following are to be noted:

- **A regional institutional structure.** The democratization of environmental management processes within Central America has been facilitated as has the coordination and dialogue among different actors. The CCAD and its technical bodies have promoted a series of regional initiatives which are now beginning to have an impact at the national level.
- **A framework for cooperation.** A framework between official national institutions and the integral incorporation and coordination of regional cooperation has been established. In this manner the CCAD has created conditions for the strengthening of international cooperation. In some instances it has been responsible for incorporating existing national organizations within the regional dynamic.
- **Social participation.** The Commission's operating framework and that of its technical bodies reflects the participation of different social sectors in the main fora for regional discussion. These include small farmers, indigenous groups, NGOs, professional groups, women and businesspersons.
- **Horizontal cooperation.** Horizontal exchange between different sectors of Central American society has been promoted: technicians, politicians, businesspersons, different NGO groups, indigenous representatives and small farmers have participated and exchanged experiences at the regional level.
- **International cooperation.** The Commission and its technical bodies have demonstrated themselves as being important regional counterparts in discussions with international representatives, thus establishing a regional working agenda based on the ALIDES' mandate, and to which international organizations have been responsive.
- **The subject of the environment** has reached the highest levels of regional policy decisions. This has contributed in most countries to the creation of specific governmental entities responsible for environmental matters as well as to the generation of legislation on this same subject.
- **A Central American environmental agenda.** Being one of CCAD's first activities, the Commission contributed towards the establishment, for the very first time, of a joint regional position which was presented at the Earth Summit in 1992.
- **A collection of specific regional agreements** relating to environment and natural resources together with horizontal cooperation mechanisms on these themes has been established. Other important steps forward in CCAD's work have been the signing of regional agreements such as those on biodiversity,

forests, climate change, toxic waste, and the Declaration of Binational Protected Areas such as La Amistad (Costa Rica – Panama) and the International System of Protected Areas for Peace (SIAPAZ) (Nicaragua – Costa Rica).

- **The creation of other permanent fora** such as the Interparliamentary Commission on Environment and Development (CICAD) made up of the presidents of the Commissions on Environment and Natural Resources of the Central American congresses, as well as support for the creation of the Population and Environment Commission of the Central American Parliament.

- **A Central American Tropical Forest Action Plan (PAFT-CA)** carried out in a participatory manner and which later became the Central American Forestry Office, and subsequently, with the signing of the Central American Agreement on Forests, became the Executive Secretariat of the Central American Council on Forests and Protected Areas (CCAB-AP).

This last has been one of the most important fora for stimulating dialogue between those sectors of Central American society interested in such matters.

- **International technical and financial resources** for environmental programs in large part have been generated as a result of the signing of the regional development strategy – the ALIDES – proposed by CCAD and developed by its Executive Secretariat in 1994 by the Central American presidents.

- **The Central American Fund for Sustainable Development (FOCADES)** is becoming the financial instrument which contributes to sustainable development of the region. Its mission is to support the ALIDES' working strategy.

- **The Mesoamerican Biological Corridor** is part of a land management strategy which includes the major part of what remains of the forest along the Caribbean side of the region.

2. STATE OF THE ENVIRONMENT AND NATURAL RESOURCES

Human Settlements

One of the most outstanding characteristics of the human settlement process in Latin America and the Caribbean is the pronounced tendency towards urbanization and the concentration of populations in urban areas. It is a process with a long history from which Central America has not escaped.

However, the manner in which this process has been evolving gives it quite special characteristics, such as the rate at which large social sectors become involved in new forms of production, consumption and management. Another characteristic is the formation of large cities, metropolitan areas and urban regions. The rate achieved by this process allows us to predict that urban settlements will become the predominant type of community in Latin America.

This settlement pattern is associated with the type and distribution of productive activities in the region. The trans-isthmus corridor Panama City-Colon, the central valley of Costa Rica, the metropolitan area of El Salvador and the greater metropolitan area of the City of Guatemala are examples of areas where more than 40 per cent of national populations and a large part of their industries and commerce are concentrated (PAHO, 1997).

Twenty-two per cent of the population lives in the 26 towns or cities with more than 100,000 inhabitants, as is shown in Table 2.1. It is the urban population which is suffering from the region's fastest growth rate.

Rural populations are showing a considerable decline which is partly due to internal migrations. While in 1980 the rural population comprised 53 per cent of Central Americans, by 1996 this figure dropped to 50.4 per cent, and estimations indicate that by the year 2030 only 28 per cent of the population will be living

in rural areas (CCAD, 1992). This implies that in addition to the concentrations of population, there will be a corresponding increase in the demand for services, including water, electricity, and waste disposal in urban areas.

Table 2.1
Cities with Populations Over 100,000

City of Guatemala,	Guatemala	1,167,495
City of Managua,	Nicaragua	948,096
Teguc/Comayagua,	Honduras	775,300
City of Panama,	Panama	445,902
Mixco,	Guatemala	436,668
San Salvador,	El Salvador	422,570
San Pedro Sula,	Honduras	368,500
San Jose,	Costa Rica	321,193
San Miguelito,	Panama	282,428
Soyopango,	El Salvador	251,811
Santa Ana,	El Salvador	202,337
San Miguel,	El Salvador	182,817
Leon,	Nicaragua	180,728
Alajuela,	Costa Rica	173,470
Mejicanos,	El Salvador	145,000
Colon,	Panama	137,825
Cartago,	Costa Rica	119,299
Nueva San Salvador,	El Salvador	116,575
Quetzaltenango,	Guatemala	108,605
Chinandega,	Nicaragua	106,134
Masaya,	Nicaragua	104,812
Delgados,	El Salvador	104,790
Puntarenas,	Costa Rica	101,167
Danli,	Honduras	100,799
Apopa,	El Salvador	100,763
Matagalpa,	Nicaragua	100,343

National ethnic groups which form numerous local communities distanced from other rural areas are not able to escape this process. It is estimated that the number of indigenous persons in Central America is greater than 6.7 million distributed as indicated in the box below.

This accelerated urbanization process and the depopulation of large areas of territory has caused unequal opportunities with regard to income, employment and public services among other conditions. This has resulted in considerable disparities in the living conditions of urban and rural populations.

**Table 2.2
Indigenous Populations**

Country	Population (x 1000)	% of Total Population
Belize	29	16
Guatemala	5,300	66
El Salvador	400	7
Honduras	700	15
Nicaragua	160	5
Costa Rica	30	1
Panama	140	6
Central America	6,759	18

Source: PAHO, 1994.

Population Size and Growth

After Africa, Central America is the region with the fastest growing population, with a doubling time of 25 years. The 1997 population was calculated at around 37 million, having more than doubled since 1960, and increasing sixfold since 1920 (CCAD, 1992).

Over the next ten years population growth within the region will result in an increase of between 34 and 42 million people. It will thus be a critical decade and much will depend on actions taken and support for programs to help in reducing the region's population growth. If, from the year 2000 on it increases more than predicted, the difference for the year 2025 could be as much as 5 million inhabitants (the population could reach 59 to 66 million). These two alternatives represent two very different scenarios with major implications for quality of life and access to natural resources (Idem).

With a few exceptions, Central America has population densities which range from between eight and 250 inhabitants per square kilometer. However, these figures are not representative as populations are unevenly distributed. Eighty per cent of the region's population is concentrated on barely 25 per cent of the surface area. In addition, the total of productive land represents only 31 per cent of the region, worsening pressure and overuse of what little land and forests are

**Table 2.3
Population (millions)**

Country	1950	1990	1997	2025
Belize	0.07	0.19	0.21	0.40
Guatemala	2.97	9.20	11.20	21.70
El Salvador	1.94	5.25	5.90	9.20
Honduras	1.40	5.14	6.00	10.70
Nicaragua	1.10	3.87	4.40	7.60
Costa Rica	0.86	3.02	3.60	5.60
Panama	0.89	2.42	2.70	3.80
Central America	9.32	29.09	34.01	66.60

Sources: WRI, UNEP, and UNDP. 1992. World Resources 1992-1993 (1950, 1990); UNFPA. 1997. State of the World's Population 1997 (1997, 2025).

available and endangering food security.

But it is not just a question of population growth affecting levels of poverty and overall well-being. Growing pressure on the natural resource base will jeopardize the capacity of ecosystems to sustainably satisfy the needs of this and future generations of Central Americans who will be called upon to face the environmental and development challenges of the region.

The Human Poverty Index

More than 20 million Central Americans are currently living in a state of poverty, and of these, 14 million live in conditions of extreme poverty. Although nearly two thirds of the poor live in rural areas, rapid growth in poverty has also been noted in cities.

Trinidad and Tobago, Cuba, Chile, Singapore and Costa Rica are among the 78 developing countries with a Human Poverty Index (HPI) of less than 10 per cent. Panama is also situated among the first ten positions with an HPI of 11.2 per cent. In the remainder of the Central American countries, human poverty affects between 20 and 35 per cent of the population, according to the UNDP's 1997 Human Development Report. (See Table 2.4)

Experience in the region has demonstrated that economic growth alone is not sufficient to reduce the high levels of poverty. If it is considered that in the 1980s these countries went into a generalized economic decline the marked growth in the region's levels of poverty is understandable.

And it is not just that the levels of poverty are high; they also have a tendency to continue rising. This increase was particularly marked during the 1980s: to the 14 million people in a state of poverty at that time almost seven million were added in 1990, and projections indicate that there could be five million more people in a state of poverty by the year 2000 (Idem).

In the rural sector the proportion of the population in a situation of extreme poverty increased from 52 per cent in 1980 to 60 per cent in 1985. At the same time, there was an increase from 24 per cent in 1980 to 35 per cent in 1985 in the proportion of the urban population in a state of extreme poverty. Inequality in land distribution is another aggravating factor to be considered in Central America. In 1980 extremes in Gini coefficients – as an indicator of land distribution with the distribution being more balanced as the coefficient approaches zero – exceeded 0.6 in some countries of the region. The same coefficients used to show income distribution reflected a similar situation,

Table 2.4
Human Poverty Index Ranking of Central American

Country	Human Poverty Index Value (%) Human Poverty	Index Rank
Guatemala	35.5	46
El Salvador	28.0	36
Honduras	22.0	25
Nicaragua	27.2	34
Costa Rica	6.6	5
Panama	11.2	9

Source: UNDP, Human Development Report 1997.

with concentrations ranging from 0.46 to 0.60 being noted (Carazo, 1997).

The region's poverty is related to environmental deterioration and the weight of foreign debt, both of which are products of processes of unbalanced growth. Indices indicate that poverty also causes environmental deterioration. The concentration of land in the rural sector is greater even than is shown in the indices, as very often the best land is occupied by those who have the means and technology for its exploitation, relegating the needy to poor quality land which is frequently on slopes.

This tendency is one of the causes of deforestation and the high level of erosion and soil loss noted in the region, and a situation which conspires to make those working these soils even poorer.

The majority of daily laborers migrate in search for work and add to the ranks of the growing mass of urban poor. This in turn results in an increase in the slum areas characteristic of underdeveloped countries, and the lack of appropriate housing, infrastructure, and services and a parallel increase in human waste.

Health

Problems of health and nutrition persist in many parts of the region with diarrhea and respiratory ailments being those which continue to be responsible for high infant mortality. Parasitical and viral illnesses and other infectious diseases still remain serious causes of death and incapacity in the area. Malnutrition persists as the most debilitating force in people subject to extreme poverty. In El Salvador 12,000 children die annually as a result of gastrointestinal illnesses and 11,000 due to respiratory causes (MARN, 1997).

A sharp contrast exists when comparing the principal causes of mortality with other parts of the hemisphere. While mortality in the Caribbean and temperate zones of South America is lifestyle-related (smoking, diet, hypertension, and accidents), in Central America the principal causes of death are associated with infectious diseases related to the environment and malnutrition, including enteritis and other diarrheic illnesses.

Causes of death have not changed since 1970 and could be reduced by improving nutrition, the quality and supply of drinking water, and by providing improved access of low income groups to adequate medical attention.

The percentage of population with access to health services during the 1985-1995 decade provides evidence of their imbalanced distribution and their concentration in urban areas. An extreme case is Guatemala where 66 per cent of the country's total population has no access to health services; but this situation acquires crisis proportions in rural areas where 75 per cent of the population has no health

When a child dies of diarrhea every 22 minutes; when 80% of illness has its origin in water problems; when 12 million people don't receive drinking water; and when only 5% of waste water is treated ... something serious is happening in the region.

Source: MASICA, 1996.

Box 2.1

In Central America:

- 40% of Central America's population lacks access to basic health services
- Between 60 and 80% of all illnesses can be attributed to deficient water supplies and sanitation
- More than 79% of sewage is discharged into the environment without any form of treatment
- Solid waste disposal problems grow with population and urbanization
- The region has the world's highest per capita rate of pesticide use which, due to its agroexporting model, is growing
- Industries dump toxic substances into the environment because of obsolete technology
- Serious problems of industrial effluents, toxic residues and air pollution exist as a result of increased industrial activity and road traffic and a lack of means for controlling them
- Institutions holding responsibility for monitoring and analyzing environmental health are generally weak due to budgetary problems and suffer from limited personnel with technical and environmental monitoring ability or the capacity to carry out environmental and/or health impact assessments.

Source: CCAD, 1992.

services whatsoever. The gap between urban and rural areas as far as these services are concerned is wide in all countries of the region and reveals grave failures on the part of Central America health systems as well as the unbalanced nature of resource allocation (CCAD, 1992). (See Box 2.1)

The number of existing national hospitals and beds within the hospital system provides evidence of the lack of health services for the region's least fortunate

sectors of the population. Just one hospital was built in Guatemala between 1986 and 1993, raising the number of hospitals from 35 to 36. In this same period El Salvador built three new hospitals, bringing the number up to 29; Honduras built 12 new hospitals

bringing the total up to 59, and Nicaragua maintained the number at three. Costa Rica reduced its number of national hospitals from 41 in 1986 to 29 in 1993, as did Panama from 58 to 57. Belize has seven national hospitals (UNDP 1997).

Table 2.5

Populations (percentage) with Access to Safe Drinking Water, Sanitation and Health Services in Urban and Rural Areas, 1980, 1988

Country	Safe Drinking Water				Sanitation				Health Services		
	Urban		Rural		Urban		Rural		Urban	Urban	Rural
	1980	1988	1980	1988	1980	1988	1980	1988	1988	1988	1988
Belize	nd	94	36	44	44	94	75	28	nd	nd	nd
Guatemala	89	91	18	41	41	72	20	48	34	47	25
El Salvador	67	76	40	10	10	86	26	39	56	80	40
Honduras	50	89	40	60	60	88	26	44	73	85	65
Nicaragua	91	78	10	19	19	32	nd	nd	83	100	60
Costa Rica	100	100	68	84	84	100	82	93	90	100	63
Panama	100	100	65	66	66	100	28	68	80	95	64

Source: WRI, UNEP and UNDP, 1992. World Resources 1992-1993.

Note: nd = no data available.

Education

Central America's relatively high birth rate and the reduction in the child mortality rate between 1960 and 1990 has resulted in a considerable increase in the number of school age children, while the number of those of a secondary and higher education age has almost tripled. The demand for education has resulted in a simultaneous increase in the supply of services in this area (UNDP, 1997).

During this same period the number of teachers in the region has quadrupled, except in Costa Rica where, since 1960, high matriculation rates have been registered together with low birth rates. This country also responded to a higher demand for primary education, increasing the number of students per teacher by 23 per cent.

However, in the field of education gender differences can be appreciated especially in the case of rural women. Illiteracy in Guatemala is particularly high with adult illiteracy reaching 47 per cent and 54 per cent among women (Idem).

It is important to stress that school leaving is a serious problem in some countries of the region, especially Guatemala and Honduras where only 40 per cent of children reach fifth grade. Figures for Costa Rica and Panama, on the other hand, show low levels of leaving. The differences between the two extremes can be explained by the nature of the social/working structures of these countries. In Guatemala high leaving rates can be attributed to, among other factors, temporary agricultural migrations (Idem).

Environmental Contamination

Local ecological problems are far more noticeable than global problems in the isthmus. For example, air, water and soil pollution is caused in cities by, among other gases, sulphur dioxide (SO₂), nitrogen oxides (NO_x) and carbon dioxide (CO₂); lead and other heavy metals, together with other toxic substances, and untreated sewage, erosion and contamination. In the rural sector problems also include loss of soil due to unplanned human settlements, inappropriate land use, mining and construction of hydroelectric dams.

Global ecological changes (e.g., the greenhouse effect causing temperature rises) and regional ones (acid rain produced by vehicular and industrial pollution) are considered problems of industrialized countries to

be resolved by them. The impact of the Latin American energy sector – which forms part of the Central American isthmus – on global and regional ecological systems is minimal due to limited energy consumption and the relatively high percentage of hydroelectric dams generating electricity. However, an awareness exists that with good forest management and conservation efforts and the avoidance of inappropriate energy consumption patterns typical of industrialized countries, many environmental problems can be obviated. The region's stance in international negotiations relating to climate change and other global environmental issues is based on this analysis.

Energy-based Sources of Pollution

The sectors producing the highest levels of atmospheric pollution are transportation, production, energy transformation, industry and domestic use. Those substances which have strictly local effects (chemical substances, particles and others) are included among the toxic substances, as well as those with regional and global impacts such as sulphur dioxide (SO₂), nitrogen oxides (NO_x), and carbon dioxide (CO₂).

There is a relatively high rate of these gases as the region has not yet started using mitigation technologies of the type used in Europe and North America to reduce sulphur dioxide (SO₂) and emissions of nitrogen oxide (NO_x).

Per capita emissions of these gases in Central America were significantly reduced between 1980 and 1989 but rose again in the mid nineties. In addition to being linked to rates of economic growth, this pattern has been influenced by factors specifically relating to the energy sector such as structural changes of supply systems and, to a lesser extent, technological modifications at the production and consumer levels.

The average level of per capita emissions for the region does not exceed 3.3 metric tonnes per hectare. Although Central America's energy sector has a limited impact on global environmental problems, it makes a considerable contribution to local pollution.

Water Pollution

Central American populations count on water from surface and underground water sources. (See section on Water.) Underground waters which supply a large number of the region's municipalities are being increasingly polluted as a result of the inappropriate disposal of municipal and industrial wastes. The products resulting from the leakage from landfills and

the inadequate discharge of industrial wastes and solvents, especially those containing chlorinated organic substances are cause for particular concern in the principal cities.

In certain specific areas, particularly rural ones, the leakage of synthetic agrochemicals has become a

serious source of pollution. Runoff from agricultural areas, especially those where input-intensive monoculture systems are practiced, and the pollution of surface waters as a result of the cleaning of agricultural equipment in rivers and other water sources, are the principal culprits. The contamination produced by septic tanks, both by nitrates and by bacteria also represents a serious problem. There is no doubt, however, that the volume of water extracted for agricultural use – more than 80 per cent for agriculture alone – is rapidly converting chemical

pollution into one of the more serious problems for the region.

In addition to chemical pollution there is a considerable increase in the biological pollution of Central American waters due to the lack of treatment of waste waters, especially those originating in municipalities. This results in high levels of fecal coliforms and viruses which can have serious health implications.

Sewage

With less than five per cent of Central American sewage receiving any form of treatment, it is one of the principal causes of water pollution. Very few cities or towns have systems which deal with this pollution load and it is thus a problem of growing dimensions to be solved.

The adequate disposal of excreta is critical, and only a few important cities have separate sewage and rainwater drainage systems and only isolated cases exist of small treatment plants. Excreta are generally

dumped in rivers or the sea without any treatment. In slum areas defecation in open areas is a common practice.

At the rural level the situation is even more critical as traditional practices pollute surface waters, watersheds and crops. The use of latrines is not widespread and where they are used their cleanliness is questionable due to the technologies used or cultural prejudices.

Air Pollution

Air pollution in urban areas is caused by industrial activities, vehicle emissions, electricity generation and service industries and results in a mix of carbon monoxide, carbon dioxide, sulphur dioxide, dusts and gases, nitrogen oxides and a number of volatile organic compounds.

Considerable effort is being made in Central America in the regulation of vehicle emissions (see section on Atmosphere and Climate). Nevertheless, the air is also contaminated with fine particles of lead. Although air pollution is localized in the region's large cities during certain periods it is not considered to be of generalized or critical dimensions.

Some countries also suffer from serious air pollution as a result of agricultural burn-offs and forest fires during certain periods of the year.

Latin America also contributes approximately five percent to world emissions of carbonic acid gases due to human activities, with Central America contributing just a minor fraction of this amount.

People's Perception of Pollution

A survey carried out within the Greater Metropolitan Area Program in San Jose, Costa Rica revealed that air pollution is considered by its inhabitants to be the most critical environmental problem. More than 90% of the population considers that the air it breathes is polluted and 80% attribute this pollution to vehicle emissions.

Source: Castillo, 1996

Soil Pollution

There are two principal sources of soil pollution in Central America: the uncontrolled use of agrochemicals and the lack of norms and controls in the disposal of solid and liquid wastes.

The uncontrolled use of agrochemicals in an intensive manner has become one of the region's most serious environmental problems. Various studies show that even if pesticides are used with care and in the recommended manner, 50 per cent of them fall to earth, polluting surface and ground water systems and affecting health. Over the five-year period from 1971 to 1976, 19,330 medically certified poisonings were reported in the region.

In areas of intensive monocultures, such as areas under coffee, banana and cotton, dangerous concentrations of toxic agents have been found in soils (for example, copper, arsenic, ametryn, lindane, dieldrin and paraquat). Some of these remain in the soil for many years after their use has been discontinued, as various studies in specific areas of the isthmus have detected. Nonetheless, "Projects for a Better Banana" developed by ECO-OK in San Jose,

Costa Rica, show that by 1997 approximately 20 per cent of Costa Rican banana production is associated with this program, which involves the establishment of a code of environmental standards for banana producers, and which has certified all the Chiquita farms in Costa Rica.

This same program has developed Criteria for the Certification of Coffee Plantations, promoting the conservation of forests, soils and bodies of water through the promotion of coffee plantations with native shade, thus increasing the benefits and services of biodiversity.

Another source of pollution is the lack of disposal of solid and liquid wastes, especially those produced by industry and urban areas. Although it is estimated that between one and four per cent of all industrial waste is toxic, there are few installations in Central America capable of recycling or eliminating industrial waste in an appropriate manner. The same may be said of domestic waste and solid residues from urban areas which are fast becoming one of the region's largest sources of pollution, particularly with the increase in the use of non biodegradable packing materials.

Solid Waste

A conservative calculation indicates that the region is producing some 19,000 mt of solid waste on a daily basis, or seven million tonnes annually. Of this figure probably only 50 per cent is collected and the rest remains dispersed in critical points of ecosystems such as rivers, lagoons, coastal areas, bays and beaches. Solid wastes include different types of dangerous materials which pose a serious hazard to those populations who depend on recycling for a living.

Landfills exist only in some cities and on occasions their leakages pollute local water systems and ground water sources. Independently of their toxicity level, solid industrial wastes are collected and disposed of together with domestic, municipal and commercial waste products. Although it is recognized that the lack of capacity for the collection of solid waste and

landfills present serious threats to the region's environment and human health, the general situation regarding toxic wastes has not been evaluated. Some projects exist in Guatemala, carried out by MUNICIPALIDAD, which contain proposals for resolving these problems.

As a rule there is no separation of toxic or hazardous wastes from more benign ones. Some hospitals have incinerators, but frequently their waste ends up on municipal dumps.

The industries which generate the greatest amount of hazardous waste, and which receive no special treatment, are involved in the production of chemicals, textiles, dyes, and pharmaceutical products, as well as metal plating processes.

Table 2.6
Solid Waste Disposal in Five Central American Cities

City/Year	Total Tons	Open Air Dump (%)	Disposal Method
Guatemala, 1994	1,500	65	Open air dump
San Salvador, 1995	990	60	Landfill/open air dump
Tegucigalpa, 1992	550	70	Open air dump
Managua, 1988	600	70	Open air dump
San Jose, 1994	1,000	80	Landfill/open air dump
Panama, 1990	930	50	Open air dump

Sources: Guatemala and Panama: PADCO, 1995; San Jose: Municipality of San Jose; San Salvador: Worden 1995; Managua and Tegucigalpa: PAHO/WHO, 1994.

Pesticides

The use of pesticides in agriculture is a source of concern for government, productive, academic and environmental sectors throughout the world, in spite of having brought benefits to humankind, especially since the end of the World War II. Their massive and careless use has brought negative consequences to the health of exposed populations and caused ecosystem pollution.

The acute effects of pesticides are well known and well documented, and which, in critical circumstances can lead to death. The World Health Organization has estimated that severe intoxications from pesticides involve nearly three per cent of the directly exposed

population (agricultural and livestock workers) throughout the world. Acute and chronic poisonings can have severe consequences for human nervous, reproductive, respiratory, circulatory and hepatic systems.

In view of the fact that half of the total surface area of the isthmus is dedicated to agricultural activities of one kind or another and that the average percentage of economically active population working in this sector is 41 it can be concluded that these substances are one of the greatest risk factors for human health and the environment. It has been estimated that as many as 100,000 severe poisonings could be taking place annually in Central America.

Table 2.7
Importation and Use of Pesticides, 1980-89

Country/Region	Imports (kg)	Use (kg)	Loss (kg)	Residual (kg)
Belize	433	2.6	8.7	19
Guatemala	9,027	1.2	7.2	83
El Salvador	6,300	1.2	7.9	301
Honduras	10,760	2.6	13.3	95
Nicaragua	9,772	3.1	15.3	70
Costa Rica	9,924	4.0	16.00	195
Panama	7,505	3.4	18.8	97
Central America	53,631	2.1	11.8	101

Source: Jenkins, J., 1995, cited by Castillo, 1996.

LAND USE

The Territorial Formation in Central America: the Process of Change in the Use of the Land

Land use changes in Central America have been marked by advances and retreats. These fluctuations have had their impact on existing agroecological and socioeconomic structures and conditions. These have also been conditioned by the availability of agricultural land in the region given that the region presents marked contrasts with respect to the population/ territory relationship.

The growing integration of the region's economies into the world market has resulted in increased development of transport systems and the opening up of new lands for agriculture. With alternating periods of relative well-being and of contraction in world demand, the expansion of the agricultural frontier has come to represent the pulse of Central American economies. Each agro-export cycle has resulted in a process of land use conversion and the emergence of a new agricultural frontier resulting in an articulation

between urban centers and ports of the region.

The mechanisms involved in land use changes in Central America take place as a result of structural and prevailing conditions.

Structural changes, with medium- and long-term effects, are related to natural resource endowment and more specifically to the agricultural potential of the soil, and access to and the availability of new land, to the agrarian structure and the distribution of landholdings and indicators of rural and urban poverty.

Changes in prevailing conditions, with effects in the shorter term, are the result of changes in world and national markets and agroexport cycles, as well as of fiscal, tariff and agrarian policies of the current governments, including structural adjustment and state reform policies.

Structural Factors

Central America is a land of contrasts. Densely populated states with a limited land endowment and frequently deteriorated natural resources, border on others of low population density with considerable reserves of land in the form of nationally owned territory or uncultivated land or *tierras baldías* (useless land).

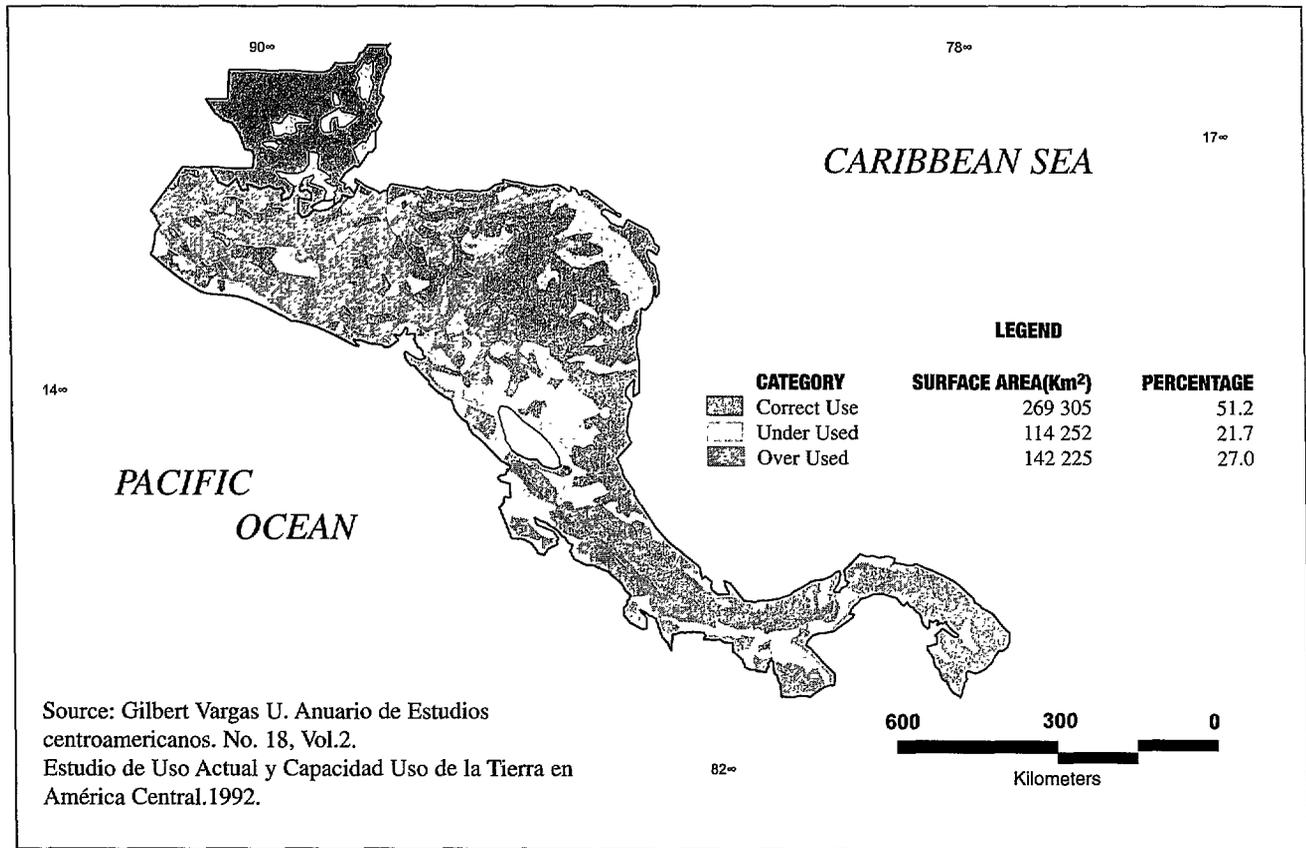
The contrast between El Salvador and Honduras is an example. With its meager 21,000 km² and a population of six million inhabitants, El Salvador is faced with a real crisis of scarcity of resources. The availability per inhabitant of agricultural land has been reduced by half in a period of 30 years: from 0.47 ha/inhabitant to 0.24 ha/inhabitant between 1961 and 1994 (FAOSTATS, 1997). Honduras, with a population of four million, has the second largest territory of the region with 112,000 square kilometers. Even in 1994 it still had close to three times more

agricultural land per capita (0.65 ha/inhabitant) than its neighbor El Salvador (Idem).

These aggregated figures and density indicators tend to mislead in that they divide territory into equal parts without taking local differences into account. Land use capacity varies considerably from one country to another and from one region to another within the same territory. This is shown in Table 2.8 in which the percentages of land use capacity are summarized for the different Central American countries.

The country with the greatest forest potential in the region is Honduras with 66 per cent of land coverage. Nearly a fourth of Salvadoran territory (24 per cent) is suitable for annual intensive crops. These figures tend to be reflected overall land use, but these are often based on theoretical estimations which do not necessarily reflect actual use or conditioning factors.

Figure 2.1: Land use potential



**Table 2.8
Land Use Capacity**

Country	Agriculture			Forests	

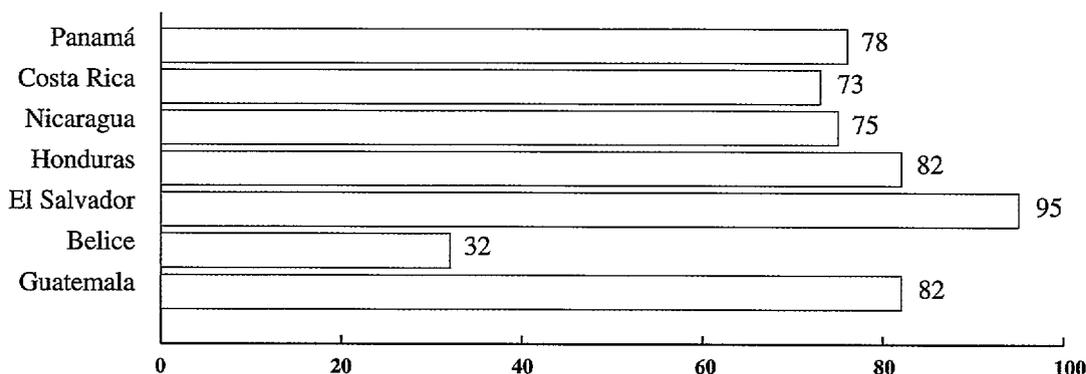
Belize	16	23	15	27	19
Guatemala	4	22	21	37	14
El Salvador	24	8	30	28	28
Honduras	11	9	13	66	66
Nicaragua	4	9	35	52	52
Costa Rica	19	9	16	32	24
Panama	9	20	6	43	18

Source: Leonard, 1987.

Steep slopes, the lack or excess of water, and inadequate drainage can be cited as being among the most important physical limitations for adequate land use. A high proportion (30%) of the region's most fertile soils have serious limitations due to the scarcity or an excess of water. The most severe limitation to land use capacity is the high proportion of steep slopes which worsen sheet erosion and the loss of productive capacity (Leonard, 1987; Vargas, 1992).

From Figure 2.2 it can be seen that all the countries of the region, with the notable exception of Belize, have more than 50 per cent of territory with steep slopes. In the case of El Salvador, 95 per cent of land is made up of steep slopes. These conditions limit not only current use that can be made of the soil but also the level and rate at which this resource is likely to suffer deterioration.

Figure 2.2
Percentage of Sloped Territory by Country



Source: Leonard, 1987

Although physical and environmental land use limitations condition the process of change in land use, the most important factors have been those of a

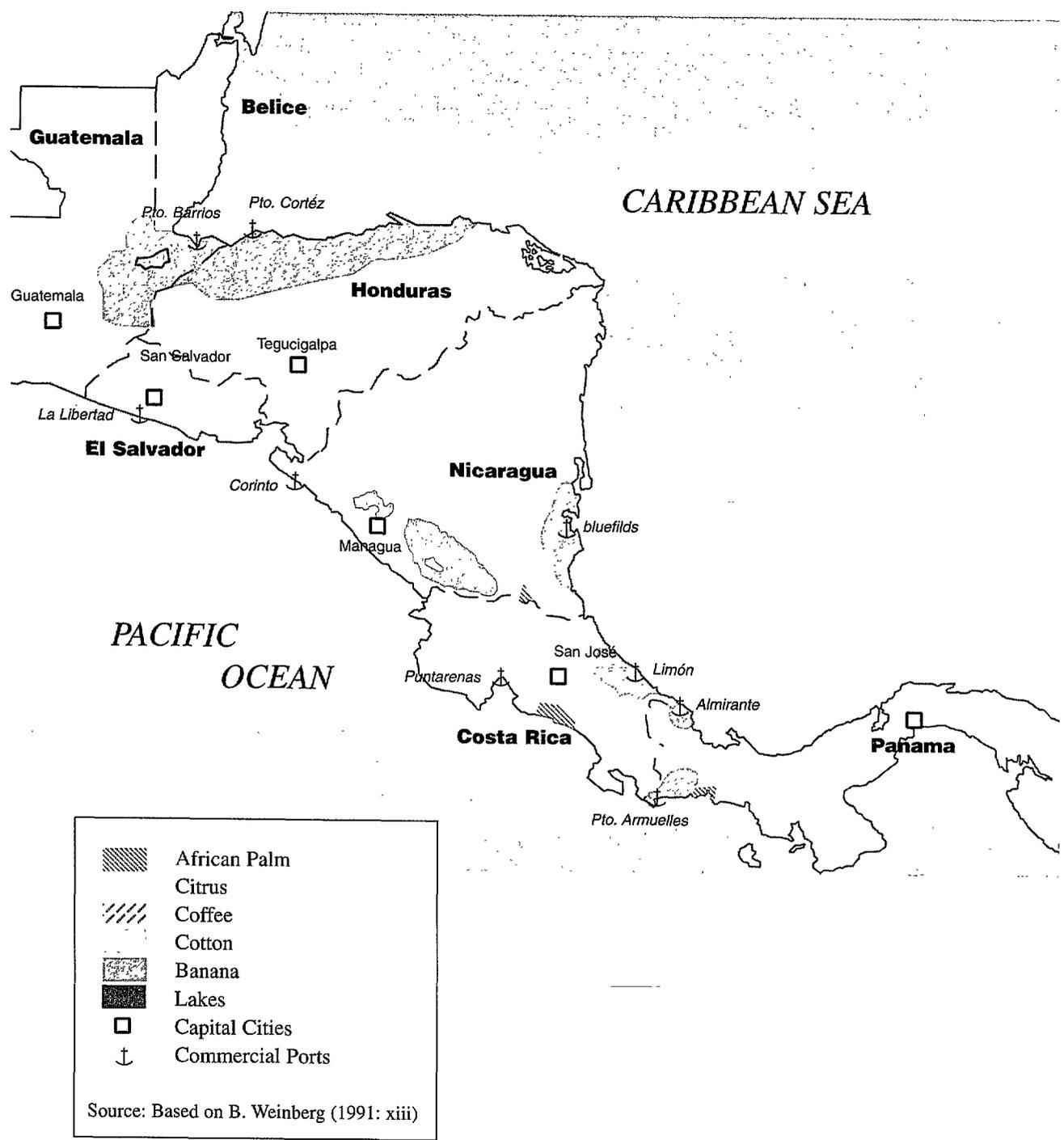
socioeconomic nature. Central America's agrarian structure has been historically marked by contrasts and a heterogenous distribution of land within rural societies in the region.

Table 2.9
Agrarian Structure

I. Large/smallholdings	(52)	(54)
Extensive cattle farming	46	10
Small farmer subsistence economy	6	44
II. Agricultural frontier	17	7
III. Modern sector	17	14
IV. Small commercial producers	14	25
Total:	100	100

Source: Utting, 1996.

Figure 2.3: Agro-Export Zones



Source: Peter Litting, Bosques, Sociedad y Poder. UCA, Managua. 1996.

Over half of Central America's agrarian society is made up of large and small holdings ("latifundio/minifundio"). This reflects the concentration of land in the hands of extensive livestock ranching and modern agro-export sectors which accounts for 63 per cent of the area in use by just 24 per cent of the total number of farms.

Three fourths of the farms share the remaining 37 percent of the agricultural areas of the region. The distribution of land and the conditions for access to new land are probably the most significant structural factor in our analysis of the region's types of land use. A considerable number of the changes in land use can be attributed to market forces in that more than 60 per cent of agricultural land in the region is oriented toward international markets.

In addition, in various countries of the region agricultural frontiers are undergoing continual transformation. In the first instance these were oriented towards the production of basic grains and then later frequently incorporated into cattle farms in areas of cattle expansion, as will be seen later.

Central America's agrarian structure also reveals the different levels of socioeconomic well-being prevailing in the region. Table 1.1 shows some socioeconomic indicators for the region which strengthen arguments in favor of the social causes of environmental deterioration.

The impact of the economic crisis of the 1970s and the following decade, affected by civil wars and

macroeconomic stabilization and structural adjustment policies, have contributed to a net increase in Central America's poverty indicators.

In spite of the fact that nearly all the countries have seen their per capita GDPs increase since the 1980s, average income has fallen in Nicaragua and Honduras. Per capita income in Nicaragua dropped from US\$830 in 1988 to US\$340 in 1993 (Utting, 1996).

The contrasts also became increasingly pronounced between the relatively more prosperous economies, such as Panama and Costa Rica, and those which had shown negative growth indices during the last decade. El Salvador and Guatemala have shown positive but slower economic growth due to war and structural factors such as extreme poverty.

An even greater source of concern is the food production index at the end of the 1980s compared with the previous decade. Nearly all the countries show a lower food production index, especially in Nicaragua where per capita production fell by more than 40 per cent between 1979/1981 and 1988/1989 (Idem). This situation reflects a relative stagnation in areas under crops in all of the countries of the region since the end of the seventies.

Per capita food production in some countries such as Costa Rica and Guatemala showed a limited increase between 1992 and 1994. There was an increase in cultivated areas at the agricultural frontier, especially in Panama, Honduras, Nicaragua and Guatemala, but

Table 2.10
Land Use (thousands of hectares), 1994

	1980	1981	1982	1983	1984	1985	1986	1987
Agricultural Area	132	4,512	1,345	3,570	7,384	2,870	2,135	21,948
Arable Land	59	1,354	555	1,690	2,290	285	500	6,733
Permanent Crops	24	556	200	340	279	245	165	1,809
Arable Land + Permanent Crops	63	1,910	755	2,030	2,569	530	665	8,522
Permanent Pasture	49	2,602	590	1,540	4,815	2,340	1,470	13,406
Forests	2,100	5,212	105	6,000	3,200	1,570	3,260	21,447
Other Land	nd	1,119	622	1,619	1,556	666	2,048	7,630
Total Territory	2,280	10,483	2,104	11,189	12,140	5,106	7,443	50,745

Source: FAOSTATS, 1997.
Note: nd = no data available

at the same time there was a dramatic decline of an estimated 440,000 ha in areas dedicated to cotton production between 1977 and 1992 on the Pacific coastal plains of Nicaragua, El Salvador and Guatemala (Kaimowitz, 1966).

Prevailing Conditions

With Central America's integration into world markets, overseas demand stimulated a considerable expansion of coffee, its prime export crop. Since the middle of the nineteenth century Central American economies have been gradually incorporated into and increasingly dependent variations in world markets.

At the macroeconomic level, the external dependency of Central American economies is reflected in the immediate impact price variations have on land use and the effect these variations have had on the advance or not of the agricultural frontier. Periods of stagnation of agroexporting economies have generally coincided with major crises in the North (World War I, 1914-1918; the crisis of 1929 and its repercussions; World War II, 1939-1945; the energy crisis of the 1970s and the current structural crisis) (Pasos et al., 1994).

During some of these episodes the crisis meant a return to forms of subsistence agriculture, in particular the agricultural frontier progressed only slowly in many parts of Central America during World War II. By the same token, the periods of growth in Central American economies and profound changes in land use patterns have coincided with high prices on international markets for their main products (coffee, banana, cotton, beef). The years 1890-1930, 1950-1970, as well as the beginning of the 1990s were, on the whole, prosperous periods marked by a considerable expansion of Central America's agricultural frontier (Idem).

Prevailing conditions have had a consistent influence on changes in land use in Central America, and these have in turn been reflected in different types of articulation of regional economies with world markets. These factors are more related to price variations on the international market and with the different economic and fiscal policies of the governments of the region.

These opposing processes contribute towards a vision of stagnation in those areas under permanent crops with the notable exception of El Salvador which does not have an active agricultural frontier (Lücke and Cussianovich, 1996).

These policies lasted in various countries in the region until the 1970s and were supported by credit policies and the handing over of lands to settlers. In his 1996 study on cattle ranching and deforestation in Central America ("Ganadería y la Deforestación en Centroamérica") Kaimowitz attributed the massive conversion of forests to grazing pastures to seven key factors:

- Favorable markets for beef export
- Availability of subsidized credit and the construction of access roads
- Agricultural policies and the absence of agrarian reform
- Limited technology transfer to the livestock producers
- Forest policies which limit the value placed on standing forest
- Reduction in political violence
- Special advantages of cattle ranching activities as a stable and recognized source of income

Many countries stimulated plans for cattle farming/ranching and banana production which facilitated access to property, technical assistance and subsidized credit which were highly attractive to the modernizing sectors of Central American society. Between 1950 and the beginning of the 1970s, the area cultivated for export in Central America doubled from 800,000 to 1.7 million hectares.

The development of the export sector was also accompanied by considerable investments in public infrastructure, especially roads, but also slaughterhouses, processing plants and ports for export. Since the middle of the 1980s the level of public investment in Central America has tended to stagnate or be reduced in countries such as Nicaragua and Honduras.

Current Land Use, Structure and Trends: Traditional Export Crops

Coffee

The spread of coffee production during the second half of the nineteenth century and its permanent contribution to the transformation of Central American intermontane landscapes caused profound changes in agrarian systems, land communication and the economic development of the region.

The conversion of some of the region's best soils to coffee production meant the gradual displacement of traditional areas of production of basic grains. The means of incorporating new lands varied considerably from one country to another, and was accompanied by the consolidation of private property to the detriment of common land inherited from the colonial period.

Already by the 1920s the coffee front had stabilized and basic grains were being produced on its periphery: in Puriscal and San Mateo in Costa Rica, Boaco and Tuma in Nicaragua, Olancho in Honduras and Verapaces in Guatemala. For decades and until the 1940s and 1950s this agricultural frontier remained stable in its symbiotic complementarity with basic grains being supplied to urban and coffee producing areas.

An unprecedented boom in the world price of coffee in 1975 caused, as in many other parts of the tropics, a new wave of expansion in coffee production towards marginal regions both in terms of agroecological appropriateness and with regard to access and communications.

Of all the export commodities, coffee is the one which has shown more stability over time. In spite of ups and downs in world markets, especially since the reorganization of the International Coffee Organization (ICO), the adoption of sophisticated technological packages, high yields and management by multi-cropping smallholders have assured a continuity of production and, above all, relative stability in land use.

This stability has positive environmental effects in that it contributes to the replenishment of aquifers. According to a study carried out by the Regional Program for Research on Society and Environment (PRISMA) on El Salvador's environmental deterioration, the coffee plantations around San Salvador and Santa Ana are areas of aquifer replenishment as coffee farms are maintained under mixed forest cover (Barry, 1994).

Other studies confirm that shade coffee on traditional farms is an agroforestry system which maintains high levels of biodiversity in addition to contributing to soil conservation (Perfecto et al., 1996). On the other hand, new varieties of shadeless coffee tend to expose the soil to weathering, providing fewer opportunities for aquifer replenishment and biodiversity conservation. Despite their greater negative environmental impact, shadeless coffee varieties have been responsible for increased yields.

Banana Enclaves

The establishment of Central American banana enclaves has been largely due to the desire to consolidate communication routes to the Caribbean so as to facilitate coffee exports. It is important to

recall that the expansion of banana production took place in marginal territories in the region at the end of the nineteenth century. The consolidation of the banana enclave had various side effects, the most

significant of which was opening up of the Caribbean coastal plains to agricultural colonization.

One of the most long-enduring effects of banana activities was the conversion of lands considered marginal or flood-prone into an agricultural bonanza with a resulting positive influence on returns from land and land markets. Many lands of the coastal plains and some of the most fertile and best drained alluvial soils, particularly in San Pedro Sula and Tela in Honduras, Limon in Costa Rica, Izabal in Guatemala, and Bocas del Toro in Panama, have been exploited by the banana companies.

The banana industry involved more than converting forest into banana plantations. It was responsible for the structuring of entire economic regions through investments in infrastructure, railroads, ports, and systems for energy generation and distribution. This type of intensive agriculture had impacts which went far beyond the agricultural sector in that it created development poles and of production of high returns from the land.

Banana production has also constituted an important source of employment, with relatively high salaries and thus a center of attraction for many local and regional labor migrations, of Salvadoreans to Honduras and Nicaraguans to Costa Rica.

The productivity of these soils and the availability of transport systems encouraged land speculation in

areas around the banana enclaves. The presence of contingents of banana workers, many of them seasonal, stimulated the opening of pioneer fronts of migratory agriculture in areas bordering banana plantations. This is the case of Tortuguero and Barra del Colorado in the north-eastern part of Costa Rica.

This monoculture has also been characterized by alternating booms and busts due to waves of plagues and diseases, labor unrest, and international market openings and restrictions.

In the majority of cases banana production in the 1970s passed into the hands of national producers, with transnational banana companies maintaining control of shipping companies and distribution systems. The area under banana cultivation in Costa Rica increased by almost 100 per cent between 1990 and 1995 from 28,296 ha to 52,447 ha, largely due to the thrust of the Banana Promotion Plan of the National Banana Corporation (CORBANA) (Idem). The banana enclaves of the Central American Caribbean plains have been affected by three of these cycles this century in the 1920s, 1960s and the 1990s (Corrales and Salas, 1997).

As a consequence of this boom in banana production, the percentage of the population involved in banana-related activities solely in Costa Rica rose from 7.1 per cent in 1987 to 13.1 per cent in 1995, exceeding, for the first time the population active in basic grain production (Roman, 1997).

African Palm and Citrus

African palm production was also introduced into those areas which had traditionally been marked by the expansion and contraction of banana production. In Tela, Honduras and Parrita in the Central Pacific zone of Costa Rica, African palm plantations replaced the banana, taking advantage of much of the infrastructure left by the banana transnationals in the eighties.

The cultivation of the African palm is considered a perennial crop and it is characterized by its considerable stability with regard to land use and its relatively benign environmental impact compared with that of banana production.

Another crop of growing importance is citrus. Costa Rica and Belize have seen a great increase in areas under citrus. In some cases citrus production has taken the place of pastures previously dedicated to extensive cattle farming. This expansion has taken place on soils which are relatively poor, compared with those for banana or African palm which need alluvial soils of optimum quality.

Many of these plantations are related to the installation of concentrated fruit juice processing plants, as in the case of Tico Fruit in the north of Costa Rica.

Cotton on the Pacific

The increase of cotton production appeared after 1950 with the growing world demand for natural fibers and consequent high prices. This increase took place at a much more precipitous rate than in the case of the banana. Its geographical impact was limited to the plains of the Pacific coasts of Guatemala, El Salvador and the Chinandega region of Nicaragua, modifying rural societies and agrarian structures of already densely populated regions.

While the expansion of banana production in many instances involved the incorporation of new lands and the conversion of tropical forest into plantations, cotton imposed itself as a mechanized plantation system in agricultural regions already settled by large landowners.

While banana exports dominated the economies of Costa Rica, Honduras and Guatemala, cotton was of considerable importance in Nicaragua, El Salvador and Guatemala. By 1958, cotton was the main export of Nicaragua and second in importance after coffee for El Salvador and Guatemala (Utting, 1996).

Between 1950 and 1965 the area under cotton in El Salvador increased from 19,000 ha to 122,000 ha (Idem). In the 1960s, cotton plantations in Chinandega, Nicaragua totaled more than 300,000 hectares. By the end of the 1980s the areas under

cotton had been reduced by nearly 50 per cent (West and Augelli, 1989). The area of land abandoned after the decline of the cotton market since the end of the 1970s is calculated to be around 440,000 hectares (Utting, 1996).

The most devastating impacts – much more than the direct effect of the introduction of the cotton enclaves – have been the environmental and social costs of two decades of intensive soil use, the excessive use of agrochemicals and the massive displacement of rural small farmer populations. In spite of having been located on some of the best soils of volcanic origin in the region, the withdrawal of the plantations left social desolation, environmental deterioration and contamination.

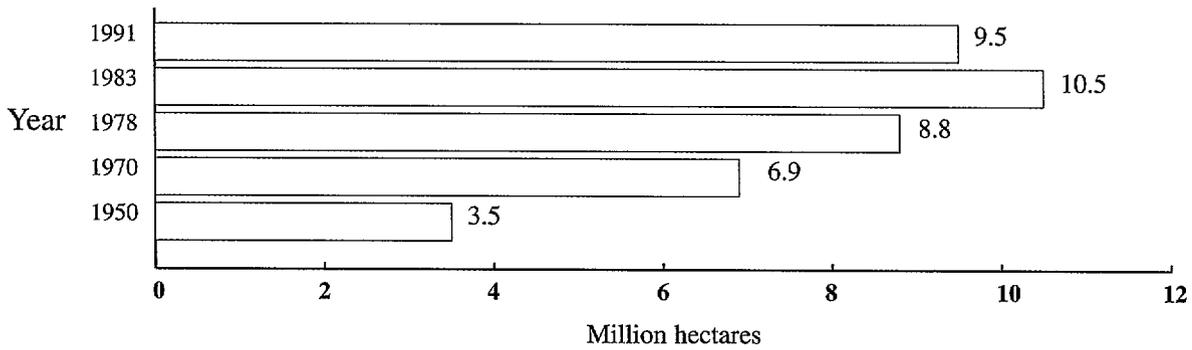
Many of the populations involved in cotton production were obliged to head towards one of two destinations: the slums of capital cities or the agricultural frontier on the plains of the Caribbean seaboard. In the late 1980s and early 1990s, tens of thousands of small farmers were obliged to move to promised lands, in the case of Nicaragua, taking advantage of the suspension of hostilities in the Caribbean region. These are the current protagonists at the agricultural frontiers along the Río San Juan and Bosawas in Nicaragua, Olancho in Honduras, Peten in Guatemala, and in the south of Belize.

Extensive Cattle Ranching

Since the 1960s the expansion of extensive cattle ranching was responsible for the largest and, geographically, the most extensive increases in agro-exporting activities. The area under pasture in Central America doubled between 1950 and 1970 and tripled between 1950 and 1983, to reach more than 11 million hectares, an area twice the size of Costa Rica (Kaimowitz, 1996). Although between 1979 and 1994 there has been a relative decline in the area under pasture in traditional cattle ranching areas such as Guanacaste in Costa Rica, Esquintla in Guatemala, or Choluteca in Honduras, cattle ranching activities have moved towards the agricultural frontier.

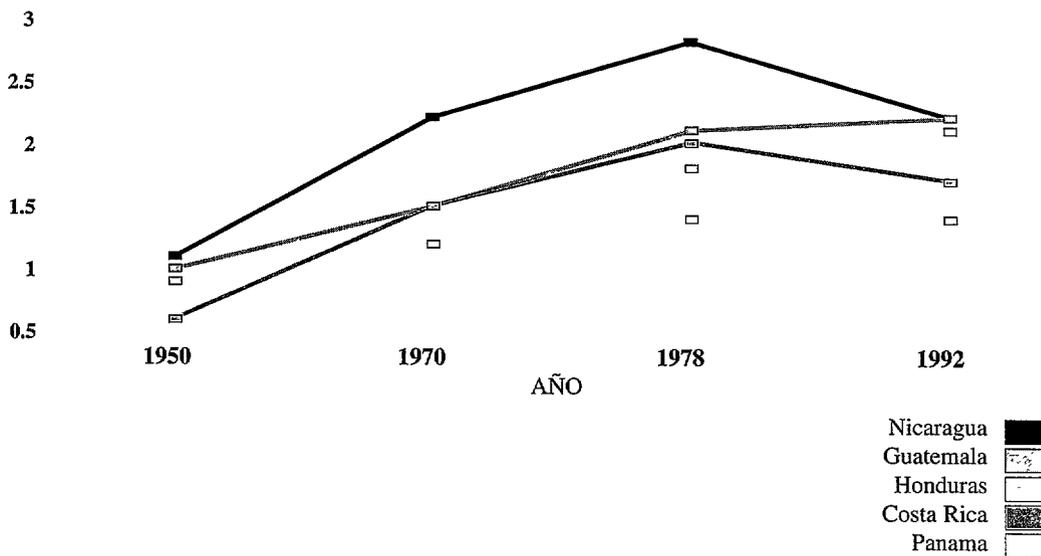
This constant advance towards new land has been the main motor behind the deforestation of humid tropical forests. Although the expansion of cattle ranching in the 1950s and 1960s was concentrated on lands of the Pacific seaboard or intermontane valleys, from the 1960s onwards expansion took place mainly on the plains of the Atlantic seaboard. While deforestation rates have tended to fall since the beginning of the 1980s, it was estimated that at the beginning of the 1990s nearly 300,000 ha of primary forest were disappearing annually to create grazing land (Kaimowitz, 1996).

Figure 2.4
Areas Under Pasture, 1950-90



Source: Kaimowitz, 1996

Figure .2.5
Evolution of Beef Cattle Population, 1950-92



Source: D. Kaimowitz, 1996

The expansion of cattle ranching took place in step with a clear geographic progression towards humid tropical lowland areas of the Caribbean seaboard (see Table 2.11). Traditional cattle areas of the dry tropical forest in the Pacific with problems of cyclical droughts were gradually abandoned for more humid areas and the availability of year-round forage.

However, while growth in cattle populations has been stemmed, grazing areas continue increasing, especially in agricultural frontier areas. But more

serious is the progressive abandonment of deteriorated pasture as scrubland, open woodland and secondary forests. It is estimated that of the 12 million hectares of pastures in Central America almost one fourth have been abandoned to revert to secondary regrowth or left fallow (Kaimowitz, 1996).

The areas most affected by the recession of cattle ranching were Guanacaste in Costa Rica, Escuintla in Guatemala, Choluteca in Honduras, Chiriqui and Los Santos in Panama, and nearly the whole of Nicaragua in the 1980s. In other regions, such as Retalhuleu and

Table 2.11
Geographic Expansion of Cattle Ranching, 1950-90

Guatemala	Escuintla Jutiapa	Santa Rosa Alta Verapaz Chiquimula Izabal Quiche Petén Zacapa	Petén Izabal
Honduras	Copan, Cortes El Paraiso Olancho Santa Barbara	Atlantida Colon Choluteca El Paraiso Olancho Yoro	Colon El Paraiso Olancho Yoro
Nicaragua	Matagalpa Nueva Segovia	Chontales Jinotega	Matagalpa Nueva Guinea Rio San Juan Jinotega
Costa Rica	Guanacaste Nicoya	Alajuela Guanacaste Perez Zeledon	Alajuela Limon
Panama	Cocle Chiriqui Herrera Los Santos Veraguas	Panama Colon	Panama Bocas del Toro Colon Darién

Source: Kaimowitz, 1996.

Suchitepequez in Guatemala, Cocle and Herrera in Panama, and the Puriscal and Los Santos regions in Costa Rica, a stagnation in cattle ranching has been noted (Idem).

The expansion of extensive cattle ranching is one of the principle forces behind the advance of the

agricultural frontier. The symbiosis between small colonizers producing basic grains and the medium and large cattle ranchers has been noted by several authors (Idem). Cattle ranching is deeply entrenched in Latin American culture and continues representing the principal means of savings and capital accumulation for the small and medium-sized farmer.

Subsistence Agriculture

Subsistence agriculture still dominates many rural areas in the Central American region and is intimately linked to processes related to the agricultural frontier. The advance of both the cattle ranching frontier and the agricultural frontier has been towards more humid and more forested areas.

Together they have been the main cause of the extremely high rates of deforestation in the 1970s and 1980s which have been calculated at between 324,000 ha and 431,000 ha/year according to 1996 estimations (Utting, 1996). The settlement of humid tropical regions implies lower yields, a higher incidence of pests and diseases, and the rapid abandonment of

recently deforested lands. Settlement is often followed by the arrival of cattle ranchers who establish grazing lands which are in turn abandoned to scrubland.

The agricultural frontier advances as a result of the impact of two simultaneous processes. One which seeks maximum short-term gain through speculation and extraction of forest resources; and the other, a subsistence process, which seeks to optimize the options and productivity through the work of the smallholder family.

Subsistence agriculture is responsible for providing a livelihood for almost half of the total number of farms in the region, and as such, plays a fundamental social role. It is represented by small farmers, the majority of whom are producers of basic grains (beans and maize) and, to a lesser extent, cattle ranching.

Subsistence agriculture has impacts of an environmental and a social nature. The former involves deforestation resulting in the impoverishment of soils and accelerated erosion

(especially on slopes); and the latter, its migratory nature results in the precariousness of land tenure and the lack of alternatives to slash-and-burn techniques. Migratory agriculture is also a key factor in ensuring food security for Central America's rural populations.

With increased levels of extreme poverty and population growth, the region's food production capacity has tended towards stagnation. One of the challenges to be faced therefore is the development of more intensive forms of agriculture through crop rotation, cover crops and agroforestry systems which would allow the stabilization of soil productivity and increase family income for the millions of small farmers in the region.

Promising experiences exist of small farmer environmental management schemes and community-based agroforestry, such as those processes managed by the Small Farmer Indigenous Coordinating Organization for Community Agroforestry (CICAFOC) and the Association of Small Farmer Organizations for Cooperation and Development (ASOCODE), both regional Central American organizations.

Box 2.3

Food Security and Community Forestry – Small Farmer Organizations

Since the 1980s a large number of grassroots organizations have emerged. Various confederations and associations of small farmer organizations were formed as a result of the reconciliation process following the Esquipulas II peace agreement. The Association of Small Farmer Organizations for Cooperation and Development (ASOCODE) functions as an association of small farmer and social organizations from all countries of the Central American region, and has participated in the region's presidential fora and summits since the end of the eighties.

Among the themes and processes promoted by ASOCODE it is worth mentioning the regionalization of the methodological experience known as "Campesino a Campesino" (Farmer to Farmer) which originated in Mexico. It then spread with great success to Nicaragua and now both ASOCODE and the Small Farmer Indigenous Coordinator of Community Agroforestry (CICAFOC) are using it throughout Central America as a valid means of exchanging experiences and agricultural techniques among producers, with encouraging results in the fields of soil conservation, cover crops and informal credit systems.

The Small Farmer Indigenous Coordinator of Community Agroforestry was created in 1990 and now comprises 110 grassroots, small farmer and indigenous organizations from the region. Its focus on the community management of forest resources has generated valuable experiences in agroforestry, forest use and the management of non-timber forest products.

Agriculture for the Internal Market

Agriculture for the internal market has been a constant together with coffee, but perhaps with rice being an important exception. Vegetable and grain production has been located in more accessible and central areas for their traditional links with national markets and the principal urban centers. These include the provinces of Chiriqui and Veraguas in Panama, Perez Zeledon and Cartago in Costa Rica, the valley of Sebaco in Nicaragua, Santa Barbara in Honduras, around San Salvador in El Salvador, and Solola in Guatemala, among others.

These zones generally coincide with the presence of more fertile soils, better roads, and easier access to credit and technical assistance. On the whole, they have been better served by agricultural ministries and other agricultural extension services.

As a rule, agriculture for the internal market tends to use a much greater quantity of inputs (agrochemicals) which have negative local impacts with regard to river pollution and soil toxicity.

Rice is an exception in that it is generally produced on a large scale and in areas more distanced from market centers. This is the case of Guanacaste in Costa Rica and Escuintla y Costa Abajo in Guatemala where large rice farms have established extensive areas of

irrigated rice. Although rice production is principally destined for the internal market, the scale of its production and the type of producers form part of the Central America's modern agricultural sector and has thus benefitted from credit policies and technical assistance.

On the one hand, this type of soil use has contributed to the stabilization of a mixed agriculture (small farmer and entrepreneurial) in areas close to the main urban markets. And while, as a result of this closeness, rice producers tend to benefit from better returns from the soil and higher incomes and rents, they also suffer from greater market instability. As opposed to the coffee farmers and cattle ranchers, vegetable producers have obtained neither as many subsidies nor have they established unions or other organizations, with the exception of El Salvador.

In spite of their economic importance, areas dedicated to production for the internal market – with the exception of rice – occupy limited areas. Nonetheless, they are responsible for important contributions to efforts to modernize rural societies and to ensure greater food security for urban markets. However, these constitute highly volatile elements of the productive sector which are subject to fluctuations in market prices.

WATER RESOURCES

Human health, well-being and quality of life depend directly on the quantity and quality of water resources. Water possesses various unusual properties which make it useful as the fundamental medium of life.

A basic characteristic of the earth is its abundance of water which covers 71 per cent of its surface with an average depth of 3,800 meters. The hydrosphere contains an immense quantity of water, of which almost 99 per cent is found in oceanic depressions and only a small percentage (approximately 1%) of fresh water is responsible for maintaining life on land (Wetzel, 1981).

Continuously moving above and below the soil surface, water maintains and links the ecosystems of the planet, the only place where liquid water is known to exist. Some of the water is returned directly to the atmosphere, partly via plants. The rest flows into and over the ground, permeating the soil, moving through organisms, recharging underground aquifers, replenishing rivers and lakes, entering the oceans, to return later to the atmosphere (IUCN et al., 1991).

The way in which people use the land and modify ecosystems affects the quality, movement and distribution of fresh waters in rivers, lakes and lagoons, as well as waters in organisms and the soil. Current patterns of freshwater use cannot be sustained if human populations reach 10 billion by 2050 (Idem).

As populations increase, the sustainability of water use will ultimately depend on people adapting their behavior to the water cycle. It is necessary for societies to develop the ability, the awareness and the knowledge to manage their uses of land, as well as water, in an integrated and comprehensive manner, in ways that maintain the quality and quantity of water supplies both for people and for the ecosystems that support them (Idem).

Central America holds considerable potential as far as water resources are concerned, and their healthy state provides the basis for the region's development.

Nonetheless, water flow and quality have been seriously affected as a result of development and industrialization processes. Poor water quality is one of the main causes of illness and death among Central Americans (ALIDES, 1994).

Thus, freshwater wetlands (rivers, lakes and marshes) are to be included among the region's important ecosystems. These depend on the physical, chemical, biological and topographical characteristics of their location, and carry out diverse functions such as the control of flooding and protection against storms. They are also responsible for the charging and discharging of aquifers, the retention of nutrients, the stabilization of microclimates, and the provision of services such as transport, recreation and tourism.

Among its commitments ALIDES emphasizes the importance of "placing priority on the development of policies and legislation covering the management and conservation of water resources, which include, among other things, legal and institutional regulations, coordination mechanisms between the various authorities charged with the management and administration of these resources both for human consumption and for irrigation and electricity generation; instructing the corresponding authorities regarding the updating of Central American watershed studies so that concrete projects can be prepared for their sustainable use and management".

The Central American isthmus is located in the tropical zone of the northern hemisphere. It has a great variety of climates due to altitude differences and the influence of the Pacific and Atlantic oceans. Central America can be divided into the following three zones (Leonard, 1987):

Pacific: In this zone rainfall can vary between 500 to 1,800 mm annually. It has relatively good soils and an average temperature of 26°C. There can be as many as seven dry months. The natural vegetation is less, and some of the land is used for dryland agriculture and some is irrigated. Low lying areas are subject to flooding in periods of high rainfall occurring in the higher reaches of watersheds.

Central: Rainfall varies between 900 and 1,800 mm annually. There are good soils and the average temperature is 22°C. The dry period is less than five months.

Atlantic: Rainfall ranges from 2,000 to more than 6,000 mm. Soils are generally poor and the average temperature is 26°C.

The Central American region presents a bimodal rainfall curve with maximum values between the months of June and September. The water balance allows the definition of a six month (November – April) dry season associated with the physiographic regions: Atlantic watersheds, areas of high central plateaux, mountains, and the Pacific watersheds. The regional rainfall range is between 400 and 7,500 mm and the spacial distribution is presented in Table 2.12.

The flow of the rivers on the Atlantic seaboard is generally abundant throughout the year. For example, in the Peten area of Guatemala, along the length of the Belizean coast, in eastern Honduras, the whole Mosquito coast of Nicaragua, and in the north east of Costa Rica, excess water causes flooding and extensive marshy areas.

On the Pacific seaboard, river flow varies not just seasonally, but also due to the many small, abrupt watersheds, which have lost their vegetation and are overgrazed, and where torrential, sporadic downpours occur (Leonard, 1987).

According to ECLA, it is estimated that on average some 629,000 million cubic meters of water flow annually towards the oceans as a result of precipitation (Faustino, 1997). This implies an average runoff coefficient of 5 per cent, for a flow equivalent to 19,950 m³/second. Of this, 70 per cent drains towards the Atlantic and 30 per cent towards the Pacific (Table 2.13). The highest and lowest average flows are those of Nicaragua with 5,505 m³/second and El Salvador with 601 m³/second respectively.

Table 2.12
Annual Average Table Table 2.15
Basic Sanitation and Health Indicators

Country	Annual Range (mm)
Belize	1,300 – 4,450
Guatemala	500 – 6,000
El Salvador	1,500 – 2,300
Honduras	1,500 – 3,000
Nicaragua	400 – 6,300
Costa Rica	1,300 – 7,500
Panama	1,500 – 5,500

Source: Leonard, 1987.

The most important Central American river systems, in order of importance, are:

- the Río San Juan which drains a transfrontier area of 39,000 km² in Costa Rica and Nicaragua and includes Lakes Nicaragua and Managua;
- the Río Coco, with a transfrontier watershed of 27,000 km² the length of the frontier between Honduras and Nicaragua;
- the Patuca and Ulua rivers which drain areas of 26,000 km² and 23,000 km² respectively within Honduran territory; and
- the Río Grande de Matagalpa watershed covers an area in Nicaragua of 20,000 km². The largest watershed of the Pacific seaboard is that of the Lempa which covers an area of 17,000 km² in Guatemala, Honduras and El Salvador (Leonard, 1987).

Information is generally scarce on the availability of subterranean water resources in Central America. More is known about resources in Nicaragua and Costa Rica. In Nicaragua the majority of urban and industrial needs are met with subterranean waters. Their satisfaction has led to an over exploitation of existing aquifers in Managua, Granada, Leon and Chinandega. Development schemes which exploit

Table 2.13
Surface Drainage

Country	Atlantic Seaboard		Pacific Seaboard	
	(km ²)	(km ²)	(km ²)	(km ²)
Belize	23	100	—	—
Guatemala	86	79	23	21
El Salvador	—	—	21	100
Honduras	92	82	20	18
Nicaragua	117	90	13	10
Costa Rica	24	47	27	53
Panama	24	31	53	69
Central America	366	70	157	30

Source: Leonard, 1987.

underground water on a large scale have taken place in limited areas in Honduras, especially for the supply of water to Tegucigalpa and banana plantations in the north of the country (Idem).

Table 2.14 shows the per capita availability of water resources in the region, based on the surface water balance and the region's population in 1994. Although this information does not take into account the quality

of available water, it does allow an overview of situations of shortage and abundance. This provides the basic information required for planning and foreseeing potential conflicts over access to water which is necessary for, among other things, the satisfaction of basic needs, production, industry, and energy generation, and others.

Table 2.14
Freshwater Resources and Use

Country	Surface water resources (km ³)	Population (millions)	Per capita availability (liters/day)	Water use (km ³)	Water use (liters/day)
Belize	80.8	nd	nd	nd	nd
Guatemala	11.9	139	9	74	17
El Salvador	3.5	241	7	89	4
Honduras	11.6	508	4	91	5
Nicaragua	44.3	370	25	54	21
Costa Rica	29.8	779	4	89	7
Panama	57.3	744	12	77	11

Sources: column 2, UNESCO 1995, cited by Faustino 1997; columns 3-6, WRI, UNEP, UNDP, 1992.

Notes: nd = no data available.

State of the Resource

Water Scarcity and the State of Watersheds

Water scarcity is a problem in Central America. There are various arid regions especially along the Pacific seaboard and in the Guatemalan highlands. Scarcity limits development and affects the health indicators of populations in these areas. Water shortages are also a result of natural physiographical conditions. However, when such situations occur they are very often the result of watershed degradation, higher demands on the resource and population increases mainly in urban areas and Central America's Pacific region where less water is available than on the Atlantic side.

The majority of the region's large watersheds are suffering from the effects of the removal of vegetation cover and erosion which has resulted in the modification of hydrological cycles and huge quantities of sediments reaching rivers and waterways (Leonard, 1987). This situation, together with urban sprawl, affect the recharging of aquifers and prevents the use of rivers for agricultural development, hydroelectric generation, human consumption and other forms of economic development. The protection, improvement and restoration of watersheds are of fundamental importance for

achieving development objectives (Sheng, 1992).

In general, watershed degradation contributes to an increase in the variability of water regimes and the generation of sediment loads in rivers and their deposition in lakes and reservoirs and other downstream locations. The majority of higher altitude watersheds, which generate between 70 and 99 per cent of electrical energy consumed, have reached serious levels of deterioration due to soil loss caused by deforestation and advances of the agricultural frontier.

The relationship between poor watershed management and water shortages is well documented in other parts of the world, and although the problem is recognized in Central America there is a lack of systematic information gathering and analysis.

Insufficient supplies of water contribute to processes of impoverishment. Countries' food and energy production capacity is threatened and their ability to satisfy the needs of growing populations is jeopardized. This has the effect of reducing the general well-being of human populations.

Access to Drinking Water

Only 42 per cent of rural and 83 per cent of urban populations had access to some form of safe drinking water in 1992. At that time the control and monitoring of water quality in rural areas was less than 5 per cent while in urban areas only towns with more than 100,000 inhabitants had control and monitoring programs. As a result, 20 million Central Americans consume water of suspect quality (CCAD, 1992), and it was reported that, over the same period, 80 per cent of illnesses were due to poor water quality and only 5% of the waste water was treated (MASICA, 1996).

Faced with this situation and in light of changes in the region's political context and the Rio Agreements,

CCAD and the Program on Environment and Health in Central America (MASICA/HEP) have been facilitating opportunities for exchanges relating to the analysis and search for solutions. The first Central American Conference on Ecology and Health (ECOSAL I) was thus held in September 1992. At this meeting ministers of health, agriculture and environment signed the "Declaration on Ecology and Health of the Central American Isthmus" which obtained support from the presidents of the region at the Panama summit at the end of the same year. The ECOSAL III conference marked the consolidation of the process integrating the objectives of MASICA, ALIDES and the Summit of the Americas.

During the period 1992-96 many intersectoral efforts were made to improve conditions for access to drinking water. The Project for the Conservation of Water Resources and the Monitoring of Water Quality (PROAGUA) has contributed to the establishment of norms, plans and programs for the monitoring and control of water quality in the seven Central American countries. This project has contributed to national analyses, and its actions have been oriented towards giving priority to the involvement of local actors in rural areas. One of the most important results after three years of implementation has been the preparation and training of approximately 11,000

Central American professionals, technicians and rural community leaders.

The report of the 12th RESSCA (Red de Salud y Medio Ambiente en Centroamerica) meeting held in Panama in August 1996 entitled "Environmental Health in Central America: A Vision of the Future Within the Framework of Integration" recognized that despite the efforts of Central American governments more than 15 million people are currently lacking access to safe and regular supplies of water, which means that diarrhea caused by intestinal infections continues to be among the first five causes of illness and death in Central America." (See Table 2.15).

Water Quality

Widespread deforestation in Central America is directly causing a deterioration in the quality of freshwater sources. Three fundamental types of freshwater pollution are the result of increases in productive activities on unsuitable soils – especially extensive cattle ranching – and the increasing use of agrochemicals, together with the rapid and unplanned growth of agro-industry and human settlements (WRI et al., 1992). These include:

- an excess of nutritive elements from sewage and soil erosion causing algal blooms. These result in excess demands for oxygen limiting the life of other living forms and exceeding the capacity for renovation (eutrophication);
- pathogenic agents found in sewage resulting in the propagation of diseases; and
- heavy metals and organic compounds of synthetic origin resulting from industrial processes, agriculture and mining.

The costs of rendering water drinkable are generally on the increase. The quantity of sediments in waters reaching treatment plants are also increasing, while information on the condition of water from wells or rural aqueducts is scarce.

Solid waste from homes, institutions, industries and hospitals is a serious source of water pollution in Central America. Of the close to seven million tonnes

of waste that are produced annually, it is calculated that only 50 per cent is collected with the remainder being dumped in river systems or lagoons, or in coastal areas, bays and beaches (RESSCA, 1996).

Coffee, sugar, milk, and beer processing plants, textile factories and slaughterhouses are also considered to be among the principal sources of regional water pollution. Infant mortality caused by diarrheic diseases is a good indication of the water quality of a country.

The Regional Coordinating Committee on Drinking Water and Environmental Health Institutions of Central America, Panama and the Dominican Republic (CAPRE) stressed that if the problem of drinking water supply is not resolved, it is estimated that at the turn of the millennium nearly 14 million Central Americans – or 35% of the population – will be lacking safe drinking water facilities and appropriate sewage disposal (Faustino, 1997).

Today more than 95 per cent of sewage receives no treatment whatsoever and flows directly into water systems. This is a problem of growing dimensions which reinforces the vicious cycle of watershed deterioration, water pollution, destruction of species of aquatic fauna and flora, and a general deterioration in human health.

According to the XII meeting of RESSCA in 1996, sanitary disposal of wastes is critical. Only in a few cases do important cities have sewage systems which

Table 2.15
Basic Sanitation and Health Indicators

Belize	—	—	—	40	1.5	294/07
Guatemala	57	64	59	67	5.2	49,673/563
El Salvador	40	69	81	40	4.1	15,673/563
Honduras	69	87	87	38	3.0	2,320/44
Nicaragua	83	53	60	60	2.0	9,541/266
Costa Rica	--	96	84	16	4.6	26/0
Panama	70	93	83	20	3.0	3,636/82

Sources: Columns 2-5, UNDP, 1995, Human Development Report; Columns 6 & 7, PAHO/WHO, 1994. "Las Condiciones de Salud en las Américas"; UNEP, 1996 Development Report.

are separate from storm drains, and on rare occasions small treatment plants exist.

In Central America it is common for excreta to be dumped untreated into river systems or the sea. This problem is even more serious in slum areas where defecation takes place in the open air; and in rural areas, even today the number of latrines is low and traditional practices which pollute waterways and crops predominate.

It is important to note that as a response on the part of the countries to the problem of water resources, in July 1996 the Action Plan for the Integral

Development of Water Resources in the Central American Isthmus was born within the ALIDES' framework. This effort represents a commitment by governments of the region to embark on actions oriented towards the integral management of water resources as a necessary means of ensuring that concepts, objectives and priorities adopted by ALIDES become a reality.

This plan, rather than trying to deal with all problems relating to water, places priority on those areas which require urgent attention, such as the updating of information which is indispensable for orienting actions for the future.

Uses and Demands

The demands being placed by humans on water are multiple and growing. Some 3,240 cubic kilometers of fresh water are extracted and used annually on the planet; 69 per cent of this volume is used by agriculture, 23 per cent by industry and eight per cent for domestic purposes (WRI et al., 1992). With the rapid technological advances and industrialization required by globalization, it is expected that demands by industry will increase more rapidly than those for agriculture, and that the inadequate disposal of waste waters will also increase.

In Central America water use differs from country to country. The most notable uses include:

Water for irrigation: Presently, about 4.4 million hectares are cultivated by dryland agriculture and some 256,000 hectares in irrigation, that is, 75% of the agricultural potential. According to Faustino, only about 14% of the irrigable area is utilized which leaves available an important area to irrigate and one which would represent an alternative for improving

Table 2.16
Hydroelectric Potential, 1992

Belize	nd	nd	nd
Guatemala	5,880	540	9.2
El Salvador	4,500	850	18.9
Honduras	2,400	380	15.8
Nicaragua	18,000	410	2.3
Costa Rica	37,898	1,780	4.7
Panama	12,000	1,283	10.7
Central America	80,678	5,243	6.5

Source: Faustino, 1997.

Note: nd = no data available.

food production and agricultural activities in general in the region.

Energy generation: Given the region's physiographic conditions, water offers potential for energy generation. Table 2.16 shows the hydroelectric potential estimated for Central America.

Estimates indicate energy potential for Central America to be 80,678 GWh, of which 65 per cent corresponds to the Caribbean and 35 per cent to Pacific seaboard. Guatemala and Honduras have the highest practical potential, but in unit value the Caribbean seaboard of Costa Rica and Panama and the Pacific seaboard of Guatemala stand out.

There are some important hydroelectric projects in Central America. For example, Chixoy in Guatemala; Lempa (Cerron Grande and 5 de Noviembre dams) in El Salvador; Cajon in Honduras; Cachi, Arenal and soon, Angostura in Costa Rica; and Bayano and Fortuna in Panama. Despite their importance, as previously mentioned, the principal watersheds which feed these hydroelectric projects are seriously deteriorated. This situation is likely to shorten the life

Legal and Institutional Aspects

While constitutions of Central American countries include the principle which establishes the citizen's right to a healthy environment, the norms and competencies with regard to the management of water resources are varied and date from different periods in each country.

span of these and other projects, increase costs and create uncertainty regarding future energy supplies.

Other uses for water at the regional level include aquaculture, industry, transport, tourism and housing development schemes.

Economic Value of Goods and Services Provided by Water

It is clear that tariffs levied on water do not reflect real costs, but little information is available and research is scarce on these in the region. The creation of environmental policy instruments is one of the means most recommended by economists and used by governments of different countries to deal with water scarcity and rational use of this natural capital.

In dealing with water as an economic asset it would be erroneous not to take into consideration its important role in global ecosystems, especially with regard to climate, within plant and animal habitats and in the many other services provided by water in the environment which cannot be easily quantified through traditional means of accounting, but which, nonetheless, have considerable market value.

To date no master plan has been drawn up for the rational and efficient use and protection of water resources in any of the Central American countries. The diversity of norms and laws generates a dispersion of responsibilities and disorder as various institutions hold mandates for water management, and

there is no single body within each country which can bring them all together (within each country) and which is in a position to implement decisions at the regional level (Table 2.17). This causes problems when it comes to acting in a coordinated and prompt manner in finding integrated solutions to halt the deterioration in the quality and quantity of this vital

resource. The State is often called upon to play a multiple role and act as owner and administrator of the resource, as entrepreneur, consumer, as the definer of sectoral policies, and as regulator or mediator in settling water-related disputes.

Below, in Table 2.17, is a compendium of legislation which exists on water resources in Central America.

Table 2.17

Institutional and Legal Framework for the Management of Water Resources

	Institutional Involvement	Laws and Regulations
Guatemala	CONAMCUEN, DIRYAM, INAFORM, IGM, INDE, GACILA, IIA of the Faculty of Agronomy, University of San Carlos	Article 47 of the Forest Law Proposed Water Law
El Salvador	MAG through the General Directorate of Renewable Natural Resources; Lempa River Hydroelectric Commission; ANDA	Law Nº 50 which only considers open air dumps. No specific legal framework exists. Forest and wildlife conservation laws mention watershed management.
Honduras	State secretariats: Planning, Coordination and Budget; Natural Resources; Communications; Public Works and Transport; SANAA, COHDEFOR, ENEE, National Agrarian Institute, Hydrology and Climatology and the Meteorological Service	General Forest Regulation, Decree Nº 85; Application of Forest Legislation, Decree Nº 103; Agrarian Reform Law; SANAA Constitution; ENEE Law; Municipal Law; Agricultural Modernization Law
Nicaragua	MARENA, INE, INAA	Inexistent as a body of sectoral norms Proposed Water Law
Costa Rica	Acueductos y Alcantarillados, municipalities, CAAR, IFAM, MAG, MINAE, MOPT, IDA, MS, SENARA, SNE, ICE, etc.; Water Law Nº 11, 1884 Law Zone of Groundwater Protection, 1888; Tax Code 1908	Water Law Nº 276, 1942 General Law on Drinking Water Nº 1634, 1953 Mining Code Nº 6797, 1982 Forest Law Nº 7575, 1995 Organic Law on the Environment Law Nº 6877, National Service of Underground Water, Irrigation and Drainage
Panama	INRENARE, IRHE, MS, MIPPE, MIDA, MOP, MIVI, BDA, Technological University of Panama, University of Panama	Law Nº 70, 1973 which regulates water use and established the Council of Water Resources Law Nº 35, 1976 which only covers licenses

Source: Vasquez, 1996.

ENERGY

Overview

The economic crisis which affected the region during the 1980s resulted from the gradual reduction in the international price of export products, fossil fuel conflicts, difficulties in accessing sources of capital, as well as political crises and internal conflicts. These situations conspired to cause a drastic decline in economic growth. The energy sector was also affected through a reduction in per capita consumption due to a lack of flexibility when faced with economic deterioration, even though residential and commercial sectors evolved along different lines.

The economic development of the region has been characterized by its exclusive style, the main factor of which has been the marked imbalance in income distribution. Social inequality and conditions of poverty have had a decisive influence on the structure of the regional energy balance. Seventy five per cent of the gross supply originates from fossil fuel and firewood. On the demand side, and adding other sources of commercial energy, energy consumption is made up of two clearly defined groups: commercial energies (fossil fuels and electricity) and non commercial ones (firewood).

Both fossil fuel and firewood are of relevance in calculating gross energy supply. The quantitative importance of modern energy sources lies in the use made of them in productive processes and transport. Firewood is of only marginal importance for industrial processes, but in some countries it is still the principal energy source for the domestic rural sector.

Fossil fuel supply has one of the most considerable economic impacts on the countries of the region. According to the Central American Monetary Council, over the last six years it has represented nearly 12 per cent of total imports (CIF). This situation does not appear to be about to change in the

medium term in that the only country with proven, if limited reserves of crude petroleum is, Guatemala. In order to satisfy internal demand, Central American countries are thus net importers of crude petroleum and its derivatives.

As imported fossil fuels will continue to be the principal source of modern energy for the region, it is important to optimize activities and commercialization of the domestic markets. The negotiations which took place within the framework of the Central American Consultative Group (October, 1997 in Brussels, Belgium) could make a significant contribution in this sense as these were aimed at establishing a unified market for fossil fuels and the joint import of the resource.

In the electricity sector, production capacity of the isthmus reached 5,419.7 MW in 1996, of which 53.44 per cent is hydropower, 41.82 per cent thermal, 4.43 per cent geothermal and 0.3 per cent from wind energy sources. In comparing data with those for 1990 an increased capacity in thermal energy generation of 14 per cent is noted, with a reduction of 12 per cent in hydropower production (ECLAC, 1997). This situation reflects the increased dependency of the energy sector on fossil fuel.

This is due, among other things, to the high investment costs of hydroelectric plants and the long payback/recovery periods, especially when compared with those required for thermal plants which are more rapidly constructed and thus more attractive to private investors who are in a position to take advantage of these relatively favorable conditions.

In 1996, the region's level of electrification was 55 per cent, 10 per cent more than in 1990. This reflects considerable growth in electric energy consumption at the regional level and an improvement in living conditions for the population.

Energy Resources

Central America has an abundant supply of available renewable energy resources which include:

Hydropower: the primary source of electricity generation.

Biomass (firewood, sugar cane and organic waste): with considerable potential as a source of primary energy for use throughout the region. These resources depend on the particular conditions of each Central American country. Its potential has been calculated at 4.7 per cent of the total for Latin America. Firewood is one of the principal energy resources in rural areas. Forest potential has been calculated based on the value derived from its exploitation as a resource (wood, firewood, biodiversity products) and its CO₂ absorption capacity, which is especially important for environmental sustainability.

Geothermal: potential in this respect has been determined as a result of geological surveys, geophysical and geochemical research and drillings carried out in various countries of the region. New areas for exploitation have been identified, and in El Salvador, Nicaragua and Costa Rica, plants are already underway.

Non renewable energy sources are scarce, with a limited availability in few countries of the region. Fossil fuel has only been found in the Peten region of Guatemala. Explorations in the other countries have not borne fruit.

Natural gas: has been found only in Guatemala.

Coal and peat: are found in the Atlantic zones of Central America (Costa Rica, Honduras and Guatemala) and offer potential for electricity generation. Knowledge of this resource is limited.

As far as new renewable sources of energy are concerned, although the development of solar, wind and wave energy has had some promotion in Central America, this has mainly been in response to specific needs of populations who do not have access to national grid systems. Another factor which has influenced the poor stimulus given to new sources of renewable energy is the sophisticated technology often required for their use and their production which is beyond the reach of the majority of people.

In an attempt to find a solution, renewable energy production has been diversified with the help of the private sector in generation, biomass use of sugar processing plants and photovoltaic energy applied in isolated rural areas. The latter have begun to have a quantitative and qualitative impact with regard to supply. Developments have also taken place in wind energy production in Guatemala, Honduras and Costa Rica.

Current conditions for small-scale electricity generation and co-generation have improved or at least have become more secure, in that terms for connection to the grid and remuneration within new legal frameworks have been more clearly defined. Although in practical terms the impact of reforms in the expansion of renewable energy and co-generation have still to be felt, they have been well received in Central America.

Since the 1970s the isthmus has shown a low exploitation of its hydroelectric potential. The fundamental causes were: poor evaluation in the face of competition from low-cost fossil fuels for electricity generation, the absence of long term planning mechanisms, the lack of adequate financing, and the tradition of seeking emergency, short-term solutions through the building of thermal plants with low capital and operational costs.

Electric Subsector

Electric Grid Systems

The interconnected grid systems are made up of a collection of hydropower, geothermal, and thermal generating plants linked by main grid lines carrying 115, 138 and 230 kV. However, there are also small systems which are still isolated. National systems are themselves interconnected internationally with 230 kV lines.

Electrical grid systems have a radial configuration and transmission distances are relatively long, mainly between hydroelectric plants and accumulation centers or to where the demand is. This configuration responds to the region's geography as well as the relative location of hydroelectric plants, centers of population and resulting economic activity.

Demand

Historically, the region's demand for electricity has grown at an average rate of approximately eight per cent annually, and over the next years it is estimated that this growth will be around 6 per cent, implying that requirements will double every 10 years. For the 1995-96 period growth in consumption was 5.5 per cent.

The structure of consumption at the regional level showed domestic demand to be 37 per cent, followed by 27 per cent for the industrial sector, 24 per cent for commercial activities and 12 per cent for other uses.

Consumption increased 6.2 per cent over the 1991-96 period, and over the same period commercial activities showed the greatest growth with an 8 per cent increase, followed by a 6.4 per cent increase in domestic use and with industry being responsible for a 6.1 per cent increase (Figure 2.6).

Figures show that in the medium term the structure of electricity consumption in Central American countries will not change and that the greatest supply is likely to be related to patterns of domestic consumption which will probably grow considerably over the coming years as a result of efforts being made in the isthmus to increase internal coverage.

It can thus be seen that the region's domestic sector is responsible for the highest consumption as it has the greatest number of users. On December 31, 1996

these numbered more than 3.5 million, representing 88.3 per cent of the region's potential consumers, with industry being the second most important consumer with just 27,8000 users, representing less than 0.7 per cent of total users.

Another important aspect to consider is related to the decrease in the number of industrial users by more than eight per cent, a factor which reaffirms the predominant domestic use in electricity consumption.

However, if average consumption is measured rather than the number of users or the level of consumption in absolute terms, 1996 data show that the industrial sector was responsible for the consumption of 166.7 MWh, followed by the commercial sector with 10.13 MWh and finally the residential sector with a consumption of 1.76 MWh for the same period.

Thus, on the demand side, the greatest consumer of electricity is the residential sector which is expected to continue as the principal user over time. This consumption is also likely to increase due to the increases in electrical coverage sought by the respective countries of the region.

Although the largest consumer is the residential sector, the industrial sector is the highest user in terms of average consumption. In spite of having the least number of users in the region, industry is the second most important user, and it is important to point out

Figure 2.6
Evolution of Energy Sales (GW/h) by Sector 1980, 1985, 1990-96



Source:

Elaborado por la Dirección Sectorial de Energía, Costa Rica, con base en DATOS DE CEPAL, 1997.

that over the last six years little growth has been noted among industrial users. And although during the 1995-96 period a reduction of around 8 per cent was even noted among these users, it is expected that this situation will change in the medium term as a result of the opening up of markets and the modernization of regional economies.

This previous situation together with the potential growth in domestic demand reaffirms the tendency that the demand for electricity in the medium term in the Central American region is expected to grow considerably, and for which reason proposals to modernize the subsector are oriented towards the satisfaction of future needs.

Table 2.18
Evolution of the Number of Electricity Consumers (thousands) by Table

Residential	2,848	3,049	3,199	3,441	3,576
Commercial	315	332	348	377	408
Industrial	25	26	27	30	28
Total:	3,188	3,407	3,574	3,848	4,012

Source: Istmo Centroamericano: Estadísticas del Subsector Eléctrico.
 ECLAC, Mexico, 1997.

Supply

As previously mentioned, the main source of electricity in the isthmus is hydroelectric, and of the total installed potential as of December 31, 1996 of 5,419.7 MW, 53 per cent (2,896.2 MW) of the region's power originates from hydroelectric schemes. This resource was developed as the result of the construction of large hydroelectric projects located in those large watersheds with the greatest size and potential.

Nonetheless, electricity use is being currently affected not just by the increasing dependence on thermal electricity generation but also by the recent restructuring of the Central American electric subsector. It is hoped that greater participation will be given to the private sector in the development of projects for the generation of thermal energy in the majority of the countries as a result of this restructuring process.

It can be seen from ECLAC data that thermal electricity generation constituted 40.2 per cent of installed potential in 1996, while in 1990 its participation was only 30 per cent. This growth has created an increasing dependency of this strategic subsector on external inputs which present a high cost for these economies. This dependency is sharpened by the scarcity and limited availability of non renewable natural resources in Central America.

Another energy source which is increasing its installed capacity in the region is geothermal energy. The commissioning of geothermal plants in 1996 represented close to 5 per cent of the region's total installed capacity. Remaining electricity comes from cogeneration schemes which are providing new possibilities for greater participation of the private sector within the electricity subsector.

This situation results as a logical outcome to a growth in demand which is greater than supply, advantage of which is being taken for the introduction of a series of reforms aimed at increasing the efficiency and competence of the electricity market through its opening up and deregulation.

Another initiative along similar lines has been the creation of the Central American Interconnected Electrical System (SIEPAC) which seeks the establishment of a regional electricity market among Central American generators. The benefits expected from SIEPAC include the creation of a Central American electricity market which will help promote trade between countries and thus stimulate competition.

Governments are providing incentives in their search for new alternatives through:

- the cogeneration of electricity among sugar producers, so that they participate in energy generation from their own sources of biomass, both for their own consumption and for the sale of excess capacity to the electric companies;

- independent generators so that they invest in the development of electricity generating projects or increase existing capacity, with the aim of selling electricity. To date the majority of energy produced from these sources has been sold to the public electricity companies, and, in some cases to important consumers and for whom transport is paid; and

- those entities, represented by industries which possess their own electricity generating plants, in order to cover their own needs or as a backup in time of power failures. In some cases agreements exist to supply grids with energy.

Central America has also started to use both solar and wind energy. In the case of the former, studies have been carried out for its application in urban areas through the use of appliances which function with solar energy and which replace those which function with electric energy; and in isolated rural areas through the use of photovoltaic plants for the satisfaction of specific minor requirements.

With regard to wind energy, although its exploitation has already started, it is barely in its initial phase – with a generating capacity of 20 MW – and Costa Rica is the only country making use of this alternative.

Fossil Fuel Subsector

Imports and Refining

Countries of the isthmus have embarked upon a process aimed at improving conditions for the regulation of fossil fuels so as to promote transparency, efficiency and the competition of the subsector as a means of ensuring less expensive finished products at the domestic level and, in this way, reducing its negative impact on other economic activities. This has been carried out as part of the search for alternatives as a means to reduce the cost of imports as, in the past, private refineries operated with guaranteed profits. Conditions for the establishment of oil prospecting contracts have also been created so as to determine real possibilities for fossil fuel production.

Table 2.19 shows the annual percentage of fossil fuel

consumption by country which has been refined. In Honduras it will be noted that from 1993 all fossil fuel consumed is imported in its final form as a result of the closing of the only existing refinery. If data are evaluated at the regional level it can be seen that overall consumption has grown faster than refining capacity.

While Honduras imports all its oil derivatives, Panama shows the opposite tendency. By exporting its surplus, except in 1994 and 1995, this country generated benefits for its economy. After Honduras, the country with least refining potential is Guatemala which has shown annual declines in its refining capacity. A similar situation is apparent in all the other countries, with the exception of Panama.

Table 2.19
Percentage of Fossil Fuel Refined Nationally, 1985, 1990-96

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Guatemala	55	41	42	41	37	35	34	32				
El Salvador	105	86	79	76	73	57	46	50				
Honduras	54	54	51	32	0	0	0	0				
Nicaragua	76	98	102	94	88	85	70	69				
Costa Rica	59	47	35	41	41	35	45	40				
Panama	132	122	107	149	136	82	82	126				
Central America	80	71	66	69	61	47	44	52				

Source: Drawn up by the Costa Rican Oil Refinery's Directorate for Studies on Energy Demand, based on ECLAC figures, Mexico, 1997.

Thermal Generation

The need to generate electricity using thermal plants is one of the factors which most affects fossil fuel consumption within countries of the region. This situation has resulted, on the one hand, from the growth in electricity consumption which exceeds the generating capacity of the hydroelectric plants, and on the other, from climatic conditions, in that water is the raw material required for electricity generation in hydroelectric plants. Long periods of drought caused, for example, by El Niño and the Southern Oscillation (ENSO) phenomenon, have caused a lowering of water levels in dams and drastic electricity rationing, as was the case of Honduras in 1995.

Fossil fuel consumption for electricity generation in 1996 was 10 million barrels, similar to the total fuel consumption in Costa Rica in this same year, but with a 27 per cent reduction compared to 1995. The overall tendency registered over the 1990-95 period showed an average annual growth of 35.7 per cent.

This temporary drop in consumption can be attributed to increased rainfall and the resulting higher water level in the dams as a result of which thermal requirements were reduced; and the opening of a hydroelectric plant in Costa Rica.

Table 2.20 shows the evolution by country in fossil fuel consumption (diesel and bunker) for electricity generation. It can be observed that in 1985 more fossil fuel was consumed in Guatemala than in 1996. This

can be explained by the fact that while in 1985 hydroelectric generation was only 45.2 per cent, by 1996 this had reached 61 per cent. The other country which showed no increase in the consumption of oil derivatives was Panama which maintained similar figures for the years 1985 and 1996. All other countries showed overall increases in fossil fuel consumption for electricity generation.

In the case of Nicaragua, with the resultant increase in the use of fossil fuels, there is a growing tendency towards the use of thermal plants for electricity generation. Further, the fact that only 51 per cent of Nicaragua's population has access to electricity needs to be taken into consideration; and that of total generated electricity, only 27 per cent was from hydroelectric schemes in 1996.

It is to be expected that any increase in the levels of electrification be accompanied by increases in the consumption of oil for electricity generation and it is thus unlikely that consumption patterns in the short term will be different from tendencies reflected until now, given the high investments required for the construction of new hydroelectric plants.

The region's average use of fossil fuels for electricity generation over the 1990-96 period was 16 per cent of fuel consumed for electricity generation, with a high of 20.7 per cent in 1995. By country, Costa Rica shows the lowest level with an average of less than 10

Table 2.20
Percentage of Fossil Fuel Used for Electricity Generation, 1985, 1988, 1990-96

Guatemala	20.5	5.1	4.5	12.4	17.0	14.3	18.5	16.0	10.3	13.3
El Salvador	6.7	10.1	5.7	19.7	17.4	21.3	27.0	27.4	18.4	19.6
Honduras	6.6	nd	nd	nd	3.2	5.7	9.7	20.5	18.1	11.4
Nicaragua	19.8	24.2	23.9	26.1	29.7	28.4	29.3	31.9	32.2	28.8
Costa Rica	0.5	4.6	1.6	4.9	14.2	9.8	16.2	14.6	8.3	9.9
Panama	17.9	13.6	14.9	20.1	26.5	21.5	21.0	21.5	17.1	20.3
Central America	13.4	9.0	7.6	13.5	17.7	16.2	19.8	20.7	15.7	15.8

Source: Costa Rican Oil Refinery's Directorate for Studies on Energy Demand, based on ECLAC figures, Mexico, 1997.

Table 2.21

Relative Distribution (percentages) of Sources of Imports of Fossil Fuel and Derivatives, 1996

Sources of Fossil Fuel:						
Colombia	0.0	2.5	nd	0.0	50.9	13.0
Ecuador	0.0	77.6	nd	45.2	0.0	37.9
Venezuela	0.0	4.0	nd	0.0	43.4	47.1
Mexico	100.0	4.4	nd	2.6	0.0	0.0
Others ¹	0.0	11.5	nd	52.2	5.7	2.0
Total:	100.0	100.0	nd	100.0	100.0	100.0
Sources of Derivatives:						
USA	31.8	24.0	41.0	3.6	5.6	57.4
Ecuador	9.6	13.8	1.5	47.7	0.0	1.8
Venezuela	39.1	37.2	47.6	12.4	69.7	23.6
Mexico	12.4	2.3	0.9	3.8	3.8	2.9
Others ²	7.1	22.7	9.0	32.5	20.0	14.3
Total:	100.0	100.0	100.0	100.0	100.0	100.0

Notes: 1. Includes unidentified sources, Argentina, Bolivia, USA, Peru; 2. Includes Caribbean, Chile, Canada, Colombia, Spain, England, Peru, Trinidad and Tobago, Netherlands and Central America; nd = no data available.

per cent for the same period. But while in 1985 nearly 100 per cent of electricity was generated from renewable sources, in 1996 this relation was 80 per cent. This difference was responsible for a corresponding increase in fossil fuel consumption.

In summary, the region has a greater need for the use of thermal plants for electricity generation, a fact which is clear from an analysis of the behavior seen in Table 2.20.

Sources of Fossil Fuels

The percentages shown in Table 2.21 are obtained by considering the source of imports of crude oil and derivatives over the year indicated (1996) of each one of the countries in the Central American isthmus.

An extreme situation is observed in the case of Guatemala with regard to crude oil, with all imports originating in Venezuela, and El Salvador which obtains products from nearly all the markets considered. It can also be seen that the isthmus receives the majority of its crude and reconstituted fossil fuels and derivatives from Venezuela and Ecuador. Venezuela is the main supplier of

derivatives, followed by the United States of America. This situation has remained relatively stable.

During the 1980s, two thirds of the region's supplies of fossil fuels came from Mexico and Venezuela. However, since 1989 significant changes have taken place, including an increase in imports from the United States of America until it occupies second place, with the relatively stable participation of Ecuador in third place. Over time the share of these four countries has declined from 95% in 1991 to 80% in 1995.

Mexico stands out in the supply of liquid petroleum gas (LPG) as this country is responsible for approximately half of the region's imports. Purchases from Venezuela and Mexico come under the San Jose Agreement which resulted from a joint and unilateral declaration of the presidents of Venezuela and Mexico in August 1980 on an energy cooperation program for

Central American and Caribbean countries. To date, this agreement has been renewed on an annual basis. A percentage of oil receipts paid to Mexico and Venezuela goes towards financing certain types of projects in beneficiary countries under favorable conditions.

Consumption

Central America is dependent on the consumption of petroleum derivatives for the development of its productive sector, transport and for electricity generation in general. This situation is of concern in that the region does not have sufficient quantities of this non renewable energy source.

With the consumption of 63,027,000 barrels of fossil fuel in 1996, the Central American oil market showed a negative growth rate of -3.4 per cent during the 1995-96 period (ECLAC, 1997)

Multinational oil companies have traditionally been involved in the import, transport, refining and distribution of this resource. Some companies with private national capital and others linked with independent electricity products have initiated activities. Public oil companies have existed in only Nicaragua and Costa Rica, although in the case of the former, this has been privatized. The private sector participates in the commercialization as concessionaires of transnational or independent companies.

The countries themselves maintain structures, located in different state institutions, which allow the monitoring and control of the different subsectors of the fossil fuel industry.

Considering the unlikelihood of Central America being in a position to reduce its fossil fuel consumption over the long term, the principle objective will be the constitution of an efficient and

flexible fossil fuel subsector, to ensure the supply of crude oil, under economic, ecological and social conditions according to the demands of each country and of the region as a whole.

A pattern can be detected in consumption patterns of fossil fuel derivatives aggregated for the region. This can be seen in Table 2.22, which shows the evolution of five products over a nine-year period.

Over 12 years the consumption of liquid petroleum gas, gasoline, kerosene/jet fuel, diesel, and fuel oil, the five most important products, has doubled from 28.5 million barrels in 1985 to 57.9 million in 1996. Diesel is among the products with the highest consumption level representing nearly 45 per cent of all fossil fuel products consumed.

If the evolution in consumption of petrol derivatives is carefully analyzed for the region, it can be appreciated that, except for 1991 when the consumption of diesel was greater than 60 per cent and the consumption of other fuels fell, this market shows a sustained growth of around 10 per cent for all derivatives. This situation presents a market with important growth rates and to which attention should be turned in the medium term.

As far as transport is concerned, studies are being carried out to establish the viability of substituting the consumption of fossil fuels through the establishment of electrified public transport system, or ones that use some other type of fuel, such as alcohol. However, under current conditions such a substitution would not

Table 2.22

Internal Consumption (thousands of barrels) of Petroleum Derivatives 1985, 1988, 1990-96

Year	LPG	GAS	K/J	DO	FO	Total					
1985	2,193	7.6	6,841	23.9	2,504	8.7	10,869	38.0	6,248	21.8	28,552
1988	2,593	8.5	7,568	25.0	2,626	8.6	11,437	37.7	6,056	20.0	30,280
1990	2,689	8.5	7,928	25.2	2,558	8.1	12,098	38.4	6,160	19.6	31,433
1991	2,878	5.2	8,004	14.5	2,445	4.4	34,522	62.8	7,063	12.8	54,912
1992	3,157	7.9	9,621	24.1	2,826	7.0	16,622	41.7	7,955	19.9	39,821
1993	3,453	8.2	10,126	24.2	2,610	6.2	16,944	40.5	8,680	20.7	41,813
1994	3,843	8.3	11,192	24.2	2,759	5.9	20,074	43.4	8,298	17.9	46,166
1995	4,184	7.8	12,084	22.7	3,078	5.8	22,689	42.7	1,098	20.7	53,022
1996	4,519	7.8	12,882	22.2	3,231	5.5	23,942	41.3	1,330	23.0	57,872

Source: ECLAC, 1997.

Notes: LPG = liquid petroleum gas; GAS = gasoline; K/J = Kerosene/Jef fuels; DO = diesel; FO = fuel oil.

be easy. In the specific case of the electrification of this service, it should be remembered that, until an effective reduction in thermal generation is achieved through an increase in the use of hydropower resources and other renewable resources,

electrification will have a substantial increase in demand as a direct effect. This would be accompanied by an increased need for thermal generation and, as a result, a considerable increase in fossil fuel consumption.

ATMOSPHERE AND CLIMATE

Human Intervention: the Global Atmosphere and its Implications for Central America

The environmental problems faced by humanity are reaching the planet's maximum tolerance levels. The deterioration of the ozone layer, more frequent climatic disasters, potential impact of climate change, deforestation, watershed degeneration, and biodiversity loss are among some of the most significant problems.

The principal cause of this environmental deterioration is human beings' search for ever higher standards of living. This involves an ever accelerating exploitation of resources with little concern for impacts in the medium and long terms, thus jeopardizing the potential well-being of future generations.

The Ozone Layer

The impact of ozone layer depletion in Central America can be seen from two different perspectives: one relating directly to health, and the other relating to the economic and developmental aspects of the countries.

Studies of the impacts of the weakening of the ozone layer over Central America are scarce. National and international cooperation efforts are thus required for the development of early warning systems for the protection of health in the region.

The majority of studies have been carried out by high latitude countries, justified by global observations which indicate a weakening of the ozone layer in the lower stratosphere of polar regions producing important environmental and health effects.

The region's economic development has had a direct impact on industry's use of ozone depleting substances (ODS). While industry uses these substances, measures have been taken in the region to limit their use and reorient industry towards their total elimination.

Ultraviolet radiation is efficiently absorbed by ozone. When the latter is lacking, this radiation possesses sufficient energy to break up molecules of biological importance, including DNA, which leads to an increase in the number and severity of infectious diseases, problems in immune systems, an increase in ocular lesions such as cataracts, an increase in the incidence of skin cancer, the loss of crops and the alteration of aquatic systems (Amador and Alfaro, 1995).

The Central American network of government "ozone" representatives has promoted the establishment of programs and the strengthening of the work of focal points or units within ministries of environment or health. They are carrying out a variety of activities which range from raising citizen awareness to the development of industrial reconversion projects.

The same source quotes Salby and Garcia (1990) who indicate the seasonal changes in total ozone as a function of latitude. However, although ozone is produced in lower latitudes, greater quantities are found at higher latitudes as a result of transport to the poles due to atmospheric circulation.

The units have also been responsible for the promotion of legislation aimed at limiting imports and ODS use as well as for promoting the region in international fora as one which is committed to the resolution of problems through action at national and regional levels.

The recuperation and recycling of refrigerants, changes in ODS use, the use of alternative products, the reconversion of domestic refrigeration, training for personnel in industry from managerial to shop-

floor levels and for transport companies, ODS inventories, the economic recognition of efforts and incentives, are just some examples of important achievements of the region's ozone units.

Air Pollution

Projects such as the Pure Air Program, technically and financially supported by Swisscontact, aim to contribute in a significant way to improvements in air quality in Central America's principal cities. Activities are being concentrated on vehicle emissions which are responsible for approximately 70 per cent of air pollution.

Under this ongoing program Central America has established the following goals:

- Reduction of atmospheric pollution by between 30 and 40 per cent (Pb, PM10, TSP, CO, HCS, NO₂, O₃) over a maximum period of 10 years.
- Reduction of the consumption of vehicle fuel by between 5 and 10 per cent.
- Reduction of CO₂ emissions by 700,000 mt/year.
- Ensure effective legislation to combat air pollution from mobile sources, and with program implementation in the hands of private enterprise.
- Elimination of the use of leaded fuel.
- Promotion of awareness of air pollution problems among the public.

Table 2.23
Vehicle Emission Regulations

	Without lead	Without lead and use of catalytic converters	Inspection and maintenance
Guatemala	Without lead since 1992	Since January 1994	Planned as from January 1998 (centralized)
El Salvador	Without lead since July 1996	Since January 1998	From January 1998 (centralized)
Honduras	Without lead since February 1996	Planned as from January 1998	Planned as from January 1998 (centralized)
Nicaragua	Without lead since July 1996	Planned as from January 1998	Planned as from January 1998 (centralized)
Costa Rica	Without lead since June 1996	Since January 1995	"Ecomarchamo" since August 1998
Panama	Without lead as of 2002	From January 1998	Since 1996

Source: PROECO— [Costa Rican] National University Laboratory on Pollutants. Annual Report, 1997

Atmospheric Warming

Changes in current conditions of the planet's temperature alter the fragile balance existing between current climatic conditions, resource use and the development of human activities in the region. According to estimations of the Central American Climate Change Project (PCCC) the region's average temperature in 2075 could be as much as 2°C higher than at present.

Rainfall on the Caribbean seaboard could increase or decrease by between 10 and 20 per cent, while on the Pacific seaboard these variations could represent between 10 and 15 percent of annual rainfall.

These climatic changes – the calculations of which are very conservative – could have serious consequences for important sectors such as agriculture as well as water, marine and coastal resources.

With regard to water resources, variations in rainfall will directly affect the region's energy production potential which is mainly hydroelectric. Should there be an increase in rainfall, effective exploitation of excess water will be limited by the type of construction and operation of dams, and at the same time the average life of reservoirs will be affected as a result of erosion associated with poor watershed management.

However, on the other hand, should there be a decrease in rainfall, the hydroelectric sector will still suffer. Increased use of thermal plants with a corresponding increase in greenhouse gas emissions will become necessary, and the availability of water for drinking and irrigation will be reduced.

The Central American Climate Change Project estimations for water resources are based on the sensitivity analysis of 14 important watersheds in the region, these having been subjected to the application of different climatic scenarios.

The effect of climate change on Central America's marine and coastal resources is associated with the potential increase in average sea level due to global warming of the atmosphere. Taking into consideration

global scenarios for a one meter rise in water level, PCCC studied the greater part of the region's Pacific coast as well as the Caribbean coasts of Belize and Honduras.

The study identified critical zones, such as the Leon-Chinandega plain in Nicaragua which are faced with a potential danger from erosion, infiltration and flooding which would affect both natural resources and coastal zone infrastructure. One of the most serious problems facing future development of Central America's coastal zones will be the salinization of underground sources of drinking water.

The vulnerability of agricultural production, and particularly that of subsistence crops (rice, beans and corn) is related to water stress as a result of a reduction in rainfall and the increase in extreme rainfall conditions bringing floods.

The results of PCCC's studies on these subsistence crops show important variations in yield if current climate conditions were to change. The adaptation of new varieties which are more resistant to drought and water excesses, as well as to warmer climates, will be an expensive process from both the economic and social perspective for each one of the countries concerned.

Other sensitive areas which are likely to be affected in Central America are forests, biodiversity and human health. Although grades of vulnerability have not yet been quantified, recent effects associated with climatic variability (El Niño) have demonstrated their sensitivity.

The United Nations Framework Convention on Climate Change (UNFCCC) and the Central American Agreement on Climate Change (ACCC), together with ALIDES guidelines – signed by the Presidents of the region in Guatemala in 1993 – constitute important steps taken to strengthen the political framework on climate change.

Parallel to this political framework are activities being developed by CCAD and the Regional Committee on

Water Resources (CRRH) relating to the estimation of the vulnerability of water, coastal marine and agricultural resources to potential climate changes.

The Central American Council on Climate Change (CCCC), a regional coordination mechanism within the ACCC framework, aims at strengthening activities carried out in each country through national programs which involve mitigation, adaptation, science, education, international cooperation and climate change policies.

While, at the time of writing, the majority of the countries in the area have prepared proposals for the carrying out of baseline studies for inventories as well as other activities relating to compliance with international commitments included in the framework convention, some individual countries have already carried out activities such as inventories of sources and sinks of greenhouse gases and options for mitigation.

Two of the region's most important activities are directly related to objectives of the framework

convention. One is related to CO₂ absorption by forests and the other deals with technological improvements for energy production. The former is carried out as part of the Joint Implementation Initiatives.

With the support of CCAD's Executive Secretariat, Central American countries have developed coordinating fora and joint position statements for presentation to the Conference of Parties of the UNFCCC and other relevant reunions, such as the 21st World Forestry Congress which was held in Turkey in October 1997. The region currently maintains the position that joint implementation and/or market mechanisms for the reduction of greenhouse gas emissions (e.g., the purchase of carbon emission bonds) be recognized and approved and that joint implementation be carried out among all Parties signatories to the Convention.

Central America believes that joint implementation presents an opportunity to strengthen their financial mechanisms such as FOCADES for conservation, recuperation and sustainable management of forests.

Climatic Variability and Its Regional Impact

The El Niño and the Southern Oscillation Phenomenon

"El Niño" is a process which involves the extensive warming of surface waters of the tropical Pacific Ocean, with a duration which varies between one year and a year and a half; and the Southern Oscillation is a wave of atmospheric pressure at sea level between a region north of Australia and another in the Central Pacific. Both phenomena are related and jointly

referred to as the El Niño and the Southern Oscillation or ENSO. It is considered the longest of the short-term climatic variations (TOGA, 1996). This phenomenon has neither an established periodicity or duration, historically it has varies between three and seven years, nor a determined intensity which tends to vary on each occurrence.

Over the last hundred years ENSO phenomena have occurred with the following frequency:

1912	1969
1917	1972-73
1925-26	1976
1940-41	1982-83
1953	1986-87
1957-58	1991-92
1963	1994
1965	1997-98

Indications of the ENSO phenomenon in the Central American region can be clearly recognized in meteorological observation series, principally those relating to temperature and rainfall. In the temperature

series, warming can be noted throughout the Central American Pacific region where a significant reduction in rainfall is also noted.

Principal Impacts

The main direct impacts of the ENSO phenomenon are felt in agriculture and water resources, although health, biodiversity, and marine and coastal resources are also affected. The reduction in rainfall over the Pacific seaboard of Central America produces water stress in crops and increased temperature directly affects evaporation rates.

The ENSO phenomenon also produces an indirect impact on the economy of Central American countries especially in the most productive sectors: agriculture, cattle ranching, with repercussions in other associated activities such as the supply of food and hydroelectricity. Reduced rainfall results in

hydroelectric generation being negatively affected as a result of a drop in river volumes and a consequent drop in water levels in reservoirs. Thus, when the phenomenon strikes, countries are obliged to import not only food but also fossil fuel for thermal generation which means an increase in the petroleum bill.

Its impacts on agriculture and water resources are among those which have been best documented. Although economic damage as a result of the phenomenon varies according to its intensity and the ability of each country to respond and forecast events, most countries are suffering impacts which have assumed national disaster proportions.

Some Solutions

The main institutions charged with following indicators which permit an effective monitoring of the ENSO phenomenon are the meteorological services and research centers in the respective countries.

The basic meteorological observation networks in the region are operating on a very limited scale compared with the magnitude of events. Added to this they are unable to count on any Central American coordinating mechanism which would allow efficient information exchange mechanisms, the more effective use of forecasts made available through international research centers, or the preparation of local impact

forecasts. The need exists to develop a regional observation, monitoring and forecasting model which would assist in the taking of preventive measures in those sectors and activities which have historically been most affected in the region.

Another important limitation is the lack of information for the measuring of the real impacts in all sectors, especially those relating to economic activities. Such information would allow a more efficient channeling of efforts towards the adoption of measures to effectively mitigate and adapt to the ENSO phenomenon.

ENVIRONMENTAL AND INSTITUTIONAL LAW

The 1990s stand out as the period in which environmental aspects were incorporated into the political agenda; CCAD was created, and Central American agreements on forests, biodiversity, protected areas, climate change and hazardous substances were drafted, signed and ratified. A policy declaration, the Central American Agreement on Sustainable Development (ALIDES), aimed at committing the region to a sustainable development model, was also adopted by the presidents of each country. All these actions took place in response to an international movement which, from the legal perspective, was initiated at the 1972 United Nations Conference on the Human Environment. They have been aimed at increasing awareness of environmental conservation and the rational use of national resources.

In order to provide a general overview of Central America's legal and institutional environmental framework, the following aspects are briefly dealt with:

a)International environmental law

deals with how it has been adopted at the regional level;

b)Regional environmental law

presents legal instruments adopted for application in Central America and their means of compliance;

c)Central American environmental law

includes a comparative analysis of the inclusion of environmental matters at the constitutional level, and national and institutional legal frameworks.

International Environmental Law

The Conference on the Human Environment produced the Stockholm Declaration which is considered to be the origin of international environmental law. From that moment on the development of international environmental law has been extremely rapid. Environmental problems produce global consequences and do not respect politically delimited territories, and it is perhaps for

this very reason that international law has tended to advance more rapidly than national legislation in this field. It is estimated that more than 300 multilateral and close to 900 bilateral treaties exist, without taking into consideration those documents released by international organizations.

Although there are some aspects of international environmental law which could be better regulated,

The principles which have oriented the development of international environmental law include:

- The principle of sovereignty, according to which each country has the right to freely exploit its natural resources.
- The principle of responsibility for transboundary damage and cooperation which dictates that each State must ensure that those acts carried out within its territory do not cause damage to other States and cooperate with others in ensuring environmental conservation.
- The precautionary principle whereby the State must take preventive action to avoid environmental damage, even in the face of a lack of scientific evidence of the potential environmental impact.
- The principle of notification and acceptance through which every State has the right to be notified, for example, in the case of an environmental emergency occurring in another State or the entry of any hazardous material into its territory.

there should be no incompatibility with national law. Coordination and complementarity of the different levels should be the norm.

In Central America the ratification of international treaties has been especially relevant with regard to wildlife both terrestrial and marine, and their related ecosystems. There is active participation regarding the problem of hazardous wastes (the Basel Convention), and the destruction of the ozone layer (the Montreal Protocol). However, gaps still exist in the case of forests and water resources.

In the majority of cases, the signing and ratification of international treaties have not been followed up with decisions at the national level, which is indispensable for their enforcement. The most active enforcement of an international treaty in Central America is that of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) which demands the naming of scientific and administrative bodies in each country, and the establishment and maintenance of close communications with the Convention's Secretariat.

The challenges faced in the enforcement of international environmental law at the national level include the need to:

- 1- strengthen enforcement and compliance mechanisms
- 2- achieve coordination among international organizations aimed at more efficient resource use
- 3- strengthen the role of international nongovernmental organizations
- 4- improve development at the national level permitting a more effective enforcement

Regional Environmental Law

Central American treaties relating to biodiversity, hazardous substances, forests and climate change are signed and ratified by all countries in the region and complement the large number of international treaties on the environment. Regional commissions of technical teams have been created as a result of these

treaties and meet periodically to ensure compliance with acquired commitments.

The last five years have generated considerable political activity associated with environmental matters, with a large number of meetings having taken place at different levels.

The Agreement on Biodiversity Conservation and the Protection of Priority Wildland Areas in Central America

The Agreement on Biodiversity Conservation and the Protection of Priority Wildland Areas in Central America was signed at the Presidential Summit held on June 5, 1992 in Managua, Nicaragua.

The agreement comprises 45 articles and is divided into four chapters: fundamental principles, general obligations, means of implementation, and general articles. Its objective is the conservation of both terrestrial and coastal-marine biological diversity, and for which articles place emphasis on the development

and strengthening of 11 protected frontier areas.

This agreement resulted in the creation of the Central American Council on Protected Areas (CCAP) with responsibility for coordinating regional efforts aimed at harmonizing policies relating to the regional system of protected areas. In May 1995 the CCAP fused with the Central American Council on Forests (CCAB), thus forming the Central American Council on Forests and Protected Areas (CCAB-AP).

Article 25 of the agreement specifically establishes the need to ratify international conventions such as CITES, Ramsar and the UNESCO Convention for the Protection of the World Cultural and Natural Heritage. In the case of CITES and the World Heritage Convention, these have already been ratified by all

countries of the region; while only El Salvador and Nicaragua remain to ratify Ramsar.

The control mechanism for the enforcement of this agreement is the presentation of annual reports by CCAD to presidential summits.

Regional Agreement on the Transboundary Movement of Hazardous Wastes

The Regional Agreement on the Transboundary Movement of Hazardous Wastes was signed by those present at the Presidential Summit held in the City of Panama in December 1992. The definition of hazardous wastes follows the categories included in Annex I and the characteristics listed in Annex II of

the agreement. Annex III includes those types of operations which are considered to eliminate these wastes. The import of hazardous wastes is termed an illegal and criminal act, and refers the determination of corresponding penal sanctions to national legislation.

Regional Agreement on Climate Change

The Regional Agreement on Climate Change was signed during the meeting of ministers of foreign affairs held on October 29, 1993 in the City of Guatemala. This agreement is based on the general guidelines of the United Nations Framework Convention on Climate Change (UNFCCC), and attempts an approach to the global problem from a Central American perspective. Its objective is the protection of the climatic system so as to ensure food production and continued economic development.

The climatic system, as defined in the agreement, is the totality of the atmosphere, the hydrosphere, the biosphere and the geosphere and their interactions. The agreement contains programmatic norms; many of its articles are declarations of principles, such as the need to maintain climatic conditions for the conservation of natural resources.

Although the agreement neither establishes operational norms nor includes the establishment of defined parameters, it does reiterate the sovereign right to the use of natural resources of each country on

the condition that these activities do not contribute to global climate change. It promotes the evaluation of greenhouse gas emissions; the sustainable use of soils and watersheds and a sustainable agriculture which is compatible with environmental conservation. Greatest emphasis is placed both on the importance of stimulating scientific research as well as acquiring a knowledge of the parameters which regulate climate and its variations, and the strengthening of meteorological and hydrometeorological services in each country.

Following the lines of previous regional conventions, the implementing body is the CCAD, in consultation with its technical advisory bodies, which in this case is the Regional Committee on Water Resources (CRRH). This committee, together with the respective meteorological services, is responsible for the drafting of the 1993-2005 Action Plan. A policy commission also exists in the form of the Central American Council on Climate Change (CCCC), as a body associated with CCAD, comprising directors of the meteorological services responsible for national policy coordination.

Regional Agreement on the Management and Conservation of Natural Forest Ecosystems and the Development of Forest Plantations

This Regional Agreement on the Management and Conservation of Natural Forest Ecosystems and the Development of Forest Plantations, referred to as the Central American Forestry Agreement, was signed during the meeting of ministers of foreign affairs held in October 1993. Subsequently endorsed at the presidential summit, it comprises a regional framework for the management and conservation of natural forest ecosystems and the development of forest plantations. Its objective is to avoid a change in the use of areas with forest cover, on those soils suitable only for forest cover, or to rehabilitate those areas once they have been deforested.

This agreement is interesting in that it offers a reference framework of principles which should provide guidance in the definition of institutional, legal and financial policies to assist in attaining its objectives. It proposes the consolidation of national and regional systems of protected wildlands, the rehabilitation of degraded forests, management techniques for primary forests, reforestation programs, and the keeping of inventories.

In the financial field, it recommends the creation of specific funds, reinvestment mechanisms, credit assistance, the channeling of international cooperation, and a modification in the national accounting systems so as to include the depreciation of natural resources in the calculation of the gross national product.

It also includes a chapter on community participation in which the need to respect cultural diversity and the involvement of different stakeholders (indigenous populations, communities, women, nongovernmental organizations, industry) is recognized.

At the institutional level, it recommends the strengthening of the Tropical Forest Action Plans, the creation of environmental attorneys and compulsory environmental impact assessments.

It was under this agreement that CCAB was created, comprising the directors of the respective national forestry services and the national coordinators of the Tropical Forest Action Plans. As mentioned above, CCAB was fused with CCAP, to form what is now known as the Central American Council on Forests and Protected Areas.

Environmental Law in Central America

Environmental norms have always been present in the legal frameworks of each country. Since the time of the Civil Code promoted last century, articles can be found relating to hunting, fishing, and forest resources, and all of which were conceived as part of the land on which they were found.

Regulations relating to water resources, always of great value for the development of peoples, can be found in legislation dating back to the first half of this century. Forest resources began acquiring value and importance during the second half of this century. Mineral resources were declared a common good in constitutions due to their strategic value in the same way as resources found in the marine-terrestrial zone.

However, this means of establishing regulations relating to natural resources was highly sectoral in

nature: resources were neither taken into consideration as being integral parts of interrelated ecosystems, nor were they treated as forming part of a whole. These are two important aspects which need to be taken into consideration so as to ensure effective conservation measures. But this systemic approach is very recent, having generated interest only within the last 25 years, and still requires considerable development within the region.

States have consistently resorted to proclaiming legislation in response to existing problems. This has produced legal overlaps and conflicting norms which have not managed to resolve the problems for which they were established. Awareness that the law is only an instrument, and that it can be used to regulate matters of social relevance is only recent. But other types of instruments and especially tools for

enforcement and compliance remain to be developed.

The fragmented and/or sectoral treatment of environmental problems and the dispersion of environmental regulations are problems typical of the first phase in the development of environment law. A second step then generally follows characterized by the classification and systematization of existing but varied environmental norms. This produces an analysis of gaps, institutional overlaps, conflicts in norms, etc. The third step, and that which is currently envisioned in Central America, is oriented towards an integrated treatment of the environment.

In 1993 Honduras approved a General Law on the Environment which brings together the most

advanced principles in this field. Nicaragua approved its General Law on the Environment and Natural Resources N° 217, on March 27, 1996; and Costa Rica approved its Organic Law on the Environment N°7554 on September 28, 1995. El Salvador and Panama are currently discussing proposed general laws on the environment with similar orientations, in their respective legislative fora.

This legislative effort opens new horizons in the environmental field. It is beginning to provide the region with a legal framework which maintains a balance between conservation and development and which is attempting to establish administrative reorganization and broader controlling instruments for law enforcement.

Constitutional Analysis

During the 1980s the constitutions of each Central American country underwent reforms so as to include the obligation of the State with regard to environmental conservation. Costa Rica was the last

country to undergo this modification, having to wait until 1994. Greater scope exists in Nicaragua where natural resources in general have been declared a national heritage.

Differences exist in the characteristics of the constitutional modifications relating to the environment in Central America. However, the following general orientations can be inferred:

- There is a tendency towards a recognition of a healthy environment as a human right, with greater clarity in Panama, Nicaragua and Costa Rica. At the doctrinal level considerable discussion is taking place of its conceptual definition as a human right. This is not only of great academic importance. It also has important practical implications due to the fact that it involves the establishment of a basic definition for its enforcement. How this right is exercised and defended, and what instruments are to guarantee it, are just some of the questions which have not yet received a unanimous reply on the part of sources of the law.

- It is recognized that production systems and development models in general should be based on the rational use of natural resources and environmental conservation. This aspect is of considerable importance and is reflected in Honduras and El Salvador by including the need to protect natural resources within those articles relating to the economic system.

- Declarations have been made regarding the status of "common good" of the following resources, considered to be of strategic importance for the nation: water, maritime-land zone, continental platform, air space, and subsoil, including non renewable natural resources such as oil and minerals.

The most delicate matter is that which relates to the legal protection and the exercise of the right to a healthy and ecologically balanced environment, as a

human right, placing it on a similar standing with other equally established human rights, such as, for example, the right to private property or free

enterprise. This balance between individual and social rights is a daily task which, in many instances, is jurisprudentially defined by constitutional bodies, but which, without doubt, reflects the conception held by society of individual issues.

“With regard to Belize, this country has a legal system based on Common Law and its constitution as an independent State was approved in September 1981, and makes no specific reference to environmental protection; it is limited solely to the establishment of citizens’ rights and to the recognition of the inviolability of the person, as well as the absolute protection of private property. Nonetheless, this right can be legally limited when it comes to general well-being, imminent danger to the public or to resource conservation, such as in the case of the prevention of soil erosion and the protection of coastal-marine systems” (Gonzalez, 1997).

The incorporation of the protection of indigenous rights within Central America’s political constitutions is different. In Costa Rica there is no specific constitutional disposition relating either to indigenous populations or to their territorial rights and those relating to natural resources.

Chapter II of Guatemala’s constitution deals with social rights. Section three of this chapter covers the rights of indigenous communities and includes five specific articles which recognize the existence of diverse ethnic groups and that they have historical lands; and establishes the necessity for the State to provide special protection, preferential credit and technical assistance, and to regulate all these aspects by law.

The Honduran constitution’s chapter on education and culture declares all anthropological wealth as national heritage, and establishes the obligation of the State to preserve and promote native cultures, as well as genuine expressions of national folklore, popular art and crafts. References to agrarian reform establish the State’s duty to dictate means to protect the rights and interests of the country’s existing indigenous communities, and especially those lands and forests where they are settled.

El Salvador’s constitution declares native languages as cultural heritage and the object of preservation, dissemination and respect. Archaeological wealth also forms part of the State’s cultural heritage. However, no reference is made to indigenous peoples as such, or to their fundamental and territorial rights.

Nicaragua’s constitution (Article 8) is the only one which recognizes its people as multiethnic. It includes a chapter on the rights of Atlantic coast communities which recognizes the communal forms of property, possession, and the use and enjoyment of waters and forests. This clear constitutional backing has resulted in the Law on the Autonomy of the Atlantic Coast, but has left other Nicaraguan indigenous peoples without any legal basis.

Panama’s constitution includes two specific articles on indigenous peoples under the “Title on individual and social rights and responsibilities”. Article 86 establishes recognition by the State and respect for the ethnic identity of national indigenous communities. Article 123 guarantees collective property and the reservation of lands necessary for the economic and social well-being of indigenous communities.

Central American States are not recognized constitutionally as multicultural and multiethnic, with the exception, as indicated, of Nicaragua. Constitutional norms refer more to cultural heritage than to the fundamental rights of indigenous populations. Added to this, this cultural heritage is declared to be property of the State. Norms which provide a legal framework for the national development of indigenous peoples, and recognize their fundamental and territorial rights are nonexistent in Central America.

In spite of the close relation between common law and environmental law, Central American has neither taken into consideration traditional patterns of natural resource use nor protected the knowledge relating to this use. The relationship between the norms which regulate natural resource use and that which indigenous peoples make of them also remains to be analyzed. Indigenous peoples perceive environmental law as a violation of their rights to these resources.

Compliance and Enforcement

Despite the fact that the 1990s have seen the approval of general environmental laws in nearly all Central American countries, regulations relating to each natural resource are to be found in separate laws. The principal problem with environmental law in the region is the lack of enforcement and compliance.

“Basic legislation suffers from deficiencies, incongruencies, duplications and overlaps; the majority of laws are not regulated and present legal gaps with regard to environmental dispositions and regulations. There is a manifest legal dispersion due to sectoral rules and regulations creating institutional competition and jealousies, as well as resistance to the possibilities of improving environmental management by means of alternative legal options. Some laws are very general and others refer to regulations which are not approved in a timely manner, making enforcement difficult” (SEDA, 1993).

Compliance with environmental norms as well as their enforcement has become the object of analyses and recommendations. Parallel to the centralization of environmental functions in one particular ministry, civil society’s increase in environmental awareness has produced a diversification of strategies to ensure compliance with environmental laws.

This is the case of the creation of environmental divisions within the offices of the attorneys general (table 2.24) which are responsible for representing the interests of the State. This is of special relevance when considering that the majority of natural resource regulations are oriented towards public ownership, and that exploitation, on a legal basis, must therefore be the object of concessions, permits or licenses.

Environmental attorneys’ offices have also been created as part of the processes relating to the administration of justice to carry enforcement functions against those who infringe on environmental laws. The establishment of legal cases has increased considerably, but to date this activity has been restricted to the penal field. Possibilities need to be explored in the future within the civil field where indemnifications could have a greater impact.

In this sense, one of the problems which is being faced is the assessment of environmental damage.

A figure which has been recently created in Central America, parallel to the development of peace processes, is that of the Ombudsman (“Defensorías de los Habitantes”). These defensorías are enjoying a very active participation in the defense of human rights and the right to a healthy and ecologically sound environment.

The ombudsman’s role has also been promoted by consumer rights mechanisms which have attempted to emphasize that there will be no supply without demand, and educate the consumer as a strategic element in the definition of greater environmental awareness with regard products consumed.

Administrative regulations and procedures for the enforcement of general laws on the environment have yet to be developed. In Guatemala, for example, the 1986 Law on Environmental Protection and Improvement reads that “our environmental legal system has not yet achieved a satisfactory level of development in that many environmental situations are not sufficiently or adequately regulated.” This means that appropriate regulations are lacking, such as those that would relate to industrial activities and their effect on the environment. As an example, the Law on Environmental Protection and Improvement considers the drafting of regulations such as those relating to air quality, sonic pollution, hazardous waste, and the protection of soils (Sobenes, 1990). These are still pending.

“Belize’s 1992 Environmental Protection Act focuses almost exclusively on the environment and the prevention of pollution, and for which it contains three basic instruments: environmental impact assessments, prohibition of dumping at sea, and the regulated use of nutrients which could effect marine/coastal biodiversity. With regard to the law’s enforcement and compliance, emphasis is placed on the legal enforcement of norms which establish violations or crimes against the integrity and health of individuals. In the previous scheme, the influence of

common law can be detected. The institution charged with law enforcement is the Department of the Environment, attached to the Ministry of Tourism and Environment, as well as the General Attorney's Office" (Gonzalez, 1997).

Enforcement instruments pertaining to environmental laws used in Central America include:

- Administrative penalties and sanctions
- Environmental impact assessments as prerequisites for the carrying out of projects or activities
- Environmental education
- Incentives
- Other specific technical instruments, such as forest or wildlife management plans.

The environmental impact assessment (Aguilar, 1997) is an instrument typical of environmental law and that which has been most recently regulated within the region. Although an appropriate legal framework for the development of this instrument does not exist, there are some legal references which have allowed its gradual establishment and use.

Limitations do nonetheless exist in the region. Trained human resources are lacking, as are financial resources for monitoring and control; more public participation is required as well as a greater exchange of information. In 1997 CCAD's Environmental Impact Assessment Technical Commission was created.

Civil society participation has been channeled through representation in different advisory commissions. However, none of these has decision-making powers. Likewise, in the instruments established for direct participation, for example in local government councils, there are no established

procedures in cases of conflict. Such situations are usually resolved with a "vote of power" (when the president or leader exercises their double vote) or the naming of a commission which analyzes the conflict and makes a proposal.

Professionals in legal sciences who had maintained a distance from environmental problems and recent developments are beginning to participate more actively. At least one nongovernmental organization made up of lawyers specializing in environmental matters and willing to contribute to law enforcement is to be found in each Central American country (Box 2.4). Nongovernmental organizations also include policy development as one of their institutional objectives.

This activism, which can also be seen as a reflection of action in the political field, produces great expectations for the future. The strengthening of the rule of law also brings with it the strengthening of the division of powers.

Legislative powers are gradually taking on more "legislative initiatives", proposing new environmental laws and overcoming the traditional practice of receiving projects from executive powers for approval. Examples in the region exist, even of contradictions between both powers, according to the type of projects being promoted.

It is also important to mention the increase in policies oriented towards decentralization and greater regional autonomy. These are providing local governments with greater decision making powers and responsibility for the administration of goods and services within their jurisdictions. In those cases in which relations touch on indigenous rights this has led to the autonomous management of territories, such as in the case of Nicaragua's autonomous Atlantic Region or the indigenous regions of Panama.

Administrative Organization

The manner in which the State organizes itself to respond to environmental necessities has been influenced by the established development model (Table 2.25).

During the 1970s, by following the predominant agro-export economic model, ministries of agriculture and livestock strengthened themselves as institutions charged with the exploitation of natural resources. Little by little departments or offices were created to deal with the respective resources so that, for example: fisheries divisions held responsibility for the exploitation of marine resources, wildlife directorates dealt with hunting and freshwater fishing, and forestry directorates took care of forest exploitation.

Although the names of the respective dependencies vary from country to country, the reality is the same. An administrative body is charged with the exploitation of the resource in a sectoral manner without an integral vision of ecosystems or an idea of the need for policies relating to sustainability.

The 1980s marked a change towards a development model based on import substitution and subsequently export promotion, giving a considerable thrust to the industrial and agro-industrial sectors. The same period saw a growth of a conservationist tendency which resulted in moves towards the independence of many of these sectoral bodies, either by becoming autonomous or by moving towards forming part of other ministries or State secretariats, and with this a change of orientation from exploitation to conservation. The establishment of protected areas was also initiated during this period.

The seriousness of natural resource deterioration is currently so evident that citizens are now demanding conservation actions on the part of the State, and constitutional articles are also included to establish obligations in this sense. Administrative bodies

charged with environmental affairs are strengthened and transformed into State secretariats, such as the Environmental Secretariat (SEDA) in Honduras, or ministries as in El Salvador, Nicaragua, Belize and Costa Rica.

Proposed laws are developed to regulate the environment in general. In these a chapter takes care of establishing the functions and attributions supporting institutional strengthening.

However, despite these there is still a need to establish greater governmental policy coordination and consistency if sustainability is to be achieved, especially with regard to ministries of agriculture and livestock, or industry and commerce.

Greater coordination is also required with and within the ministries of health being the bodies responsible for aspects relating to environmental health (control of drinking water, solid waste and pollution, etc.).

State structures in Central America are in a state of flux. Discussions on the role of the State in each Central American country are common. It is clear that structural changes are required if the objectives of ALIDES are to be reached.

One of the instruments foreseen by ALIDES is the constitution of National Commissions for Sustainable Development (NCSD). Nicaragua has recently created such a body (CONADES) as a forum for analysis, discussion, evaluation, dissemination, coordination and follow up, comprising representatives of the executive, legislative, judicial and electoral powers, as well as of civil society and Autonomous Regions. The present orientation in environmental law is to achieve the application of existing legal measures, respect for these on the part of citizens and on their application by public institutions.

Box 2.4

Citizen Participation in the Drafting of Environmental Law

The Nicaraguan Environmental Movement (MAN), established in 1988, brings together individuals and legally constituted bodies which are concerned with environmental conservation. In 1992 the initiative to promote the approval of a General Law on the Environment and Natural Resources took shape. A work plan was drawn up on the basis of which it was decided that the drafting of the proposed law should be a social movement drawing on consciousness raising, consultation, dissemination and lobbying processes. With a first draft drawn up by professionals of distinct disciplines, 175 citizen consultative assemblies were held in all departments. On October 7, 1993 the formal presentation of the draft project was made to the

Commission on Environment and Natural Resources of the National Assembly. Although at that time the drafting of laws was the exclusive prerogative of the State, current constitutional reform allows for draft laws to have the support of five thousand signatures. This legislative commission accepted the initiative and converted it into a proposed law. A mass promotional campaign was undertaken with the distribution of 10,000 copies of the proposed law as well as promotion on the radio and television. During the discussion process pressure was exerted to impede its approval and that of other proposed laws, but after negotiations and pressure from civil society the law was passed in March 1996. The experience of MAN in this legal process is an example of citizen influence.

Source: Nicaraguan Environmental Movement. 1997. *Aprobación de la Ley General del Ambiente y los Recursos Naturales: Un Caso de Incidencia.* (Approval of the General Law on the Environment and Natural Resources: An Influential Case).

Box 2.5

Mesoamerican Network of Nongovernmental Environmental Law Organizations

During the Americas Summit, held in Miami in 1994, the Central American – United States of America Agreement (CONCAUSA) was signed through which the latter became an extraregional ALIDES partner. One of the commitments established in the action plan was the establishment of a network of experts in environmental law who would improve compliance and enforcement of the Alliance.

In January 1996 the Mesoamerican Network of Nongovernmental Environmental Law Organizations (known as RODA by its Spanish acronym) was constituted. This initiative has been promoted by Guatemala's Institute for Environmental Law and Sustainable Development (IDEADS) and the Center for Environmental Law and Natural Resources (CEDARENA) in Costa Rica, and has received CCAD endorsement.

It includes a nongovernmental organization from each country: the Mexican Center for Environmental Law (CEMDA), the Belize Institute for Environmental Law and Policy (BIELPO), the Honduran Environmental Law Center (CENDAH), the Salvadoran Foundation for Environmental Law (FUNDASALDA), the Center for Environmental Law and Development Promotion (CEDAPRODE) in Nicaragua, and the Panamanian Association for Environmental Law (ASLAP).

The Network's mission is to promote development in the mesoamerican region through compliance with environmental law and strengthen the management capacity of nongovernmental environmental law organizations working in the area.

Source: Personal communication with Alejandra Sobenes, Executive Director, IDEADS, Guatemala

Table 2.24

Central American Environmental Attorneys

Guatemala

- May 31, 1985 Constitution establishes a chapter for a Human Rights Commission of Congress and an Attorney elected by this body
- Regulated by Decree N° 54-86, October 1, 1986

An Environmental Attorney (EA) exists within the Human Rights Commission, charged with ensuring compliance with related constitutional articles (64, 97, 125, 126).

Honduras

- General Law on the Environment, Decree N° 104-93, creates the post of Environmental Attorney
- Regulated by General Regulation, Agreement N° 109-93, February 5, 1994

EA located within the General Attorney's Office, elected by Congress for five years. Administrative and legal representative of State interests in the environment.

El Salvador

- December 15, 1983 Constitution establishes General Attorney and Public Prosecutor's offices together with Human Rights Prosecutor. Environmental divisions exist within both the General Attorney's and the Public Prosecutor's offices.

General Attorney and Public Prosecutor named by Legislative Assembly for a period of three years. Control respect for rights of the individual and interests of the State, and secure respect for human rights (Art. 117).

Nicaragua

- General Law on the Environment and Natural Resources N° 217, March 27, 1996; creates the post of Attorney for the Defense of the Environment and Natural Resources within the General Attorney's Office.

EA represents and defends interests of the State and society in this area. Is party in suits for violations of environmental laws.

Costa Rica

- Organic Law of the General Attorney's Office N° 6815, September 27, 1982
- In one of its reforms (Law N° 7455, November 29, 1994) the post of Environmental and Maritime Land Attorney is created.

General Attorney named by the Government Council and ratified by the Legislative Assembly for a period of six years. Represents the State and is the highest consultative, technical, legal body of the public administration. Its functions include taking legal action to guarantee constitutional right to a healthy and ecologically sound environment, and to ensure the enforcement of international treaties and national legal framework in this field.

Panama

October 11, 1972 Constitution establishes the Public Prosecutor's Office at ministerial level and the Administrative Attorney and Treasurer.

Functions of the Administrative Attorney include the promotion of law enforcement, defend the interests of the State and form part of the State's legal processes. It has no environmental division.

Table 2.25

Legal Basis of Environmental Administration

	Legal basis	Organization
Guatemala	<ul style="list-style-type: none"> • Law for Environmental Protection and Improvement, Decree N° 68-86, November 28, 1986 	CONAMA. Depends directly on the Presidency. Has a technical advisory council. Advises on and coordinates activities for the drafting and application of national environmental protection and improvement policies
Belize	<ul style="list-style-type: none"> • Environmental Protection Act N° 2, October 14, 1992 	Ministry of Tourism and Environment. Formulates natural resource, environmental management and conservation policies
Honduras	<ul style="list-style-type: none"> • General Law on the Environment, Decree N° 104-93, June 30, 1993 • Legislative decree N° 218-96, December 1996. 	SERNA. Ensures compliance with environmental law. Drafts and coordinates national environmental policies. Has a national consultative council, a advisory technical committee and an environmental attorney's office
El Salvador	<ul style="list-style-type: none"> • Executive Decree N° 27, May 16, 1997 • Executive Decree N° 30, May 19, 1997 	MARN drafts, plans and implements conservation and natural resource use policies and legislation
Nicaragua	<ul style="list-style-type: none"> • Decree N° 1-94 • General Law on the Environment and Natural Resources, Decree N° 217, March 27, 1996 	MARENA regulates national policy on natural resources and the environment; and planning, administration, research, control, management and rational use of these natural resources
Costa Rica	<ul style="list-style-type: none"> • Law N° 7152, June 4, 1990. • Organic Law on the Environment N° 7554, October 4, 1995 	MINAE drafts, plans and implements policies on natural resources, energy, mining and environmental protection
Panama	<ul style="list-style-type: none"> • Law N° 21, December 16, 1986 	INRENARE is an autonomous body with a board of directors including nine representatives of the Executive Branch and private sector. Has a director general and a technical council. It defines, plans, organizes and coordinates the country's conservation and natural resource development policies

3. BIODIVERSITY CONSERVATION

Central America's real wealth lies in its biological diversity and its high level of endemic plant and animal species. It is estimated that the region possesses seven per cent of the planet's biological diversity: of the 250,000 species of flora described in the world, an estimated 90,000 species are found in the American tropics; of these, between 18,000 and 20,000 are from Central America. It is also estimated that close to 10,000 species of vascular plants in the neotropics have yet to be described (Gentry 1978, 1982). The region represents 14 per cent endemism, with the highest concentrations of endemic flora being found on the higher altitudes of mountains. In the 1970s it was estimated that 70 per cent of vascular

plants in the mountains of Guatemala, Costa Rica and Chiriqui-Panama showed endemic levels greater than 50 per cent (D'Arcy, 1977).

Central America:

- It is located between two continental masses
- It separates two oceans
- It forms a biological bridge linking the northern and southern hemispheres
- It covers 53.2 million hectares
- It includes 17 life zones
- There are more than 300 landscape forms
- It possesses over 46 indigenous groups

The Biodiversity Convention

The terms biological diversity or biodiversity have been incorporated into environmental parlance in the region and seem to have transcended the terms wildlife, forests and protected areas. From the technological perspective the concept of biological diversity is clearly established in the Convention on Biological Diversity (CBD) which states that "Biological diversity means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems" (Convention on Biological Diversity, 1992).

The Central American concept of biodiversity is based on this nucleus of biological characteristics and has been interpreted in a way which allows for a wide range of action and impact in political, economic, social, ethic and legal spheres. Biodiversity is not a resource in itself, but rather a characteristic common to living beings; it is the quality of being different. The aspect of being a resource is derived from the use of the elements which make them up.

The region's recognition of the importance of biodiversity from a holistic and interdisciplinary perspective facilitates conservation and natural

resource use and stimulates the interest of decision makers in matters relating to the sustainable use of renewable natural resources.

The Convention on Biological Diversity includes wild and domestic, terrestrial and marine biodiversity. However, actions have tended to center on the wild, terrestrial aspects while leaving important gaps in the marine aspects. Nonetheless, the latter offer enormous but as yet untapped potential for the region, as do the widely used traditional and domesticated species which are of an essentially agricultural nature.

There are at least three fundamental considerations for biodiversity conservation: those of an ethical nature, those related to the economic potential of the use of its elements, and those related to human survival. These three aspects are equally important for the region's development.

All Central American countries have ratified the Convention, signed at the Earth Summit in 1992, as part of a global policy framework. Their actions have been expressed in concrete terms through the signing of the Central American Agreement on Biodiversity Conservation and the Protection of Priority Wildland Areas.

Institutional Involvement

Three international legal instruments which govern actions in the field of biodiversity conservation exist in the isthmus: the CBD, the Central American Agreement on Biodiversity Conservation and the Protection of Priority Wildland Areas, and the Central American Alliance for Sustainable Development (ALIDES).

Other international and regional treaties exist which regulate specific aspects of biological diversity, such as the RAMSAR (Wetlands) Convention at the ecosystem level, or CITES (Convention on International Trade in Endangered Species of Wild Flora and Fauna), covering activities relating to the commercialization of species.

Countries of the region have advanced in complying with the CBD since its signing in 1992. However, it is difficult to imagine the conservation of all the region's biological diversity. For this reason regional priorities have been established according to different national (local) objectives. This process has involved policy decisions which have responded to economic, social, legal, political and cultural variables specific to Central America.

The functions of the State in Central America are undergoing processes of revision and there is a marked tendency toward the strengthening of democracy through regionalization, decentralization and the validation of means which characterize civil society.

The restructuring of the State has had a positive impact on biodiversity conservation. It has facilitated compliance with CBD, favored regional coordination through the CCAF-PA with projects such as the

Mesoamerican Biological Corridor (MBC), and has promoted the establishment of national structures to consolidate national protected area systems.

However, at the same time the State's controlling capacity has been weakened due to personnel reduction policies, new training requirements for existing human resources, and a lack of clarity in control and enforcement mechanisms.

One type of organization which is being promoted as a means to comply with the CBD are the National Biodiversity Commissions (CONABIO). Their formation processes have differed from country to country, and consensus has not always existed on their operation or which sectors should be represented in them. However, basic agreements do exist regarding their main objective: the promotion of CBD compliance and enforcement (Annex 2).

No country of the region yet has a legal framework for biodiversity conservation as such. Important gaps exist covering aspects relating to emergent themes such as genetic resources, biotechnology and biosecurity. Countries do, however, have regulations covering the relevant resources such as forests, wildlife and marine coastal resources.

In the general laws on the environment of Costa Rica, Nicaragua and Honduras, specific chapters relating to biodiversity offer broad guidelines on the subject. However, a debate has been initiated on the need to draw up general biodiversity conservation laws or laws which regulate the different facets of biodiversity. Decisions are to be taken by individual countries.

Interest Groups and Biodiversity Use

In addition to the State other actors are involved in the use and conservation of natural resources both within and outside protected areas. These include men and women small farmers and indigenous peoples in rural areas, nongovernmental organizations and the private sector, all of which interact and interrelate in different ways. Aspects of gender and equity merit a place in a framework of development and social justice.

With respect to the use of natural resources, it is necessary to distinguish between their use of management for survival and their use for commercial purposes.

Throughout the history and development of the Central American region natural resource exploitation has taken many different forms. As far as wildlife is

concerned, the most widely spread practices involve subsistence and sport hunting, commercial capture and collection, reproduction and use in captivity, recreational and tourist use, as well as traditional forms of use associated with specific cultures. With regard to the exploitation of forests and forest products, this has ranged from the use of wood and non-wood products, as well as a diversity of services and activities such as bioprospecting which is the search of natural active ingredients useful in the development of pharmaceutical products or chemicals for agriculture.

In recent decades there has been increasing recognition of the needs of minority groups, such as subsistence farmers and indigenous peoples, and interest in the use they are making of natural resources in buffer zones, on the borders of protected areas, or in frontier regions, all of which are places of considerable biodiversity.

Faced with the threat of resource deterioration and scarcity, many vulnerable populations, frequently comprising minority groups, have undertaken management initiatives which provide options for economic rewards and resource conservation. Many such activities in Central America are oriented toward the participatory management of natural resources.

Due to the preservationist approach of the seventies in matters relating to the environment, the possibilities for using wild resources were extremely restricted, and in certain cases legally prohibited. Around the middle of the following decade this tendency changed towards one which accepted the conservation concept and which included activities relating both to preservation and use by different sectors of the population.

Based on a policy of attraction of private investment and of foreign capital, the activities promoted by the countries have principally been oriented toward commercial uses.

Although natural resource use by both indigenous populations and small farmers has generally been carried out independently of legal or institutional authorizations – very often their survival depending to

a greater extent on their use – over the last years the State has started to provide greater help to these sectors.

Small farmers and indigenous groups have organized themselves so as to advance with their own development processes and approaches to natural resource management. The recognition of land rights, the delimitation, demarcation and rehabilitation of land, resource management such as that of water, soil and forest, and the maintenance of medicinal plants and traditional crops are all among the principal needs of indigenous and small farmer populations.

Over half of Central America's population lives in rural areas and is made up of small farmers and indigenous populations. The contribution to the agricultural, ranching, forest and fisheries sectors is significant in that they represent almost 20 per cent of the total production of goods and services and demonstrate the strategic role they play in contributing to the region's food security.

Nevertheless, there is a clear disparity between urban and rural areas with respect to income and access to services as may be seen in the tables of the section on Human Settlements.

The obvious wealth in biodiversity in rural areas should be directly reflected in improvements in the quality of life of the people who live there, through a better distribution and access to resources, services and opportunities. Nevertheless, the reality is different.

The implementation of integrating policies and the existence of entities which support human development, economic growth and biodiversity conservation assume particular relevance within this context. According to the "Directory of Nongovernmental Organizations with Activities in the Fields of Environment and Health", drawn up by the Program for Environment and Health in the Central American Isthmus (MASICA) (HEP et al., 1992), 35.3 per cent, or 42 NGOs in Central America have conservation and environmental protection as part of their mission, while those dedicated to social development (40 in number) represent 33.6 per cent of the total.

At the beginning of the 1990s there was a strong emphasis on environmental and conservation organizations, however, few of these integrate gender and environmental issues in the same perspective.

Some new organizations and initiatives are beginning to emerge which incorporate a framework of development and social justice into their projects. These same initiatives are also focusing on natural resource conservation and sustainable use, and some of the regional ones are mentioned in the box below.

Box 3.1

Sample Initiatives Integrating Gender and Environment Perspectives

- Programme for Environment and Health in the Central American Isthmus, MASICA- PAHO-WHO
- Tropical Forest Action Plan for Central America
- Central American Consultative Council on Women and Forestry Development
- Social Programme of the World Conservation Union, IUCN
- Gender Program of the Central American Forest Program
- Regional Unit of Technical Assistance (RUTA)
- Communication, Gender and Sustainable Development Program, IICA
- Forests, Trees and Rural Communities Programme, FAO
- Pan-American Development Foundation

Source: Ivannia Ayales. Central American Consultative Committee on Women and Forestry Development. 1995. "Mujer y forestería comunitaria en Centroamérica: aproximación a un análisis de género."

Involvement of Private Enterprise

Within a regional context, the natural resource base upon which economic and commercial investment largely depends is of special interest.

Since the beginning of the present decade the private sector, represented by the Federation of Private Enterprise for Central America and Panama (FEDEPRICAP), has been promoting initiatives aimed at convincing business leaders of the need for changes in attitude and the undertaking of technological changes so as to reduce negative environmental impacts and bring their practices into

line with sustainable development norms. By the same token, the private sector is seeking to increase competitive advantages by adapting to the requirements of international markets which are demanding cleaner technologies and healthier products.

Even in the absence of figures which indicate capital investment by the private sector in sustainably development initiatives and environmentally friendly technologies, some initiatives do exist which attempt to reduce the negative environmental impact caused by some of its activities.

As far as the position of Central America's private sector on the subject of sustainable development and ALIDES is concerned, in June 1994, FEDEPRICAP presented CCAD and presidential delegates responsible for this area, a document entitled "Alliance for Sustainable Development: A Proposal from the Private Sector."

Box 3.2

Environmental Certification Program for Banana Production

With the backing of the Rainforest Alliance and Costa Rica's AMBIO Foundation, this program establishes a series of norms for environmentally friendly production systems. In 1993 the Chiquita Brands company joined the program of these two NGOs in the Sarapiquí region. The project for a Better Banana ("Banano Mejor") is an integrated project which includes waste management, monitoring of waters, hazardous product management, work safety and environmental health.

Research is being undertaken on biodiversity in areas bordering banana plantations and in the patches of forest within them. It is hoped that this research will help understand the importance of isolated forest patches to the conservation of wild species. Support is provided to students with their theses and, in collaboration with the La Selva Biological Station of the Organization for Tropical Studies, these same students participate in a network which monitors bird populations.

The Costa Rican experience has provided the basis for further development of the program, and in 1996 the company initiated a similar program in Bocas del Toro, Panama, and it is expected that programs will be initiated in Guatemala and Honduras.

Source: Interview with Carlos Vega, Chiquita Brands

Box 3.3

The Private Sector and the Basic Principles of Sustainable Development

Democracy: Political, democratic and participatory systems are assets which will attract investments and resources.

Sociocultural development: Economic and social policies should be integrated. If social investment is not taken care of the main factor for national competition – the quality of human resources – will be weakened.

Sustainable economic development: Sustainable economic growth requires a sustained investment process, access to overseas markets, investments in human resources, infrastructure, and science and technology. This is fundamental to greater productivity and competition.

Sustainable natural resource management and improved environmental quality: These fundamental and determining factors for growth are necessary for a high quality insertion in the world economy. Sustainable development should be fully compatible with business and greater investment.

Source: Salazar, 1995.

Among those ALIDES initiatives which have required investment and organization, tourism stands out as an option which can “contribute to improving the quality of life of all Central Americans by including and training local and community groups in the efficient management of this activity” (Montelimar Declaration, Managua, 1996).

Micro tourist entrepreneurs, the majority of whom work in the area of ecotourism, are conscious of the importance of natural resources and the need to contribute to their conservation as they form part of the region’s archaeological, historical and cultural heritage. They have therefore suggested the guidelines indicated in Box 3.4.

Box 3.4

Proposed Guidelines for a More Sustainable Tourism

- Promote among micro entrepreneurs the notion of responsibility towards the sustainable use of natural resources
- Within each enterprise, promote the creation of a fund to finance environmental education programs
- Provide economic backing, strengthen and support environmental conservation projects at the community level.

Source: Montelimar Declaration, Managua, 1996

A new role is being promoted among States as facilitators and regulators of investments in the tourist sector, as in the case, for example, of the merger between the national tourist administration and the private sector through a pro-tourist alliance in Panama, or a national tourism corporation in El

Salvador. In other situations, such as in Costa Rica, bilateral commissions between the State and the private sector with high decision-making powers are formed, to act at the grass roots or parliamentary levels, with the intention to influence legislation (Leroux, 1997).

-
- **Fomentar entre los microempresarios, la noción de responsabilidad hacia el uso sostenible de los recursos naturales,**
 - **Promover en cada empresa, la creación de un fondo para el financiamiento de programas de educación ambiental, y**
 - **Fortalecer, apoyar y respaldar económicamente a los proyectos comunales de conservación del ambiente.**

FOREST RESOURCES

The wide range in climate and difference in soil types in Central America result in numerous forest ecosystems (20 Life Zones), some of which have a wide variety of forest species. A Central America without forests would be unimaginable. Nonetheless, it is estimated that forests are disappearing at a rate of 388,000 hectares a year, equivalent to a loss of 44 hectares every hour (Tuomasjukka, 1997); and FAO estimates forest loss between 1990 and 1995 to be around 2,284,000 hectares.

The causes of forest loss are diverse and complex and range from specific cultural patterns to economic structural adjustment programs. In general, the principal reasons for its destruction are related to food production and the extraction of wood or firewood.

Firewood is used for cooking in 33 per cent of households in Belize and 85 per cent in Guatemala; and throughout Central America it is calculated that approximately 62 per cent of households use firewood for cooking. Although wood is used for construction, according to Tuomasjukka only 8 per cent of estimated wood production was used for this purpose in 1996, with the remainder, 92 per cent, being used for firewood (Tuomasjukka, 1977). National markets are responsible for absorbing up to 80 per cent of wood production in each country, which leaves barely

20 per cent for international trade in the product (FAO et al., 1997).

However, it would be incorrect to assume that forest exploitation and clearance for agricultural purposes are the only factors responsible for forest loss in Central America. It would appear that poverty, underdevelopment, population growth and few alternatives for employment and production represent much more significant causes of reduction in forest cover.

As a joint force, the governments of the region have proposed various initiatives to confront the problem of deforestation through the creation of the Central American Council on Forests and Protected Areas. Over 1995-1996, IUCN-ORMA and CCAB-AP carried out an information gathering process of the forest sector which resulted in a study of restrictive policies, an analysis of planning and international cooperation ("Revisando Cuentas en el Sector Forestal Centroamericano") and the updating of National Forest Sector Reviews ("Diagnósticos Forestales") based on information originally collected in 1992. The serious weakness of baseline data within every country of the region became evident during this updating process.

Forest Cover

According to the State of the World's Forests (FAO, 1997), it is estimated that forest cover for 1995 in Central America was 19.5 million hectares, which represents 38 per cent of total territory in the region.

The majority of this forest cover is reported as being primary forest and is under some form of management category (see figure on vegetation cover).

According to the Forest Stewardship Council:

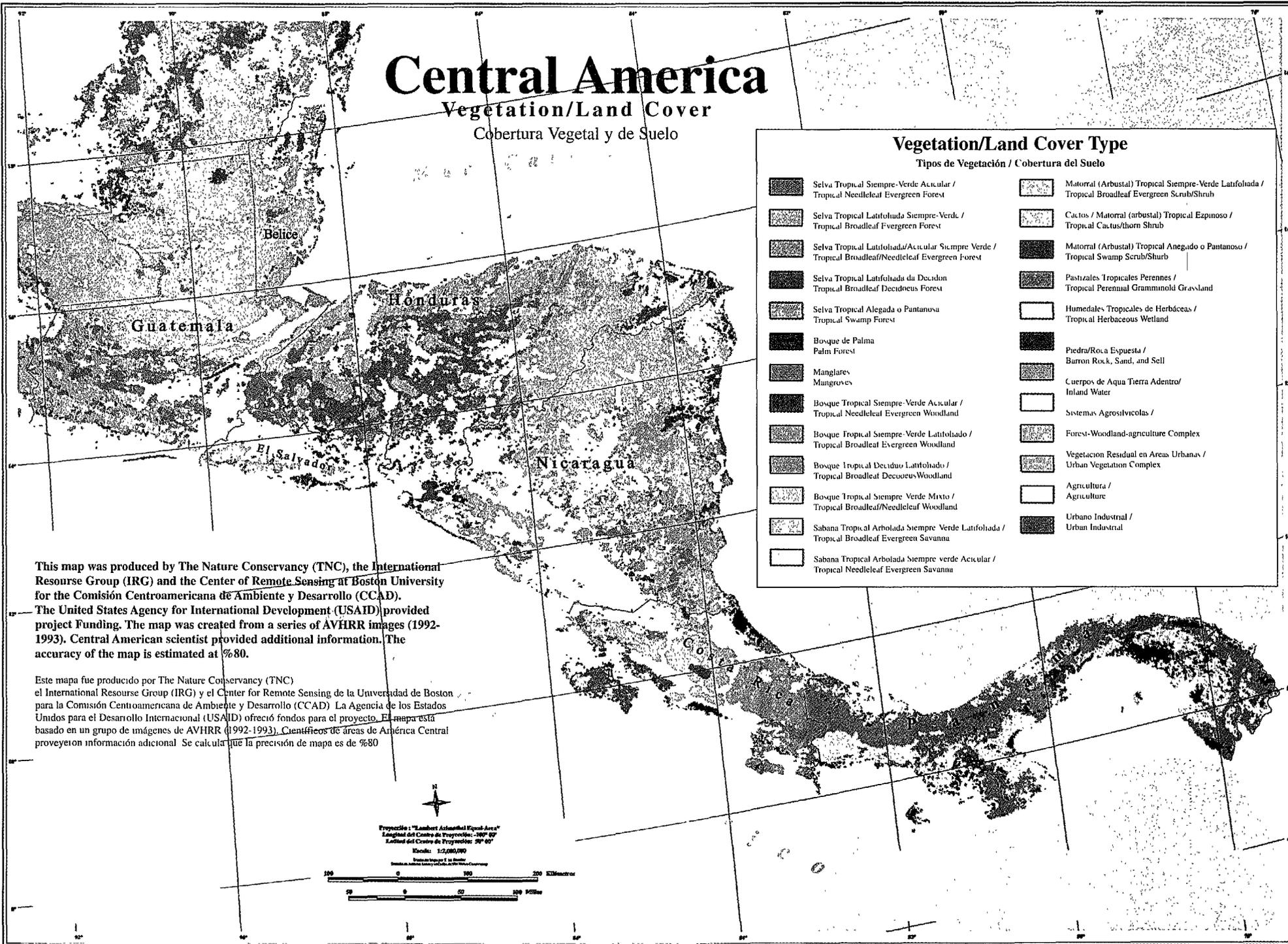
Primary forest is an ecosystem characterized by the abundance of mature trees which are relatively unaffected by human activity.

Secondary forest is an ecosystem which regenerates after substantial disturbances (flooding, fires, changes in land use or extensive or intensive wood extractions), and is characterized by the scarcity of mature trees and the abundance of pioneer species, as well as by new ground shoots and herbaceous plants.

Central America

Vegetation/Land Cover

Cobertura Vegetal y de Suelo



Vegetation/Land Cover Type

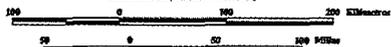
Tipos de Vegetación / Cobertura del Suelo

- | | |
|--|---|
|  Selva Tropical Siempre-Verde Acicular / Tropical Needleleaf Evergreen Forest |  Matorral (Arbustal) Tropical Siempre-Verde Latifoliada / Tropical Broadleaf Evergreen Scrub/Shrub |
|  Selva Tropical Latifoliada Siempre-Verde / Tropical Broadleaf Evergreen Forest |  Cactus / Matorral (arbustal) Tropical Espinoso / Tropical Cactus/thorn Shrub |
|  Selva Tropical Latifoliada/Acicular Siempre Verde / Tropical Broadleaf/Needleleaf Evergreen Forest |  Matorral (Arbustal) Tropical Anegado o Pantanoso / Tropical Swamp Scrub/Shrub |
|  Selva Tropical Latifoliada de Deciduo Tropical Broadleaf Deciduous Forest |  Pastizales Tropicales Perennes / Tropical Perennial Gramminoid Grassland |
|  Selva Tropical Alegada o Pantanosa Tropical Swamp Forest |  Humedales Tropicales de Herbáceas / Tropical Herbaceous Wetland |
|  Bosque de Palma Palm Forest |  Piedra/Roca Espuesta / Barren Rock, Sand, and Sill |
|  Manglares Mangroves |  Cuerpos de Agua Tierra Adentro/ Inland Water |
|  Bosque Tropical Siempre-Verde Acicular / Tropical Needleleaf Evergreen Woodland |  Sistemas Agrosilvícolas / |
|  Bosque Tropical Siempre-Verde Latifoliado / Tropical Broadleaf Evergreen Woodland |  Forest-Woodland-agriculture Complex |
|  Bosque Tropical Deciduo Latifoliado / Tropical Broadleaf Deciduous Woodland |  Vegetación Residual en Areas Urbanas / Urban Vegetation Complex |
|  Bosque Tropical Siempre Verde Mixto Tropical Broadleaf/Needleleaf Woodland |  Agricultura / Agriculture |
|  Sabana Tropical Arbolada Siempre Verde Latifoliada / Tropical Broadleaf Evergreen Savanna |  Urbano Industrial / Urban Industrial |
|  Sabana Tropical Arbolada Siempre verde Acicular / Tropical Needleleaf Evergreen Savanna | |

This map was produced by The Nature Conservancy (TNC), the International Resource Group (IRG) and the Center of Remote Sensing at Boston University for the Comisión Centroamericana de Ambiente y Desarrollo (CCAD). The United States Agency for International Development (USAID) provided project funding. The map was created from a series of AVHRR images (1992-1993). Central American scientist provided additional information. The accuracy of the map is estimated at %80.

Este mapa fue producido por The Nature Conservancy (TNC) el International Resource Group (IRG) y el Center for Remote Sensing de la Universidad de Boston para la Comisión Centroamericana de Ambiente y Desarrollo (CCAD). La Agencia de los Estados Unidos para el Desarrollo Internacional (USAID) ofreció fondos para el proyecto. El mapa está basado en un grupo de imágenes de AVHRR (1992-1993). Científicos de áreas de América Central proveyeron información adicional. Se calcula que la precisión de mapa es de %80.

Proyección: "Lambert Azimutal Equal Area"
 Longitud del Centro de Proyección: -89° 00'
 Latitud del Centro de Proyección: 9° 00'
 Escala: 1:2,000,000
 Fuente: Mapa 1 de la Serie
 Datos de Cobertura Vegetal y de Suelo de América Central



All countries in the region report having less than 50 per cent of their territory covered with forests with the exception of Belize which has 86 per cent. El Salvador has forest which covers just 5 per cent of national territory.

Table 3.1
Estimated Forest Cover (ha x 000), 1995

Belize	2,280	1,962	86.1	1,960
Guatemala	10,843	3,841	35.4	3,813
El Salvador	2,072	105	5.1	101
Honduras	11,189	4,115	36.8	4,112
Nicaragua	12,140	5,560	45.8	5,546
Costa Rica	5,106	1,248	24.4	1,220
Panama	7,443	2,800	37.6	2,794
Central America	51,073	19,631	38.4	19,546

Source: FAO, 1997. State of the World's Forests, 1997.

In 1996, in the absence of recent forest inventories, an estimation of forest cover in the respective countries was carried out based on National Forest Sector Reviews. It took forest cover and rates of deforestation and reforestation into account and, in some cases, estimated the conversion of abandoned land to secondary forest. It was estimated that forest

cover in Central America amounted to some 19,600,810 ha, representing 35 per cent of the region's total territory. The majority (91%) of this forest cover (Figure 3.3) is primary forest with different grades of human intervention (Tuomasjukka, 1997).

Table 3.2
Estimated Forest Cover (ha x 000) According to Tuomasjukka, 1997

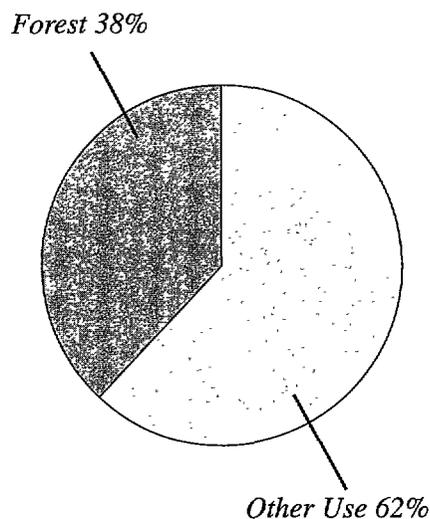
Belize	2,144	1,453	318	2	1,773
Guatemala	10,889	3,030	360	90	3,480
El Salvador	2,097	34	276	7	317
Honduras	11,249	5,990	nd	9	5,998
Nicaragua	12,143	3,700	nd	64	3,764
Costa Rica	5,113	1,306	388	152	1,846
Panama	7,552	2,396	nd	27	2,423
Central America	51,187	17,909	1,342	350	19,601

Source: Modified from Tuomasjukka. 1997. "Síntesis del Estado del Sector Forestal en Centroamérica." CCAD, CCAB-AP, IUCN-ORMA. November 1997.

Note: nd = No data available.

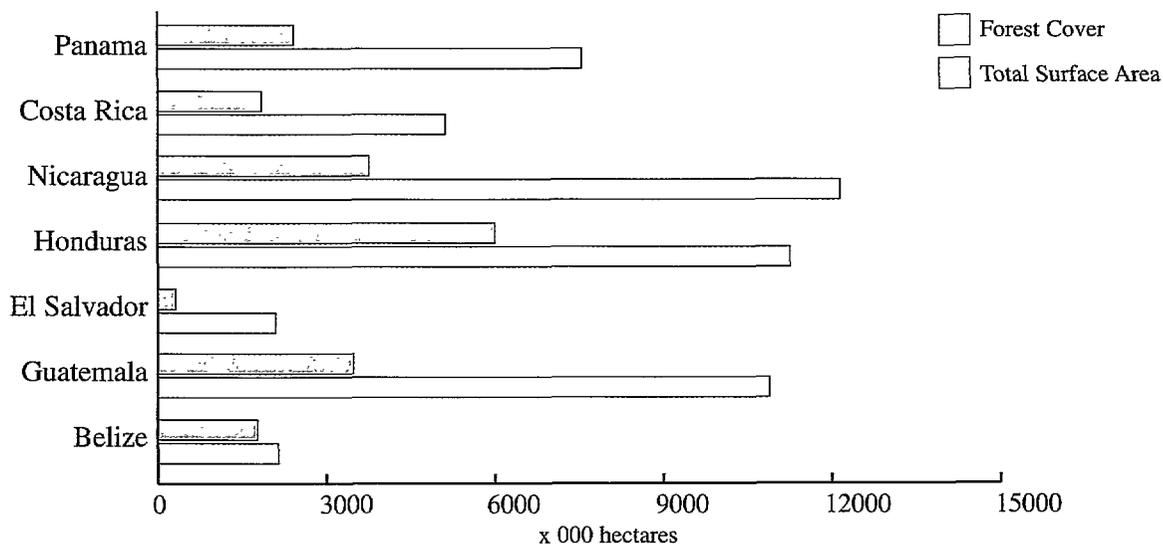
It is important to note that the estimates by FAO and those carried out in the region differ, first because they refer to a different year, and the values used for the estimates are different as in the case of the surface area of the countries in hectares, as well as probably that the estimation in hectares, as well as probably that the estimation methodologies are different. Nevertheless, both reports reflect the behavior observed in the countries with respect to the area covered by forests in each country. Both reflect estimates of the annual loss of forest cover of between 388,000 and 451,000 hectares.

Figure 3.1
Estimated Forest Cover in Relation to Surface Area in the Seven Central American Countries, 1996.



Source:
CCAD et-al, 1998. National Forest Sector Reviews ("Diagnósticos Forestales") of respective countries.

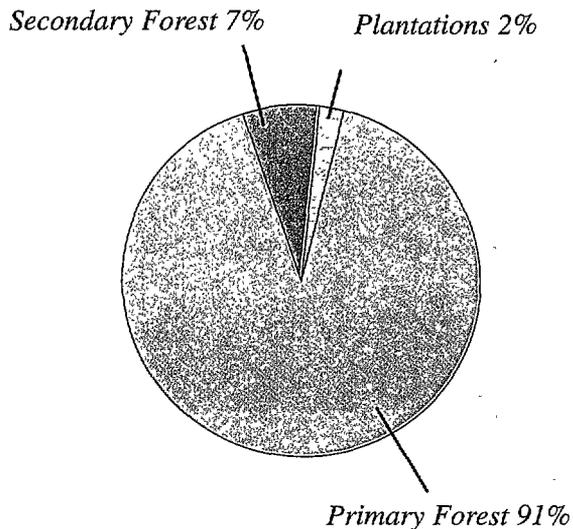
Figure 3.2
Estimated Forest Cover by Country, 1996



Source:
CCAD et-al, 1998. National Forest Sector Reviews ("Diagnósticos Forestales") of respective countries.

Figure 3.3

Estimated Forest Cover in Central America by Type, 1996.



Source:

CCAD et-al, 1998. National Forest Sector Reviews ("Diagnósticos Forestales") of respective countries.

Changes in Forest Cover, 1990-96

According to FAO estimated forest loss over the 1990-95 period was 2,284,000 ha, representing an annual average loss of 451,000 ha. This change in forest cover is shown in Table 3.3, while the estimated rate of deforestation in each country is shown in Table 3.4.

Few countries of the region monitor changes in forest cover on an annual basis. Costa Rica currently has a system which is generating satellite images of forest cover over the whole country, the results of which are being analyzed by the Ministry of the Environment and Mines.

In some cases the estimated rates are weak. If one compares the most recent estimates and the total rate (388,000 hectares per year) with the estimates from the beginning of the decade one can see a drop of 7%. Given the uncertain quality of the figures it is doubtful that this reduction reflects reality. Rather, it should be considered as a new indicator of the future development of the forests, after the decade of the 1980s.

Table 3.3
Estimated Change (ha x 000) in Forest Cover, 1990-95

	Forest Cover		Total Change	
	1990	1995	1990-95	%
Belize	1,995	1,962	-33	-7
Guatemala	4,253	3,841	-412	-82
El Salvador	124	105	-19	-4
Honduras	4,626	4,115	-511	-102
Nicaragua	6,314	5,560	-754	-151
Costa Rica	1,455	1,248	-207	-41
Panama	3,118	2,800	-318	-64
Central America	21,885	19,631	-2,254	-451

Source: FAO, 1997. State of the World's Forests, 1997.

Table 3.4
Estimated Rate of Deforestation (ha x 000), 1996

	Deforestation		Rate		Rate
	1996	1990-95	1996	1990-95	
Belize	2,144	1,773	10	0.47	0.56
Guatemala	10,889	3,480	90	0.83	2.59
El Salvador	2,097	385	12	0.56	3.03
Honduras	11,249	4,537	108	0.96	2.38
Nicaragua	12,143	3,764	100	0.82	2.66
Costa Rica	5,113	1,846	18	0.35	0.98
Panama	7,552	2,423	51	0.68	2.11
Central America	51,187	18,207	389	0.76	2.13

Source: Tuomasjukka, T. 1997. Síntesis del Estado del Sector Forestal en Centroamérica. CCAD, CCAB-AP, IUCN-ORMA, PFA. November 1997. Mimeograph.

Plantations and Reforestation

Information on reforestation is incomplete and lacks systematization (Table 3.5). For example, although the registered rate of reforestation in Panama for 1996 was 6,058 ha, informal sources put this figure at around 25,000 hectares. Data, based on available official statistics, indicate that the actual rate of establishment of forest plantations is around 35,000 ha/year. National Forest Sector Reviews detail

specific objectives for the establishment of artificial forests.

It is to be noted that in the majority of cases plantations have been established on degraded areas using exotic species for their rapid growth. In Central America these plantations represent just two per cent of total forest cover and 0.8 per cent of the region's

total surface area, using the 1997 estimated figures for plantation coverage.

Unfortunately the majority of countries do not register coverage by species, rates of survival or the condition

of the plantations. This renders the evaluation of the state of survival of plantations difficult. Other data which is missing are those relating to agroforestry areas which are important sources of firewood for rural populations.

Table 3.5
Forest Plantations and Reforestation

Belize	2,245	1987 ^a	nd	2,245
Guatemala	87,482	1996 ^b	4,860	97,202
El Salvador	6,593	1996 ^a	nd	6,593
Honduras	8,647	1996 ^a	nd	8,647
Nicaragua	21,000	1992 ^a	10,793	85,758
Costa Rica	136,318	1995 ^a	15,389	182,485
Panama	26,724	1996 ^a	3,236	33,196
Central America	358,089		35,078	416,126

Sources: a. Modified from Tuomasjukka, T. 1997. Síntesis del Estado del Sector Forestal en Centroamérica. CCAD, CCAB-AP, IUCN-ORMA, PFA. November 1997. Mimeograph; b. Bank of Guatemala, 1996. Production, export, import statistics, and prices of principal agricultural products. Department of Economic Statistics, National Accounts Section. November 1996. Mimeograph. Nd = no data available

Forest Production

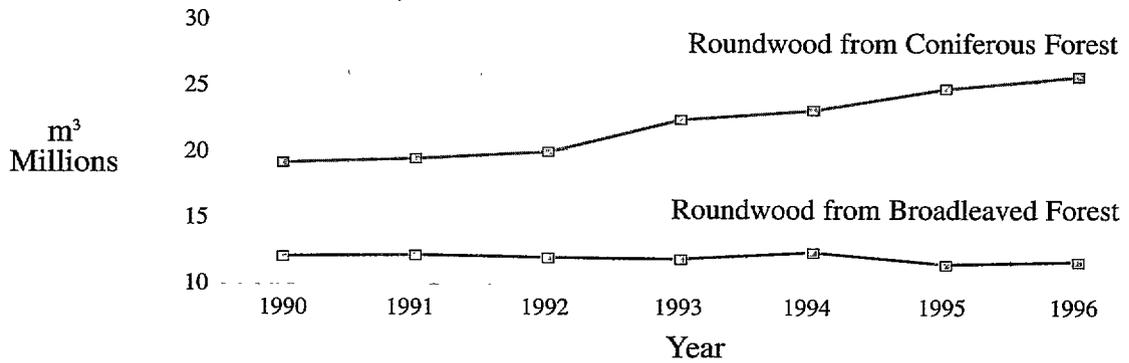
Timber Products

Data available from FAO (Figure 3.4) indicate that more roundwood is produced from broadleaf forests than from coniferous forests, but that there has been an increase in both. It can also be noted (Figure 3.5) that the majority of firewood comes from broadleaved forests and that this is growing while that from coniferous is diminishing. It can be seen from Table

3.6 that considerably more wood is used as a source of energy (92%) than by industry.

It is important to recognize that only El Salvador, Guatemala, Honduras and Nicaragua have coniferous ecosystems from which firewood is obtained, while broadleaved forests are present in all seven countries of the region.

Figure 3.4
Estimated Roundwood Production, 1990-96



Note: Only El Salvador, Guatemala, Honduras y Nicaragua have coniferous ecosystems

Source: FAOSTAT, Database. 1990-1998.

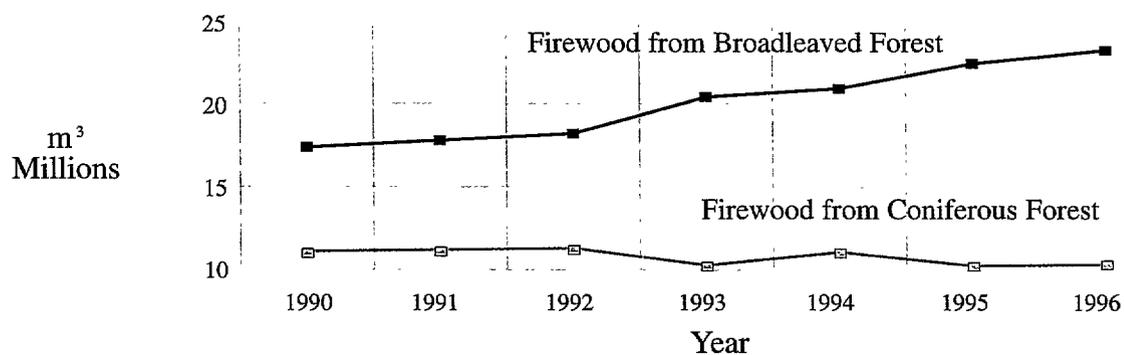
Table 3.6
Estimated Wood Use, 1996

Country/Region	Coniferous (Millions m³)	Broadleaved (Millions m³)	Total (Millions m³)	Value
Belize	0.07	0.06	0.13	54
Guatemala	7.11	0.31	7.42	96
El Salvador	5.30	0.32	5.62	94
Honduras	7.50	0.70	8.20	91
Nicaragua	3.70	0.27	3.97	93
Costa Rica	1.69	0.68	2.37	71
Panama	0.93	0.05	0.98	95
Central America	26.30	2.39	28.69	92

Source: Tuomasjukka, T. 1997. Situación de Uso de Leña en Centroamérica. CCAD, CCAB-AP, IUCN-ORMA. November 1997. Mimeograph.

Figure 3.5

Estimated Production of Firewood from Coniferous and Broadleaved Forest, 1990-96

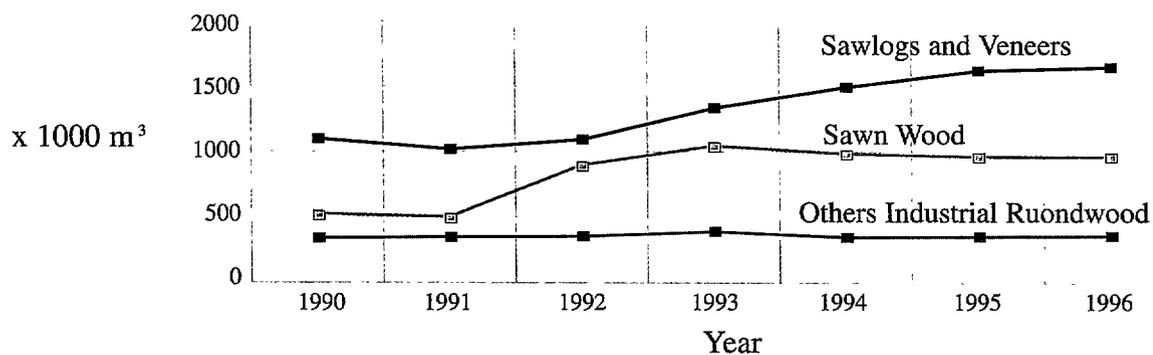


Note: Only El Salvador, Guatemala, Honduras y Nicaragua have coniferous ecosystems

Source: FAOSTAT, Database. 1990-1998.

Figure 3.6

Estimated Production of Timber Products from Broadleaved Forest, 1990-96



Source: FAOSTAT, Database. 1990-1998.

Box 3.5

Forest Certification

Forest certification has been conceived as a process to identify whether the forest, which produced the wood or the wood product itself, is being managed in a sustainable manner (in relation to technical-forest aspects such as inventories, forest planning, silviculture, wood extraction, and road construction, as well as environmental, economic and social impact assessments) and finally provides a written declaration of quality confirming the origin of the raw material, its state and/or its having qualified after having been validated by an independent third party.

In Central American countries forest certification is a process which is still very new and relatively unknown. However initiatives have been carried out in three countries in the region: Costa Rica, Honduras and Panama, but the level of knowledge is limited and the fruits of the process have yet to be seen.

The following table shows the organization, companies or projects which have been certified by independent groups from the United States of America and Europe.

By comparing the total certified forest area with the 1996 estimated forest cover in the region, it can be ascertained that the certified area barely represents 0.35 per cent of Central America's total forest cover. This indicates that the forest certification process in the region is in its infancy. In addition to which, this start only applies to the three countries mentioned above.

Proyecto de Bosque Latifoliado	Honduras	Native managed forest	25,000
PORTICO	Costa Rica	Native managed forest	3,900
FUNDECOR	Costa Rica	Native managed forest	15,000
Fundación Tuva	Costa Rica	Native managed forest	750
Tropical American Tree Farms	Costa Rica	Plantations	nd
Stone Forestal	Costa Rica	Plantations	15,000
Flora y Fauna	Costa Rica	Plantations	3,500
Futuro Forestal	Panama	Secondary native forests	26
Total:			63,176

Source: Adapted from PROARCA, CAPAS. 1997. La Certificación Forestal en Centroamérica. Preliminary draft. nd = no data available.

Source: FAO, CCAD, CCAB-AP. 1997. Basic reference document on the certification of forest products in Central America and the effect on their commercialization. Mimeograph.

Box 3.6

Firewood Use and Poverty

If it is considered that the total volume of wood produced from one hectare of Central American forest were to be some 400 m³, the total of 26.6 million m³ of wood used for firewood would represent approximately 66,500 ha of forest destroyed annually for this purpose. However, it is important to point out that this is not the real pattern of events. Firewood collection is not a process which maintains a gradually advancing, easily defined deforestation front. In many instances firewood comes from natural forests, and when extraction exceeds the forest's recovery rate, deterioration take place.

The following table presents firewood use per capita in the 1990s. Variations between countries are considerable, from just 0.34 m³/year/person in Belize to 1.58 m³/year/person in Honduras. It can be seen that the lowest consumption is in Belize which, due to its Caribbean culture, uses gas for cooking instead of firewood; while the highest consumption is in Honduras with a more developed forest culture.

Another factor which probably affects per capita firewood consumption in Central American countries is poverty. Firewood is the energy source for marginal communities which have neither physical nor economic access to other forms of energy such as electricity. In addition to which, poverty in Central America is traditionally located in rural areas where firewood is a natural energy source to due its availability. Though not strong, the trends revealed in data on poverty and extreme poverty in relation to per capita firewood consumption in Central America would appear to confirm that the greater the poverty and social marginalization, the higher the per capita firewood consumption.

Per Capita Firewood Consumption in Relation to Poverty and Rural Population, 1990

Country	Per Capita Firewood Consumption (m ³ /year/person)	Poverty (%)	Rural Population (%)	Notes
Belize	0.34	52	23	nd
Guatemala	0.85	65	86	60
El Salvador	0.68	50	87	52
Honduras	1.58	57	73	58
Nicaragua	0.95	52	54	23
Costa Rica	0.55	53	30	nd
Panama	0.40	51	77	34

Source: CCAD, CCAB-AP, IUCN-ORMA. 1997. National Forest Sector Reviews of respective countries.
Notes: nd = no data available

Some information is available at the national level on the hypothetical cost of substituting firewood with oil products. The range of variation in data is very high, from US\$17,000 to US\$342 million. This is probably a reflection of the different methodologies used in estimating substitution costs. It would appear that the most trustworthy data are from Guatemala and Costa Rica, being US\$342 million and US\$46 million respectively. This information provides an indication of the relative importance of firewood in national economies. In Guatemala, for example, the cost of substitution is equivalent to foreign currency received as a result of total 1991 coffee exports.

Firewood Substitution Costs

Country	Firewood Substitution Cost (Millions of US\$)	Year
Belize	0.5	1990
Guatemala	342.0	1985
El Salvador	nd	nd
Honduras	nd	nd
Nicaragua	nd	nd
Costa Rica	45.6	1987
Panama	0.017	nd

Source: CCAD, CCAB-AP, IUCN-ORMA. 1997. National Forest Sector Reviews of respective countries.
Note: nd = no data available.

Source: Tuomasjukka, T. 1997. Situación de Uso de Leña en Centroamérica. CCAD, CCAB-AP, IUCN-ORMA. November 1997. Mimeograph.

Box 3.7
Contribution of Non-Timber Forest Products

The distinction between timber and non-timber products is not well defined, and different countries and organizations have their own interpretations. Within the present context, “timber” is interpreted as roundwood, sawnwood, wood-based panels, particle board and pulpwood (Wickens, G.E. 1995).

“Non-timber forest products” are understood to comprise all biological material (with the exception of previously cited timber products) which are extracted from natural ecosystems, organized plantations, etc. and which can be used in the home, be commercialized or have social, cultural or religious uses. These products include plants for food, drinks, forage, fuel, medicines, fibers, biochemical products, as well as animals, birds and fish for food, skins, feathers, and subproducts such as honey, lacquer, silk (Idem 1995).

Forests are traditionally seen by authorities and technicians solely as a source of timber, with other forest products being referred to as “secondary forest products”.

In recent years the region has started paying more attention to these secondary products as in many cases they are of greater economic and social value than the timber itself. In addition, these same forest products could well provide a key to achieving greater participation of local rural communities in sustainable forest management.

Unfortunately few countries in the region keep statistics on forest production and the contribution of forest products to the social and economic development of its communities. Honduras is the exception.

The following table shows the economic contribution of two non-wood products over the 1992-1996 period. The social impact of these products should also be considered as, for example, in the case of pine resin, various rural communities have benefitted as the product’s extraction is carried out by hand and thus provides employment for thousands of people resulting in economic benefits for their families.

The contribution of pine seeds is extremely important in technical forest education. Some technical training centers have commercialized their seed banks and these provide income for investment in educational centers.

Year	Total Value (US\$)	Percentage of Total Value	
		Exports	Domestic Sales
1992	3,628.0	7.0	36.0
1993	4,399.9	nd	115.6
1994	2,532.1	nd	0.0
1995	12,397.7	nd	97.5
1996	13,623.6	nd	125.7
Totals:	36,581.3	7.0	374.8

Source: AFE-COHDEFOR, 1996. Anuario Estadístico Forestal, 1996, Tegucigalpa, Honduras, MDC.
Notes: 1. Percentage of exported products: pine resin (0.7%); colophony or rosin (90.6%); turpentine (1.0%); dipentanol (0.3%); liquid amber (3.2%); other (1.9%); nd = no data available.

Source: AFE-COHDEFOR, 1996. Anuario Estadístico Forestal, 1996, Tegucigalpa, Honduras, MDC.

Notes: 1. Percentage of exported products: pine resin (0.7%); colophony or rosin (90.6%); turpentine (1.0%); dipentanol (0.3%); liquid amber (3.2%); other (1.9%); nd = no data available.

Box 3.8
Forest Fires

Under certain conditions forest fires can cause wide damage and interfere with the flow of goods and services from forest ecosystems. They can affect the development and survival of trees, the quality and production of water, wildlife habitat, and their value as recreational, scenic and cultural areas. In addition, burning trees liberates carbon from their woody tissues added to the atmosphere as CO₂, and other gases which contribute to the greenhouse effect (FAO, 1994).

Unfortunately, as can be seen from the table below, countries of the region have no systematized information on the number of hectares or type of vegetation or the level at which ecosystems are affected. In general statistics are maintained only for those fires which have been fought. It is common to find in reports of those countries which attempt to keep records references which warn that forests do not disappear as a result of forest fires, but their growth and development within the natural conditions of their ecosystems are hindered. This manifestly limited vision of the forest sector recognizes the effect of fires neither on local flora and fauna nor on the health of local communities. It is only concerned with the standing trees which, because of their adaptability, resist the impact of the fire to a certain degree.

It is necessary for forest authorities to assume responsibility for the design and implementation of information systems which register reliable data on the impact of fires on forest ecosystems of each country and at the same time take preventive measures. These should center on education, legislation and the availability of resources for fire prevention and fighting and the contracting and training of appropriate human resources.

Belize	nd	nd	nd	nd	nd	nd	nd
Guatemala	nd	nd	nd	nd	nd	nd	nd
El Salvador ¹	nd	nd	nd	nd	3,967	3,967	7,934
Honduras ²	17,650	53,000	64,568	29,973	98,085	92,614	355,890
Nicaragua ³	nd	nd	50,483	41,102	26,757	24,467	142,809
Costa Rica	9,761	4,150	2,218	2,995	6,219	1,747	27,090
Panama ⁴	nd	nd	nd	nd	nd	2,066	2,066
Central America	27,411	57,150	117,269	74,070	135,028	124,861	535,789

Source: Proceedings 1st Central American Meeting on the Prevention and Control of Forest Fires, IUCN-ORMA, MINAE-SINAC, USAID-OFDA, CCAB-AP, Costa Rica, September 1995.

Notes:

1. The existing report refers to 53 fires over the 1994-95 period;
2. According to Honduras' report to the 1st Central American Meeting on the Prevention and Control of Forest Fires, the number of fires which enter the statistics only reflects those which have been fought. It is estimated that around 3,000 forest fires take place annually and affect an area greater than one million hectares;
3. MARENA, General Forestry Directorate, Forest Statistics Bulletin, 1992-1996, Managua, Nicaragua. Data for the years 1993-95 inclusive.
4. December 1995 -July 1996 report. nd = no data available.

Non-Timber Products

Non-timber forest products have been used in the region for thousands of years as food, medicine, in industry, in housing construction and for crafts. Nonetheless, the idea persists in the region that forests are solely a source of timber and the important contribution of non-timber products to local economies, and especially small farmers, is unappreciated.

In Guatemala the gum tree (*Manilkara achras*) is exploited and commercialized for its latex. Income from exports in 1991 reached US\$2 million, and it is responsible for the employment of 2,000 people on an annual basis. In 1989 the leaves of the Xate palm (*Chamaedorea* spp.) generated US\$3.5 million in exports, and provided direct employment to 4,000 people. In the same year the fruits of the pepper tree (*Pimienta dioica*) generated US\$550,000 and provided employment to 1,300 people (CONAP et al., 1996).

In Honduras the exploitation and commercialization of resin from coniferous forests provides the basis of

many small farmer economies (Box 3.7). In the Department of Santa Barbara the Yunco palm (*Cardulovica* spp.) is the second most important source of income; and in Ocotepeque local agro-industry depends on the exploitation of the Pacaya palm (*Chamaedorea* spp.) (Ocampo, R. et al., 1995).

In Nicaragua the wild herb known as Raicilla (*Psycotria ipecacuanha*) is exploited locally by communities bordering the San Juan river and the raw material is sought by pharmaceutical companies for its medicinal properties (Idem, 1995).

In Panama the indigenous Chocoos commercialize vegetable marble (*Phytelephas* spp.) in the form of crafts and clothing accessories (Idem, 1995).

Finally, in Costa Rica rubber latex (*Castilla elactica*) and the fibers of the shade palm (*Cardulovica palmata*) have been traditionally exploited. Other species of palm are used and commercialized for housing and luxury beach hotel construction (Idem, 1995).

Criteria and Indicators for Sustainable Forest Management

The road towards sustainable development demands real efforts. One of these is the application of criteria and indicators as useful tools designed to provide means to measure, estimate and demonstrate progress towards sustainable forest management (TCA, 1996).

The process of identifying and analyzing criteria and indicators for sustainable forest management represents a political commitment assumed by the countries of the region at the time of the Earth Summit, and more recently at the America's Summit held in Santa Cruz, Bolivia in December 1996. The following month a meeting took place in Tegucigalpa, Honduras, to define working mechanisms for the definition of a proposal for the identification of criteria and indicators at regional and national levels.

The term "Lepaterique Process" was coined in recognition of forest management efforts which have taken place in the Honduran community of the same name. It represents an initiative similar to other international ones such as the "Montreal Process", the "Helsinki Process", the "Tarapoto Process", the "Middle East Process" and the "Sub-Saharan Africa Process".

The proposal is summarized in Table 3.7, involves four criteria at the regional level and eight at the national level. Five criteria have also been proposed for the Forest Management Unit (FMU) level. Associated indicators (not shown) are also proposed for each of the levels (40, 53 and 41 respectively).

Table 3.7

Proposed Criteria for Sustainable Forest Management (“Lepaterique Process”)

Regional Level Criteria1	National Level Criteria1	Forest Management Unit (FMU)2 Level Criteria
<p>Criterion 1: Existence of a legal, policy, institutional, technical, economic and social framework which guarantees and promotes the sustainable forest management and conservation</p>	<p>Criterion 1: Existence of a legal, policy, institutional, technical, economic and social framework which guarantees and promotes the sustainable forest management and conservation</p>	<p>Criterion 1: A legal, policy, and institutional framework which favors sustainable forest management</p>
<p>Criterion 2: The conservation and maintenance of environmental services provided by ecosystems</p>	<p>Criterion 2: Forest cover</p>	<p>Criterion 2: Sustainable forest production</p>
<p>Criterion 3: Maintenance of productive capacity of forest ecosystem</p>	<p>Criterion 3: Health and vitality of the forests</p>	<p>Criterion 3: Maintenance of biological diversity within forest ecosystems</p>
<p>Criterion 4: Maintenance and improvement of the multiple social, economic and cultural benefits of forest ecosystems so as to meet the needs of different human groups</p>	<p>Criterion 4: Contribution of forest ecosystems to environmental services</p>	<p>Criterion 4: Soil and water protection</p>
	<p>Criterion 5: Biological diversity among the forest ecosystems</p>	<p>Criterion 5: Maintenance and improvement of socio-economic benefits at the local level</p>
	<p>Criterion 6: Forest ecosystems with productive functions</p>	
	<p>Criterion 7: Scientific and technological capacity for the development of forest resources</p>	
	<p>Criterion 8: Maintenance and improvement of the multiple social, economic and cultural benefits of forest ecosystems so as to meet the needs of different human groups</p>	

Sources: 1. CCAD, FAO, CCAB-AP. 1997. Report of the experts' meeting on Criteria and Indicators for Sustainable Forest Management. Tegucigalpa, Honduras, 20-24 January 1997; 2. CCAD, FAO, CCAB-AP. 1997. Proposal of Criteria and Indicators at the level of the Forest Management Unit (FMU) for Sustainable Forest Management. San Jose, Costa Rica, March 1997. 9 pgs.

Joint Implementation Initiatives

Joint Implementation refers to agreements by means of which an entity in a particular country partially complies with its commitment to reduce the level of greenhouse gases, compensating for some of its domestic emissions through financing projects in another country” (Figueres C. et al., 1996).

The concept of Joint Implementation originated in Article 3.3 of the FCCC which states that “Efforts to address climate change may be carried out cooperatively by interested Parties.” Article 4.2a also establishes that industrialized countries may carry out “policies and means (which limit anthropogenic emissions of greenhouse gasses) together with other Parties in achieving the objective of the Convention” (Figueres, C. et al., 1996).

Central America is one of the world’s most successful regions in the development of joint implementation projects. Although not all the countries have joint implementation offices the region has produced 12 project proposals: eight in Costa Rica, two in Honduras, one in Nicaragua and one in Belize. These proposals include energy and soil use projects.

Costa Rica’s joint implementation program was established in 1995 and Guatemala’s in 1997. However, Nicaragua, El Salvador and Honduras also have the beginnings of national programs.

Parallel initiatives have been developed, such as the creation of the Central American Council on Climate Change (see section on Atmosphere and Climate) the

objective of which is to promote the creation of national commissions on climate change, develop a regional information base, and promote regional and national projects which help countries implement their respective plans.

With the December 1994 signing of the Agreement between Central America and United States of America (CONCAUSA), the respective countries committed themselves to joint implementation projects. Later, in June 1994, with the signing of the Declaration of Intentions for Sustainable Development Cooperation and Means for Joint Implementation with the United States of America, the governments of Central America committed themselves to establishing national joint implementation offices with the aim of evaluating projects, backing pilot projects, designing monitoring and control methodologies and mechanisms for greenhouse gas emissions, and disseminating and promoting joint implementation activities among all civil society actors.

A Central American strategic plan for the capture and reduction of carbon emissions and for the establishment of the region’s joint implementation offices is currently being carried out by CCAD. Related to this, CCAB-AP and IUCN-ORMA are carrying out a training program in the use of the Land Use Carbon Sequestration methodology (LUCS) which is used for modeling carbon capture in a given region, based on soil-use dynamics.

Box 3.9

Joint Implementation and Rural Development

The first carbon emission compensation project was carried out in Guatemala in 1989 through a CARE agroforestry project together with the Applied Energy Service of Connecticut, United States of America which had a carbon-based generator. As this project came into being well before the creation of Central America's joint implementation program, it had no relation with governmental institutions.

The project was planned to be carried out over a 10-year period as a voluntary alternative to help small producers ensure the appropriate management of forest, soil and water resources. The project is being implemented through the establishment of tree nurseries, forest protection and management, and an increase in agricultural production through the application of agroforestry, soil conservation and other simple agricultural techniques.

Some of the activities contemplated include the development of 12,200 ha of forest plantations, 66,250 ha of agroforestry plantations, an implementation plan for fire fighters which will cover a total area of 19,200 ha and a series of soil conservation activities through tree plantations, terrace and ditch construction, live fences, and fertilizer trenches over an area of 8,600 ha to protect the soil from erosion and degradation and increase harvests in the forest and agroforestry systems.

The objective of these activities is to fix and store 15.4 million tons of carbon over a 40-year period, the amount corresponding to the quantity of carbon emitted by the Applied Energy Service's generator in the U.S.

The project has managed to involve a significant number of local people. More than 7,000 Guatemalan families, or approximately 49,000 individuals, have received benefits such as increased yields, protection against forest fires, improvements in the local environment and increased income, all of which have contributed to improving their quality of life.

A joint implementation project such as this, in addition to serving as compensation for carbon emissions and contributing to a reduction in greenhouse gases, can also provide significant social and environmental benefits through the resolution of technical problems in rural areas and a reduction in deforestation.

Source; Ingebrikt, A., 1997. Joint Implementation: a Sustainable Way to Reduce Carbon Emissions? M. Sc. Thesis, Aalborg University, Department of Development and Planning, Denmark. May 1996. 85 pgs.

Box 3.10

The Political and Financial Context of Forests

If the forest sector is seen from the traditional economic perspective its contribution is limited. However, there is a wide range of forests goods and services which are not taken into consideration. It is thus quite frequent for the forest sector not to be considered of importance to national economic development, and to be of low priority. This situation is reflected in the reduced political and financial support received.

Central American forests have considerable potential for the production of a wide range of goods and services, of which only a few are currently exploited, with the aggravating factor that only a part of production is considered in national accounting systems, giving the impression of a sector which is not very productive.

The lack of a forest culture in the region is a reflection of its history. Central America has been subjected to abrupt changes in production systems since colonial times. These broke the intimate relationship between forest resources and the region's indigenous populations. This forced introduction of agriculture resulted in the establishment of an idiosyncratic development model which considered trees and forests as an encumbrance to productive activities, and saw forest lands with potential for nothing other than agriculture.

Over the years this false image has remained well established in Central America, and is clearly manifest through the importance given to agro-exports as the main development model.

The image of the forest sector contributing little to economic development has reinforced the lack of a forest culture. This provides fuel for the misunderstanding that the forest sector offers few options for the development of national economies and ensures the perpetuation of agro-export as the most important development model. This situation is exacerbated by the fact that this model has more weight in political circles and results in a lack of political and financial support for the forest sector.

In addition to rendering political and financial support less attractive, the lack of negotiating capacity negatively affects the efficiency of the instruments, such as forest policies, sectoral planning and incentives, on which the forest sector depends. It is particularly important to mention that this poor negotiating capacity frequently results in the lack of articulation of forest policies with other sectors thus contributing to the lack of impact of forest policies which results in the under exploitation of productive potential.

The lack of political and financial support also causes the undermining of the sector's basic instruments resulting in institutional weaknesses, and the paucity of information makes impossible the financing of activities through incentives and forest credit schemes. The poor participation of important forest user groups in productive activities within the sector is also a reflection of the lack of political will to resolve problems such as land rights issues.

The under exploitation of productive potential refers both to timber and non-timber goods as well as to environmental services which are provided by forests. Nonetheless, the most obvious case is that of timber. In absolute terms the region produces very little roundwood and derivatives. If productive potential is considered, this situation appears particularly anomalous when taking into account the region's strategic location relating to the large timber consumer markets (Europe, North America, Japan). Also considering that much timber production is not accounted for, the image of the forest sector as one with few economic benefits is strengthened.

Source: Tuomasjukka, T. 1997. Síntesis del Estado del Sector Forestal en Centroamérica. CCAD, CCAB-AP, IUCN-ORMA, PFA. November 1997. Mimeograph. 47 pgs.

Advances to Date and the Future

Since the creation of CCPA in 1992 and CCAF in 1993 the region has promoted a process aimed at achieving sustainable forest development through the

implementation of a series of initiatives throughout the countries of the region, the most important of which include:

- 1- the updating of National and Regional Forest Sector Reviews (“Diagnósticos Forestales”) for 1996
- 2- study of restrictive policies, analysis of planning and international cooperation (“Revisando Cuentas en el Sector Forestal”)
- 3- forest policy studies
- 4- analyses of National Protected Area Systems (SINAPs) and the regional system
- 5- initiation of a process for the identification of criteria and indicators for sustainable forest management
- 6- syntheses of the state of the respective forest sectors

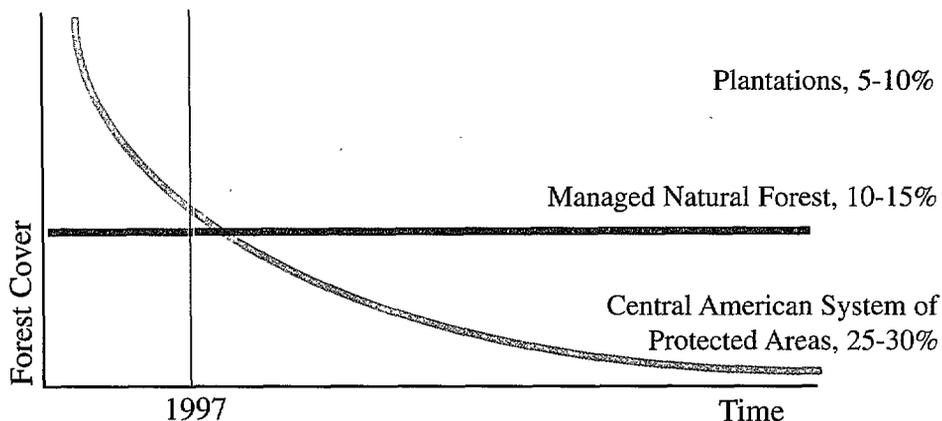
Tuomasjukka (1997) concludes that in order to try and change the traditional view of forests it is necessary to carry out activities at the regional level which should include:

- 1- promotion of environmental education with a strong forestry component so as to create a culture of sustainable forest use
- 2- seek political will so as to initiate processes aimed at solving land-holding problems
- 3- development and promotion of a new institutional concept in which convening power holds precedence, where appropriate information and monitoring and control mechanisms exist, and where social solutions oriented toward the development of the forest sector are facilitated.
- 4- evaluation of options and proposals for new schemes for the use of economic indicators in the development of the forest sector
- 5- promotion of the adoption of “green” accounting systems among the region’s governments
- 6- seek practical solutions for the payment of environmental services rendered by the forests
- 7- evaluation of the negotiating capacity of the forest sector with a view to developing strategies for its reinforcement
- 8- establishment of reliable registers of forestry statistics and of the movement of forest products in each country.

Figure 3.7 shows the vision of the future for Central American forests, on the assumption that from 1997 to 2025 the region has managed to maintain a forest cover of 25-30 per cent under protected area systems,

that plantations represent between 5 and 10 per cent of the total surface of Central America, and that managed forests represent between 10 and 15 per cent of the total area.

Figure 3.7 Forest of the Future



WILDLIFE

Wildlife is defined as all living plants, animals, fungi and microorganisms which live independently of human beings, as well as all living marine and continental species which are not cultivated or domesticated.

In spite of the relative abundance of endemic species in the region (Table 3.8) Central American wildlife is seriously affected and reduced mainly as a result of habitat loss and the overexploitation of resources, frequently aggravated by legal and illegal traffic in wildlife and its products (Table 3.9).

This traffic is mainly concentrated on species of traditional use such as iguanas, parrots, alligators, marine turtles, as well as orchids, bromeliads, song birds, toads, frogs, snakes, tarantulas, butterflies, sharks, lobsters, shrimps and mahogany wood, among others.

Obstacles affecting the control of traffic include limited institutional capacity, especially in the application of CITES on the part of the public sector; the control of trade in other species not covered by CITES, and greater poverty in rural areas which increases pressure on this resource.

Wildlife possesses more than just a high aesthetic and cultural value for Central Americans. Historically, this resource has been of considerable economic importance. Even so, little research has been carried out in the region with regards the distribution, ecology and biology of wild species, making estimations difficult on the current status of populations and the impact of their use.

The commercialization and use of wildlife has a long history and forms part of the economies of the countries of the region with the export of a diverse

Box 3.11

Knowing Biodiversity

The main means by which the National Biodiversity Institute (INBio) learns of Costa Rica's biological diversity is through the national inventory of species. To date the inventory has concentrated on four principal biological groups: plants, insects, mollusks and fungi. The objectives of the inventory are to gain a greater knowledge of biological diversity existing in 28 protected areas in Costa Rica, species' geographical distribution, how to locate a particular species for later use, and its economic, biological and natural history value.

This knowledge will contribute to improving its protection, use and management. The focus of the inventory has been changing so as to study specific taxonomic groups, interrelations between species and ecological relations.

This allows the gathering of pertinent information in support of biological prospecting, education, the production of publications, and the management and protection of conservation areas.

Source: INBio. Annual Report, 1996.

selection of species (orchids, birds, etc.) and sub-products (tortoiseshell, dried alligators, skins, etc.). In spite of the importance of wildlife trade, little research has been carried out on the economic value of these products, and there are no studies relating to the cultural and social value of species used in

communities. However, there is an interest in these aspects, and efforts are being made at the conceptual and methodological level to integrate not just the economic aspect into assessments, but also those which are related to quality of life improvements through species management and conservation.

Box 3.12

Breeding in Captivity as an Important Source of Protein

Since 1992 a small farming community in Cosigüina, Nicaragua, is raising green and black iguanas in captivity. A comparative study was carried out between this and another neighboring community without a similar project. It was found that understanding, subsistence, organization and the need to participate were areas in which there was a high level of satisfaction in the community where the iguanas were raised while these needs had yet to be satisfied in the other community.

The sale of iguanas continued until 1996 and the economic retribution was not so significant. Nonetheless, the community maintains considerable interest and motivation in continuing with this project which has allowed it to attain personal and collective goals.

Source: Gutierrez M., I. 1996. Aportes de un proyecto de manejo de vida silvestre a la calidad de vida de las poblaciones rurales: el caso de la Cooperativa Omar Bacca, Cosigüina, Nicaragua. Master's thesis. Turrialba, Costa Rica: CATIE.

The Legal and Institutional Situation

The following conclusions can be drawn regarding the legal and institutional situation concerning wildlife in Central America (Madrigal and Solis, 1993):

- As a resource, wildlife has not benefitted from a positive valuation. It has almost been treated with indifference in national development policies.
- Institutions charged with its management have limited their activities to the control of its exploitation, and specifically hunting and fishing.
- Public administration has not strengthened the bodies which deal with this resource. On the contrary, divisions – which cannot be justified on a technical basis – exist between marine and continental wildlife.
- There have been no adequate interrelations between academic and research institutions working in the area of wildlife, and public administration, with the state undertaking empirical activities with little scientific basis.

Costa Rica, Panama and El Salvador have general laws relating to wildlife (Madrigal, 1996) (Table 3.10). These focus on its management for conservation purposes, and include regulations on hunting and fishing as a means of using wildlife and also regulate other uses such as breeding in captivity, scientific collection and other activities such as the

import and export of wild species, the introduction of exotic species or taxidermy.

Disperse articles exist in Nicaragua and Guatemala within forestry regulations, protected areas and hunting laws of 1956 and 1960 respectively. However, the international treaties signed and ratified by the countries of the region also form part of national legal framework, which, in the case of wildlife – continental and marine – are numerous and provide quite comprehensive guidelines for the conservation of this resource.

What has been lacking in the region is the development of national legal frameworks in support of these international instruments. For example, the enforcement of CITES requires the establishment of internal procedures which allow the emission of export permits, certificates of origin and the naming of scientific and administrative authorities.

Although there is a legal framework in place, composed of national articles and international treaties, to provide the necessary elements for natural resource and wildlife conservation, no such provisions exist for other kingdoms such as those of the fungi and microorganisms. Central America is in its infancy regarding the development of legal

compliance and enforcement mechanisms, especially in the environmental field.

In the majority of cases the concept of wildlife reflected in legislation is limited to flora and fauna, and in the case of the latter, it refers mainly to higher vertebrates. This is understandable in that what is mainly regulated is sport hunting and fishing. This conceptual limitation has resulted in the lack of regulations covering lower species.

Jurisdiction over continental and marine wildlife is separated on all countries of the region. Marine wildlife is regulated in each country by a law on fishing and marine hunting which dates back to the 1950s. Its objective is the exploitation of marine resources, with a system for the granting of licenses necessary for legal fishing activities. In some cases fishing methods are regulated, but the type of control

is generally weak, as are the norms and policies established for the conservation of the resource.

The administrative organization relating to marine wildlife is much more complicated than its continental counterpart. Exclusive of whether the government body is centralized or decentralized, when governmental authorities relate to one sector of a resource without considering others in an integral manner, results include dispersion of resources, duplications and conflicts of interest.

The legal framework which regulates these resources should promote exploitation but, at the same time, guarantee their conservation. The role of the state is indispensable in ensuring an adequate control, but popular and traditional knowledge, practices and innovations of natural resource use should also be taken into account when planning.

Table 3.8
Species Status by Country

Country	Mammals				Birds				Higher Plants			
Belize	125	0	5	95	533	0	1	405	2,750	150	41	2,090
Guatemala	250	3	5	114	669	1	4	304	8,000	1,171	315	3,638
El Salvador	135	0	2	106	420	0	0	329	2,500	17	35	1,956
Honduras	173	1	5	78	684	1	4	308	5,000	148	55	2,252
Nicaragua	200	2	6	86	750	0	3	322	7,000	40	78	3,003
Costa Rica	205	6	8	120	850	7	10	496	11,000	950	456	6,421
Panama	218	14	11	112	929	8	9	477	9,000	1,222	561	4,618

Source: WRI, UNDP, UNEP, World Bank, 1996. World Resources 1996-97.

Table 3.9
Traffic of Wild Species and Their Products

Orchids	X			X			X		
Bromeliads	X			X			X		
Wild Palm	X								X
Mahogany Wood	X	X		X					X
Ferns	X		X	X					X
Corals	X		X					X	
Tarantulas				X			X		
Butterflies			X	X			X		
Mollusks			X	X	X			X	
Queen Conch	X		X					X	
Lobsters/Shrimps	X		X	X	X	X		X	
Land Crabs			X	X	X			X	
Shark				X	X			X	
Frogs				X			X		
Alligators			X	X	X				X
Iguanas (1)			X	X	X		X		
Iguanas (2)	X	X	X	X	X	X		X	
Other Lizards				X			X		
Snakes			X	X			X		
Freshwater Tortoises				X			X		
Marine Turtles	X	X	X	X	X	X		X	
Parrots		X		X	X			X	
Song Birds		X	X	X	X	X		X	

Source: Cornelius, 1996.

Table 3.10

Summary of Wildlife Legislation and Administrative Organization

Continental Wildlife

Legal Source:

Law on Protected Areas, Decree 4-89, January 10, 1989) and its regulation 759-90, August 22, 1990; General Hunting Law, Decree N° 8-70, February 10, 1970.

Competent Authority:

National Commission on Protected Areas holds authority over National System of Protected Areas and wildlife use and conservation. Regulates matters relating to hunting: areas, authorized arms, and prohibitions.

Legal Source:

Law on the Rational Exploitation of Fish Resources, Legislative Decree N° 1470, June 23, 1961; law regulating fish farming and fishing, Decree N° 1235, January 18, 1932.

Competent Authority:

Ministry of Agriculture and Livestock, regulates that relating to licenses, instruments, measures and fishing seasons; repopulations, conservation and propagation.

Marine Wildlife

Legal Source:

Wildlife Protection Act, 1981

Competent Authority:

Ministry of Natural Resources regulates wildlife conservation, restoration, development and use.

Legal Source:

Fisheries (Amendment) Act, 1987

Competent Authority:

Ministry of Agriculture grants licenses, permits and establishes fishing methods. Establishes specific regulations for the protection of certain threatened or endangered species.

Legal Source:

General Law on the Environment, Decree N° 104-93, June 30, 1993; Law of the Honduran Corporation for Forestry Development (COHDEFOR), Decree N° 13, January 10, 1974; Department of Protected Areas and Wildlife, Presidential Agreement N° 74-91.

Competent Authority:

COHDEFOR's Department of Protected Areas and Wildlife, declaring the conservation and management of flora and fauna to be of public interest.

Legal Source:

Fisheries Law, Decree N° 154, May 19, 1959

Competent Authority:

General Directorate of Fisheries and Fish Farming of the Natural Resources Secretariat which has as its objective the conservation, propagation, exploitation, commercialization and industrialization of river, freshwater and marine flora and fauna.

Legal Source:

Wildlife Conservation Law, Decree N° 844, April 14, 1994

Competent Authority:

National Parks and Wildlife Service currently part of the Ministry of the Environment and Natural Resources, declares wildlife a natural heritage of the nation.

Legal Source:

General Law on Fishing Activities, Decree N° 799, September 14, 1981

Competent Authority:

General Directorate of the Fisheries Development Center (CENDEPESCA) of the Ministry of Agriculture and Livestock. The objective of the law is to promote and regulate fishing and fish farming. Includes regulatory functions (permits, licenses) and conservation activities (research, training). Has not been adequately regulated.

Legal Source:

General Law on the Environment and Natural Resources, Decree N° 217, March 27, 1996; Hunting Law, Decree N° 56, August 23, 1956)

Competent Authority:

Ministry of the Environment and Natural Resources regulates the instruments relating to hunting, establishes the possibility of declaring hunting seasons, and prohibits the hunting of certain species. Natural resources declared national heritage.

Legal Source:

Special law on the exploitation of fish resources, Gaceta N° 32, February 7, 1961; Nicaraguan Fisheries Institute (INPESCA), Decree N° 1426, April 13, 1984

Competent Authority:

INPESCA establishes norms, coordinates, supervises, controls and implements state policy relating to fisheries activities.

Legal Source:

Wildlife Conservation Law, N° 7317, October 21, 1992; Regulation of Wildlife Conservation Law, Decree N° 22545-MIRENEM, August 30, 1993, reformed Decree N° 24342-MIRENEM, January 18, 1995.

Competent Authority:

General Wildlife Directorate of the Ministry of Environment and Energy establishes regulations on wildlife (excluding forest resources), regulates the enforcement of CITES and includes regulations on diverse management activities. Declares fauna as public property and flora as of public interest.

Legal Source:

Fisheries and Marine Hunting Law, N° 190, September 28, 1948, and its regulation, Decree N° 363, January 11, 1949; Law for the Creation of the Costa Rican Institute of Fisheries and Fish Farming (INCOPEPESCA) N° 7382, March 8, 1994.

Competent Authority:

INCOPEPESCA is an autonomous institution but of a public nature. It establishes conditions for the exploitation of fish resources, including rational use, aiming for greater economic returns and species conservation.

PANAMA

Continental Wildlife

Legal Source:

Wildlife Legislation, Law N° 24, June 7, 1995)

Competent Authority:

National Directorate of Protected Areas and Wildlife of the National Institute of Renewable Natural Resources. National Wildlife Commission constituted as advisory body. Wildlife declared natural heritage and its protection, conservation, and restoration to be of public interest. Carries out research, management and development of genetic resources and regulations included for in situ and ex situ conservation .

Legal Source:

Decree Law N° 17, June 9, 1959; regulated by Executive Decree N° 1, January 19, 1977

Marine Wildlife

Competent Authority:

National Directorate of Marine Resources of Ministry of Commerce and Industry responsible for development of fishing policy, research, exploration and exploitation of marine resources and the establishment of fishing seasons. Marine fauna considered as a renewable natural resource.

COASTAL AND MARINE CONDITIONS

Coastal Zone Characteristics

Central America has 6,603 km of coastline, representing about 12 per cent of total Latin American and Caribbean coastlines. Along its length can be found some 567,000 ha of mangroves, 1,600 km of coral reefs and 237,650 km² of continental shelf where many activities of economic and social importance take place. The region also has a potential Exclusive Economic Zone (EEZ) of 1.1 million square kilometers.

The Central American coast is characterized by numerous peninsulas, gulfs and bays which favor a high degree of physiographic diversity. Extensive intertidal zones and well developed coastal barriers exist around large coastal lakes.

Sea cliffs are absent from the Guatemalan Pacific coast, in El Salvador, Nicaragua, Honduras and Panama they are partially developed, and in Costa Rica highly developed ones are found. On the Caribbean side, the coast tends to be very flat and cliffs are nonexistent as a result of less drastic geological and geomorphological processes.

Nearly a quarter of the region's population is located along the coast which produces at least US\$750 million through fishing activities, provides work for over 200,000 people (Windevoxhel et al. 1997) and at least 250,000 people from indigenous communities live in coastal zones and depend directly on their resources.

Table 3.11
Biophysical and Demographic Characteristics of Coastal Zones

National territory (km ²)	22,965	108,889	20,935	112,088	118,358	50,900	77,082	511,217
Population 1994 (millions)	0.209	10.322	5.641	5.497	4.275	3.334	2.611	31.889
Population density 1994 (hab/km ²)	9.1	94.8	269.5	49	36.1	65.8	33.9	62.4
Population in coastal marine zones (%)	39.0	26.0	13.0	15.0	24.0	7.0	50.0	21.6
Length of coastline (km)	250	403	307	844	923	1,376	2,500	6,603
Ratio coast/territory	0.01	0.003	0.01	0.007	0.008	0.03	0.03	0.01
200 mile continental shelf (km ²)	8,250	12,300	17,800	53,500	72,700	15,800	57,300	237,650
Exclusive Economic Zone (km ² x 000)	nd	99.1	91.9	200.9	159.8	258.9	306.5	1,117.1
Mangroves (ha)	11,500	16,000	26,800	145,800	155,000	41,000	170,800	566,900
Coral reefs (km)	474	1	1	364	455	2.5	320	1,617.5
Surface drainage Pacific (%)	0.0	21.0	100.0	18.0	10.0	53.0	69.0	39.0
Surface drainage Caribbean (%)	100.0	79.0	0.0	82.0	90.0	47.0	31.0	61.0

Source: Windevoxhel, Rodriguez and Lahmann, 1997

Central America possesses eight percent of the world's mangroves and the second largest coral reef with an extension of 1,600 kilometers. These special coastal characteristics are responsible for tourism – one of the region's most important economic activities – being focused in these areas.

In the region there are approximately 110 protected areas along with another 65 associated protected areas. The high number of protected areas in the

region provide protection to a representative array of the most important coastal ecosystems, despite the need for a revision of categories used and poor institutional coordination and physical presence required for their management. However, the lack of information, limited technical and financial capacity, and a high degree of fragmentation in countries' development policies are also serious limitations to integrated coastal zone management.

International Context

As mentioned, the Central American coastal zone (CZ) is characterized by intense human activity and enormous ecological wealth where physical, biological, social, economic and cultural processes overlap and interrelate. One of the special characteristics of this zone is the considerable natural productivity of its ecosystems, a fact which holds particularly true in the case of tropical systems.

Agenda 21 dedicates a whole chapter to the sustainable management to oceans, seas and coastlines in recognition of the importance of coastal marine resources for social and economic development. The document stresses the relation which exists between sustainable development and marine coastal environments, and focuses on four main points:

- coastal marine environments form an integral system essential for maintaining life on the planet;
- coasts and oceans present economic and social opportunities for sustainable development;
- the United Nations Convention on the Law of the Sea (1982) establishes rights and responsibilities of States and constitutes the international basis for the protection and sustainable development of coasts and marine living resources; and

- given increasing rates of environmental loss and degradation, new approaches are required for coastal marine zones (at the sub-regional, regional and global levels) that are integrated, precautionary and anticipatory.

The most recent regional agreements which promote the sustainable and integral management of marine coastal zones include the 1997 agreement signed by the presidents of Mexico, Belize, Guatemala and Honduras in May of that year for the conservation of the Mesoamerican Reef System as an initiative to promote Caribbean marine resources of the region. In June of the same year Central American presidents approved the integration of coastal marine aspects into the Mesoamerican Biological Corridor as part of a strategy to be promoted by the Central American Commission on Environment and Development.

As signatories to CBD, Central American countries are committed to the integrated management and sustainable development of the marine coastal resources over which they hold jurisdiction. The signed text proposed the adoption of integrated policies and decision-making processes and suggests actions which allow States to strengthen their efforts in the management of coasts and oceans.

A Definition of the Coastal Zone

The coast is delimited by the interface between land and sea, while the concept of "coastal zone" refers to the space which delimits this interface. The basic definition of coastal zone indicates that it is the part of the land affected by its proximity to the ocean and that part of the ocean affected by its proximity to the land (US Commission on Marine Sciences, 1969). An extensive list of definitions of coastal zone can be found in the literature. Some of these are limited to the definition of physical characteristics and others include demographic aspects, ecological functions and geographical considerations.

Some countries, such as the United States of America, have divided their coastal zone according to the territorial unity which stretches from the limits of the EEZ to the terrestrial limit of climatic influences. Others, such as Costa Rica, have adopted a different focus, basing their coastal zone on arbitrary limits, from the level of the average low tide to 200 m inshore.

For the purposes of this document a broad definition of coastal zone, with a functional and flexible nature, will be used allowing the consideration of biological, biophysical, social and economic aspects as follows:

A coastal zone is understood to be the geographic space in which principal exchanges of matter and energy take place between marine and terrestrial ecosystems. Functional criteria are to be established for its delimitation according to the specific objectives of each individual case. (Windevoxhel, 1997)

Coastal Ecosystems of Greatest Importance

In general, Pacific coral reefs are less extensive and diverse than those of the Caribbean. Live coral formations have been described in El Salvador, Costa Rica and Panama; and Pacific coral communities are richer towards the south, in Costa Rica and especially in Panama, where at least 21 species have been reported.

In the Caribbean, on the other hand, coral reefs are to be found in every country, but with that of Belize standing out with its 220 km length and its atolls and other almost unique formations in the Caribbean Sea. Although some eighty species of coral have been reported along this coast, the exact number of species associated with them is unknown.

Mangroves exist along the whole coast, with nine species present in five frequent genera on the Pacific coast and four genera on the Caribbean side. Central American mangroves represent eight per cent of planet's total surface area of the mangroves and seven per cent of the region's natural forests. The most extensive mangrove systems on the Pacific side are found along the coasts of Guatemala, Costa Rica, Panama and in the Gulf of Fonseca.

Pacific mangroves maintain a lower biodiversity range associated with their root systems due to wider tidal variations with the roots of the trees remaining dry over longer periods of time due to low tides. In the Caribbean the largest expanses of mangroves are to be found in Honduras and Nicaragua.

While long sandy beaches, with a wide range of sand texture and color, characterize the Pacific coast, the Caribbean coast has beaches which are smaller due to current patterns and tide cycles, and other oceanographic and geomorphological reasons.

On this same coast there is a large number of islands and small islands. In Belize, the Cays; in Honduras,

the Bay Islands and Cochino Cays; in Nicaragua, the Miskito, Cisne and Maiz Cays; and in Panama, in Bocas del Toro and the San Blas Archipelago approximately 2,400 islands are to be found, the majority of which are associated with coral formations.

The Pacific coast, on the other hand, has few islands, with the exception of Panama which has two hundred. Small groups of islands exist in the Gulf of Fonseca, including Meanguera, Conchaquita and El Tigre. In Costa Rica the Gulf of Nicoya has a group of eight islands, and to the north the Murcielago Islands are to be found. Coco Island, located at a distance of 500 km off to the south west, marks the most distant point of land off the Central American region.

The previously mentioned physiographical variability is also reflected on the ocean floor. For example, the Mesoamerican Trench extends along the whole length of the Central American Pacific coast with a maximum depth of 6,662 meters. On the other side, the Cayman Trench in the Caribbean has a maximum depth of 7,680 m, with depths of up to 2,000 m off Belize.

The greatest upsurges of oceanic waters in the region occur off the gulfs of Panama and Papagayo in the Pacific. These are caused by seasonal winds in the Caribbean which push waters out to sea causing the upsurge of colder and more nutrient-rich waters.

As is typical in tropical seas, in the Caribbean there is little mixing of surface waters with deeper, cooler and more nutrient-rich waters. For this reason open seas demonstrate a low level of primary productivity. The greatest Caribbean wealth, in terms of productivity, is associated with the presence of coral reefs, mangroves and other important ecosystems upon which regional fish stocks depend.

Coastal Activities and Resources

Population

Approximately 21.6 per cent of the region's population lives on the coast, in population units which range from small fishing villages to cities in the case of Panama and Belize. The majority of coastal inhabitants, however, are found in rural areas where the availability of basic services (health, education, drinking water, sanitation) is limited and quality-of-life conditions are critical. Population distribution is linked to past development patterns where the emphasis on agriculture, promoted in the majority of

the countries of the region, formed the basis of economic development.

Traditional coastal cultures are absent in Central America with the exception of some indigenous communities, especially in the Caribbean. The most important ones are the Garifuna, Miskito and Kuna ethnic groups with distinctive social, cultural and historical characteristics and a total population of at least 250,000 people.

Environmental problems associated with coastal population centers in Central America include:

- coastal water contamination due to the lack of treatment plants for waste waters
- the modification of habitats, critical for the maintenance of fish stocks, wildlife and other human activities such as tourism and fish farming, for housing and commercial activities
- the development of inappropriate or poorly designed coastal infrastructure which promotes and accelerates erosion processes or the exposure of populations to natural risks
- disorganized spatial distribution which prevents public access to beaches and other national lands
- inappropriate solid waste management which increases pollution processes and affects public health
- inadequate use of local resources for building materials, such as sand, coral and wood from neighboring wetlands, and social and cultural displacement of native populations belonging to minority groups

Tourism

Tourism is considered as a priority activity by most of the governments of the region. In Belize it is the most important income generator and one of the most important ones for Costa Rica (28.2% of total exports). At the regional level income from tourism represented 20.4 per cent of regional exports of goods (WTO, 1994). In 1993 it was estimated that more than 2.3 million tourists visited Central America, generating some US\$1.16 billion (Table 3.12). The majority of tourists come from North America and Europe. Over the 1983-1993 ten-year period, the average annual rate of growth in income from tourism

in the region was 10.3 per cent, with hotel capacity doubling during this time. (WTO, 1994)

The current strategies for tourist development in Belize, El Salvador, Honduras, Nicaragua, Costa Rica and Panama are oriented towards coastal zones. Development of the sector could be optimized through the integrated management of MCZs through the protection and restoration of regional environmental conditions; the participation of local communities in the benefits generated by tourism; and the improved spatial management of distinct activities which are currently undertaken in these zones.

Environmental problems generated by tourism in the MCZs include:

- lack of compliance with national legislation in coastal zones
- increases induced in the cost of land/property (speculation with the displacement of local populations or causing restrictions in the carrying out of other activities)
- generation of intersectoral conflicts (e.g., small fisherman vs. sports fishermen, farmers vs. tourist operators, commercial marine transport vs. cruise operators)
- disordered development of infrastructure with high socioeconomic costs
- lack of planning for solid and liquid waste management and for the provision of basic services to populations who attend to tourists
- construction of tourism infrastructure in locations which promote erosion and interrupt basic ecological processes (especially in the case of hotel construction on beaches)

Table 3.12
Comparative Conditions of the Tourist Sector, 1993

Number of tourists (x 000)	248	565	264	225	170	625	293	2,390
Variation compared to previous year (%)	0.4	4.44	-15.92	-2.17	14.38	20.79	0.69	3.23
Foreign currency income (millions of US\$)	108	260	41	32	26	441	208	1,116
% of GDP, 1992	24.49	2.37	0.77	1.08	1.2	6.84	3.57	5.76
% of exports, 1992	76.6	22.97	8.21	2.99	9.25	24.76	40.59	26.5
% of imports, 1992	39.56	9.87	2.89	2.24	2.63	17.63	10.25	12.15
More than 50% of activity in MCZ	Yes	No	No	Yes	Yes	Yes	Yes	Yes

Source: Windevoxhel, Rodriguez and Lahmann, 1997

Fishing and Fish Farming

Living marine resources provide an important source of protein and are of commercial and economic importance for the region (Table 3.13). Fishing generates approximately US\$750 million annually, provides approximately 200,000 jobs and contributes to the upkeep of local communities and indigenous populations.

In the Caribbean, lobster and conch production has fallen considerably, and in Belize alone there has been a seventy-five per cent drop over the last 15 years.

In the Pacific the capture of shrimp per unit of effort has also dwindled. For example, in El Salvador a

catch of 305 kg/hour of trawling was the norm in 1958, while by 1984 catches had been reduced to just 4.5 kg/hour. This situation indicates a need for fisheries management frameworks for the region which would maintain current fishing efforts but also ensure sustainable economic and social benefits.

Such a framework could help provide solutions which would safeguard the considerable public and private investments in the sector as well as maintain environmental conditions at acceptable levels so as to also protect investments in other sectors such as tourism, fish farming and conservation in general.

Table 3.13
Comparative Conditions of the Fishing Industry, 1991

Total capture 1991 (mt x 000)	1.6	6.7	11.3	21	5.7	17.9	147
Fish exports 1991 (millions of US\$)	5.6	15	14.5	59.8	18.1	61.6	74.8
Capture in coastal zone (mt x 000)	1,600	nd	7,000	10,100	nd	nd	122,600
Contribution of coastal zone to total capture (%)	100	nd	61.95	48.1	nd	nd	83.4
Number of commercial vessels	nd	50	109	350	164	73	230
Number of small fishing vessels	700	nd	nd	nd	nd	2,800	nd
Number of small fishermen	3,000	nd	17,200	nd	nd	14,000	7,500
Direct employment (number of individuals)	nd	nd	nd	15,000	5,300	15,000	2,000
Indirect employment (number of individuals)	nd	nd	nd	nd	1,250	nd	nd
Catch reduction 1986-1991 (%)	0	nd	50	0	nd	nd	50
Main fishing ports	1	3	3	3	6	4	3

Source: Windevoxhel, Rodriguez and Lahmann, 1997.

Note: nd = no data available.

Several species of fish are being cultivated for commercial purposes in coastal zones, including tilapia, bivalves and crustaceans. The most important from the economic, social and environmental aspects is the cultivation of white shrimp (*Penaeus* sp.). With a net water surface area of 25,900 ha, Central America produced a total of 23,000 mt of white shrimp in 1991. Around 93 per cent of production goes to the US market, although some also goes to Europe. During this same year production in the region

represented 3.13 per cent of world shrimp production and it is expected to rise over the next years. Seventy per cent of the region's production comes from Honduras and Panama. The Gulf of Fonseca, as a productive unit, represents fifty-two per cent of the region (Table 3.14). At least ninety per cent of the region's shrimp farms have been built over mangroves and neighboring ecosystems. This has resulted in their destruction and/or fragmentation and damage to neighboring ecosystems such as estuaries.

Fish farming is responsible for a variety of environmental problems some of which are:

- the destruction of critical habitats (mangroves, estuaries, salt marshes, among others) which provide the basis of other activities of economic and social importance, such as tourism and fishing
- the destruction of populations of other species of economic and ecological importance as a result of the post larval collection of wild shrimp
- a reduction in the quality of marine water as a result of organic pollution of lagoons with a considerable loss to associated economic activities
- land speculation
- losses in environmental quality of production sites which promote diseases on the farm
- the lack of spatial and economic planning
- the concentration of wealth and resources in the hands of small groups of investors which generates local and transfrontier social conflicts

Table 3.14

The State of White Shrimp (*Penaeus* sp.) Farming, 1994

Area under production (ha)	520	2,000	400	14,900	4,529	659	4,899	27,907
Gross production (mt)	596	2,863	493	10,500	909	1,582	6,125	23,068
Percentage of production exported	82	92	95	93	95	95	95	92
Percentage of world production	0.08	0.39	0.05	1.43	0.12	0.22	0.84	3.13
Gross production potential (ha)	nd	2,000	8,000	25,780	39,250	5,000	9,000	89,030
Percentage of potential used	nd	100	5	57.8	6.44	13	54.43	39.45
Number of companies	6	40	2	40	22	3	53	166
Number of cooperatives	0	0	nd	1	36	0	0	37
Number of postlarvae laboratories	1	1	2	9	0	1	7	21
Incidence of Taura Syndrome	No	Yes	Yes	Yes	Yes	No	No	Yes
Wild postlarvae catch	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Source: Windevoxhel, Rodriguez and Lahmann, 1997.

Note: nd = no data available.

Agriculture

As indicated in the section on land use, some of the region's richest soils are to be found on the coastal plains. The soil quality together with a fairly regular topography renders these plains important sites for high yield agricultural activities. With the exception of Belize, all countries of the region depend primarily on agricultural exports for the generation of foreign exchange. According to IDB (1994), 66.21 per cent of the region's exports are from the agricultural sector.

Banana, pineapple, sugar cane, melons, citrus, rice, sorghum, coconuts, African palm and beef cattle are among the main foodstuffs produced along Central America's coasts.

Agriculture has spread in a disorderly manner in the region. With the exception of Belize and some parts of Mosquitia, the agricultural frontier has gone beyond the natural limits of soil use for agriculture and has resulted in soil deterioration as a result of erosion. In El Salvador, for example, the natural vegetation along

the coast has completely disappeared (with the exception of mangroves) to make way for agricultural activities (MAG, 1996). The indiscriminate use of pesticides (the region has one of the world's highest per capita rates of pesticide use) has also enabled these chemicals to penetrate the coastal marine trophic chains, as, for example, in the Gulfs of Nicoya and Fonseca and elsewhere.

In spite of its relative importance, the contribution of agricultural activities in coastal zones has not been quantified in any of the countries. Likewise, the environmental and economic costs imposed by such activities on marine coastal productive systems and other human activities such as fishing, tourism, recreation and marine transport, have also to be ascertained. This is explained by the lack of importance traditionally attributed to coastal and marine areas and the limited planning efforts in the countries of the region.

Some of the most important environmental problems associated with agricultural and ranching activities are:

- pollution of run-off waters which eventually drain into the sea
- destruction of critical habitats such as coastal forests, mangroves, and other wetlands
- extraction of ground waters for irrigation which has resulted in saltwater intrusion
- increases in the natural sedimentation rate of coastal ecosystems
- conflicts with other actors in the zone, such as fishermen, tourist operators, protected areas and urban zones
- the invasion of public property

Coastal Wetlands

With a surface area of some 40,000 km², approximately eight per cent of Central America, the region's wetlands are to be found principally in coastal zones and in low inland areas. Given the land bridge status and the extreme variations in climate, altitude, latitude, geology and tidal fluctuations, Central America possesses some of the potentially most productive wetlands in the world. (Davidson and Gauthier, 1993)

The largest Central American wetlands are to be found on the coast along the Caribbean side due to the

region's particular hydrological and geomorphological conditions. Nonetheless, some important and dispersed wetlands can be found along the Pacific coast; although these are not as extensive as those which are found, almost uninterrupted, along the Caribbean coasts of Belize, Honduras and Nicaragua. Inland, important wetland areas are concentrated in the low lying rainforest areas of Peten and around the lakes of Nicaragua. In the rest of the region wetlands are scarce, and those which have not been drained generally consist of herbaceous swamps or low lying deciduous forests prone to flooding.

Among the most important freshwater wetlands are:

- the Darien flood systems
- the lake system of the Panama canal
- the SIAPAZ area, including the lakes of Managua and Nicaragua and the Caño Negro area of Costa Rica
- the San Juan river watershed
- the Caribbean flood plains of Nicaragua along almost their whole length
- the lake and flood plain systems of the Honduran mosquitia
- the lagoon systems of volcanic origin in El Salvador
- the flood plains of the system associated with Lake Izabal in Guatemala, including the mouths of the Polochic and Cahabon rivers, and the area of the river Dulce
- the inland wetlands of the La Pasion river and other associated plains in Guatemala
- the wetlands and swamps of the Belize coast

Pacific coastal wetlands are generally limited to a belt which extends between 5 and 10 km inland. These wetlands are found in areas of higher population density (Idem). Some of the most important Pacific wetlands are found around the Bays of Panama and Parrita, the Gulf of Chiriqui, the Bay of Montijo, Terraba-Sierpe, the Gulfs of Nicoya and Fonseca, the Bay of Jaquilisco, and the Barras of Santiago, Monterrico and Manchon. The majority of these sites are estuaries dominated by mangroves and are critical habitats for the reproduction of many species including some with a high commercial value (Table 3.14).

The Caribbean coastal plains, which extend inland for a distance of between 50 and 75 km, have large estuarine expanses and flooded forests. The largest areas of wetlands are to be found on the Honduran and Nicaraguan coasts in the Mosquitia, and of these the Caratasca wetland in Honduras, covering an area of approximately 3,700 km² is the largest in the Mosquitia. Other important wetlands along this coast include those associated with Lake Izabal and Rio Dulce in Guatemala, the San Juan river in Nicaragua, the Barra del Colorado in Costa Rica, and Bocas del Toro in Panama.

The following are some of the most serious problems affecting wetlands:

- drainage of the areas for agricultural and urban purposes
- forest clearance for construction materials, charcoal and firewood
- deforestation for shrimp farming and salt production
- disorganized tourist development schemes
- illegal hunting and over exploitation of wild species, including uncontrolled forest fires
- deterioration of higher parts of the watersheds which drain into wetlands causing siltation and high concentrations of solids in suspension
- pollution by agrochemicals due to intensive agricultural practices
- construction of dams and irrigation canals which modify the natural circulatory patterns of water and sediment load
- use of mangrove bark for the production of tannins used in the curing of leather

Table 3.15
Wetlands of International Importance

Country	Date	Wetland	Area (ha)
Guatemala	June 26, 1990	El Petén	48,372
Laguna del Tigre	April 25, 1995	San Marcos	13,500
Manchón-Guamuchal	March 20, 1996	Izabal	21,227
Bocas de Polochic			
Honduras	June 23, 1993	Atlántida	13,225
Barra de Cuero y Salado	March 28, 1995	Atlántida	78,150
Jeanette Kawas	March 20, 1996	Atlántida	11,200
Punta Izopo			
Nicaragua	July 30, 1997	Rivas/Rio San Juan	43,750
Los Guatuzos			
Costa Rica	December 27, 1991	Alajuela	9,969
Caño Negro	December 11, 1995	Limón	9,445
Gandoca-Manzanillo	March 20, 1996	Limón & Heredia	75,310
Humedal Caribe Noreste	December 27, 1991	Guanacaste	19,800
Palo Verde	June 9, 1993	Guanacaste	500
Tamarindo	December 11, 1995	Puntarenas	30,654
Térraba-Sierpe			
Panama	November 26, 1990	Veraguas	80,765
Golfo de Montijo	October 13, 1993	Darién	13,805
Punta Patiño	June 9, 1993	Bocas del Toro	16,414
San San - Pond Creek			

Source: Windevoxhel, Rodríguez and Lahmann, 1997.

Framework for Marine Coastal Management

Legal Aspects

On the whole, the legal framework for MCZ management is weak and diffuse. A sector focus pervades regional legislation and results in a fragmentation of responsibilities among those institutions which have jurisdiction these areas. The laws and regulations which allow for some level of management emphasize extractive practices (permits, quotas, levies, seasons, etc.) and lack the necessary technical elements for the sustainable management of

public resources. The fragmentation and lack of interinstitutional coordination has resulted in duplications, overlaps, gaps and contradictions in the control and planning functions relating to the use of marine coastal zones. To date, the only country which has a specific law covering MCZ management is Costa Rica (Law N° 6043 on the Maritime-Land Zone), although it has a very limited spatial extension recognizing a strip of just 200 m inland from the high tide mark.

Among the most important general weaknesses in regional legislation relating to integrated MCZ management are:

- fragmentation of institutional responsibilities
- lack of clear-cut definitions regarding rights to public property
- lack of an adequate spatial definition of MCZs
- involvement of civil society in MCZ management is not effectively defined
- obsolete sectoral laws
- existing legislation is lacking structure and is diffuse
- lack of general knowledge of existing legislation in both public and private sectors

Table 3.16
Relevant Legal Aspects in Marine Coastal Zone Management

Constitutional definition of MC resources	Yes						
Specific law on MCZs	No	No	No	No	No	Yes	No
General Law on the Environment	No	Yes	No	Yes	No	Yes	No
Law on integral management of natural resources	No						
Legal definition of MCZ	No	No	No	No	No	Yes	No
Sectoral laws on MCZ management	Yes						
Effective participation of civil society	No						

Source: Rodriquez and Windevoxhel, 1995.
 Note: nd = no data available.

Institutional Aspects

The disperse institutional framework for MCZ management is a reflection of its legal basis. In general, institutional responsibilities for MCZs are not entirely clear, for which reason many of them have to be interpreted by higher legal authorities. This causes problems of an administrative nature due to the

limited institutional capacity to keep up to date on such issues.

Municipalities or local governments of the region hold responsibility for resource management of MCZs within their jurisdictions. However, a lack of

economic and human resources hinders an efficient and effective management of these areas. The majority of municipalities limit their participation in MCZ management to the granting of permits for development projects and the charging of tolls and taxes for resource use.

Interinstitutional coordination is weak, a fact which has been recognized by the majority of governments.

As a general rule there are no effective mechanisms which permit the coordination of bodies which hold jurisdiction over the administrative and technical management aspects of marine coastal zones. The most frequent strategy employed in the region for the resolution of problems relating to interinstitutional coordination is the creation of ad hoc commissions. These are made up of members representing those institutions which have resource management responsibilities.

Among the principal institutional needs for the more effective management of marine coastal protected areas are:

- improve technical capacity in aspects relating to the management of MCZ resources
- increased participatory drafting of medium- and long-term MCZ resource management plans
- greater project implementation capacity
- more effective and efficient coordination structures
- identification of financial resources for the carrying out of assigned tasks
- establishment of environmental quality standards which allow institutions to be more effective in the monitoring of MCZ resources
- more effective and reliable processes to monitor MCZ resources
- greater communication between professionals in state entities working in similar fields

Box 3.13

Mesoamerican Caribbean Coral Reef System

The Mesoamerican Caribbean Coral Reef System (MCS) extends along the coasts of Mexico, Belize, Guatemala, Honduras with an extension of approximately 1,000 kilometers. It is considered to be the world's second largest coral reef system after that of the Australian Great Barrier Reef (CCAD, 1997b).

The initiative's aim is to bring together the efforts of these four countries so as to constitute one large protected natural area to ensure the conservation and sustainable development of the reef system at the regional level.

The western Caribbean coral reef system offers one of the planet's greatest and most viable opportunities for carrying out a multinational conservation project within an ecosystem of international relevance.

The MCS initiative aims to consolidate the region's sustainable development opportunities in the fields of tourism, fisheries, research and education, through the rational use and conservation of reef resources.

To do this it will be necessary to join the forces of coastal communities, private initiatives and those of the governments of Mexico, Belize, Guatemala and Honduras through the implementation of strategies in the following areas:

- establishment of protected natural areas
- regulations
- ecotourism development
- coastal management
- pollution prevention
- international financing
- compliance with international commitments
- training, scientific research and monitoring
- civil society participation

CONSERVATION MECHANISMS

Protected Areas (*In Situ* Conservation)

Ecoregions Represented in the Central American System of Protected Area (SICAP)

According to a World Bank study (Dinerstein et al., 1995) 22 ecoregions can be identified in Central America, of which half are considered to be in a critical state and the other half in danger of disappearing. Among these ecoregions are moist forests, montane forests, dry forests, pine forests, savannas, paramos and thornscrub formations. At least four different mangrove formations have also been identified as have a similar number of reef zones of great biological wealth. (McCarthy et al., 1997)

If a qualitative evaluation is made of this situation it is evident that the following ecoregions are the best represented:

- **moist forests** of the Peten, Guatemala[8] and of the Caribbean represented in Honduras, Nicaragua, Costa Rica[13]
- **flooded forests** of the Peten, Guatemala
- Talamancan **montane forests**[16], Costa Rica and in Panama
- **pine-oak forests**[102] found in Guatemala and Belize
- **Paramo**[136] of Chirripó, Costa Rica
- Darien **moist forests**[39], Panama
- Caribbean **mangroves** found in Honduras, Nicaragua, Costa Rica, and Panama

Those ecoregions which are relatively well represented include:

- Belizean **swamp forests**[12]
- Panamanian **moist forests**[15], Costa Rica and in Panama
- Central American **Pacific dry forests**[72], to be found in Nicaragua and Costa Rica
- **Miskito pine forests**[104] in Honduras and Nicaragua
- Gulf of Fonseca **mangroves** in El Salvador, Honduras and Nicaragua
- Yucatan **mangroves** found in Belize and Guatemala
- Southern **coral reefs** found off the coasts of Costa Rica and Panama.

Ecoregions which are hardly or poorly represented within the protected areas system include:

- Sierra Madre **moist forests**[10] of Guatemala and El Salvador
- Central American **montane forests**[11] to be found in Guatemala, El Salvador, Honduras and Nicaragua
- Costa Rican seasonal **moist forests**[14] in the Nicoya Peninsula
- **Balsas dry forests**[68] found in Nenton, Guatemala
- Panamanian **dry forest**[73]
- Bay Islands **pine forests** in Honduras
- **Savannas** of Peten, Guatemala
- Cuchumatanes **paramo** in Guatemala
- Motagua Valley **thornscrub**[68] in Guatemala

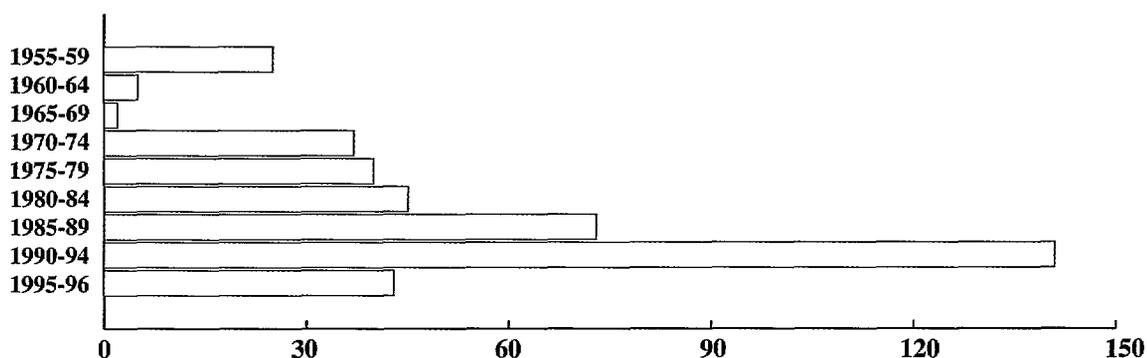
The numbers in square brackets [] correspond to ecoregion categories according to Dinerstein et al. The remaining ecoregions are those defined in McCarthy et al.

An Historical Perspective

The creation of protected areas in Central America dates back to the last century when in Guatemala in the year 1870 municipal areas were protected as natural forest under a special management regime for the production of forest products.

In 1923 Panama declared the Isla Barro Colorado a biological reserve; in 1928 Half-Moon Cay was declared a Crown Reserve in Belize; and in 1957 Costa Rica declared the inalienability and national park status of some mountains responsible for

Figure 3.8
Declaration of Protected Areas, 1955-96



Source: R. MC Carthy, A Salas, *Sistemas Nacionales de Áreas Protegidas de Centroamérica* UICN/ORMA, 1997

providing the central valley with water. (Ugalde and Godoy, 1992).

By 1959 four of the isthmus' seven countries had at least one protected area. In 1970 six countries had protected areas, and with the creation in 1987 of the Montecristo National Park in El Salvador, each one of the countries had a protected area within its territory.

The needs and opportunities to create protected areas have varied according to the country. In the 1950s and 1960s the tendency was towards the establishment of sites for recreation and observing natural environments, the protection of archeological sites and/or extraordinary natural resources. However, it was not until the 1970s that the recognition of the rapid deterioration of natural resources prompted the creation of protected areas. (Idem)

More recently the adoption of national and regional policies to slow biodiversity loss and general environmental deterioration, have constituted important motivating factors.

Central American System of Protected Areas

The Central American System of Protected Areas (SICAP) is made up of national protected area systems (NPAS) of the seven countries of the region, the main tool developed by the respective countries to

ensure the conservation and management of their natural resources. The Central American System is made up of 704 protected areas, of which 391 have been legally declared while 313 are at the proposal level (Table 3.17).

Another important recent factor is the awareness that different sectors of the population have gained regarding the importance of conserving and protecting natural resources in their respective countries. Nowadays, communities, NGOs and the private sector have now become active promoters of the creation of protected areas, and in some cases participate in their management.

As a result of this increase in consciousness of the need to conserve natural resources and of the importance of protected areas, from 1985 onwards protected areas were established at an accelerated rate. As can be seen from Figure 3.8 above, more than 50 per cent of these areas have been established since that year, and between 1990 and 1996 184 protected areas were declared.

Over the last 27 years (1969-1996) Central America's declared protected areas increased from 25 to 391, to cover the equivalent of 18 per cent of total territory (approximately 9.5 million ha).

Table 3.17
SICAP Declared and Proposed Protected Areas, 1996

Belize	54	24	78
Guatemala	48	57	105
El Salvador	4	121	125
Honduras	42	65	107
Nicaragua	75	21	96
Costa Rica	126	0	126
Panama	42	25	67
Totals:	391	313	704

Source: R. McCarthy, A. Salas. Sistemas Nacionales de Areas Protegidas de Centroamérica. IUCN-ORMA, 1997.

And although data are not available for all protected areas, whether declared or proposed, in all countries – with the exception of El Salvador – the percentage of protected territory is considerable (Table 3.18).

Table 3.18
Extension of Protected Areas, 1997

Belize	35.0	787	nd	nd
Guatemala	19.0 ^a	2,062 ^a	6.5	699
El Salvador	0.4 ^b	9 ^b	1.2 ^d	25 ^d
Honduras	9.6 ^c	1,070 ^c	3.5	395
Nicaragua	18.2 ^e	2,161 ^e	1.3	160
Costa Rica	30.5 ^f	1,559 ^f	0	0
Panama	26.0	1,967	0.7 ^g	57 ^g

Source: R. McCarthy, A. Salas. Sistemas Nacionales de Areas Protegidas de Centroamérica. IUCN-ORMA, 1997

Notes: a. Figures correspond to a total of 44 protected areas; information missing on four of them. b. 102 protected areas; information missing on 18. c. 37 protected areas; information missing on 8. d. 27 protected areas; information missing on 34. e. 74 protected areas; information missing on 2. f. 110 protected areas; information missing on 16. g. 11 protected areas; information missing on 14.

Although the efforts of countries have been considerable and it is recognized that the majority of ecosystems and ecoregions found in the isthmus are found within SICAP, it is also recognized that protected areas are suffering serious threats. These are related to a complex set of economic and social factors, among which are to be noted the advance of the agricultural and colonization frontiers, the expansion of large scale monocultures, the prevalence of unsustainable cultural patterns, increased poverty and population pressure.

At the same time the protected areas lack a series of resources making their management and control difficult and in many cases impossible. The lack of

personnel, insufficient funding, the lack of planning tools, little support from civil society and areas which are extremely small are some of the problems encountered.

One of the policies adopted by States in order to face the realities under which they have to operate is the establishment of "minimal or priority systems" which, in some cases, do not even cover the current number of declared protected areas.

This policy not only reflects the recognition by the respective States of their limitations, but it also presents and reinforces the need to incorporate and commit other sectors of the population to the administration and management of protected areas.

Table 3.19
Status of Protected Areas by Country

	Costa Rica	Guatemala	Honduras	Nicaragua	Panama	El Salvador	Total	
Number of legally declared PAs	54	48	4	42	75	126	42	391
Number in minimal system	7	31	46	33	8	126	67	318
Institutional presence	39	71	12	25	11	68	22	246
Number of private PAs	7	10	10	0	0	85	1	113

Source: R. McCarthy, A. Salas. Sistemas Nacionales de Areas Protegidas de Centroamérica. IUCN-ORMA, 1997.

Categories of Management and Sizes of Protected Areas in SICAP

The SICAP incorporates a wide diversity of categories – at least 20 – according to the country in which they are found. This situation has rendered the task of ensuring a coherence between the management objectives and the characteristics of the respective protected areas a difficult one.

Each NPAS has decided to use its own system of categories, these being the same, in some cases, as those used in national legislation. Efforts are currently underway to establish a uniform system of categories for the region which will provide a clearer panorama of the conservation objectives of the different protected areas.

Among SICAP's great variety of resources are to be

found 32 sites of international importance; 17 Ramsar sites, eight World Heritage Sites and eight Biosphere Reserves.

The areas that make up the NPASs are generally small, and these tendencies are reflected in the latest formal declarations. While protected areas of less than 10,000 ha increased by 23.4 per cent between 1992 and 1996, no areas greater than 50,000 ha were established over the same period.

According to figures for 387 declared protected areas, 33 per cent of them cover an area of less than 1,000 ha, 70 per cent are under 10,000 ha and only four areas exceed 500,000 ha (in Guatemala, Honduras, Nicaragua and Panama).

Environmental Education and Research

Although no SINAP has a program of activities in the research and environmental education (EE) fields, isolated initiatives have taken place. Throughout the region it is calculated that at least 101 protected areas have EE programs and 69 have informative sheets.

With regard to research, studies have been carried out by organizations external to the respective systems and with little control on the part of the State. Only Belize and Honduras claim to have updated lists of all research carried out in their protected areas.

Cultural Heritage

In addition to the 29 ethnic groups within SICAP, 144 areas have been identified as possessing Cultural

Heritage sites representative of Central America's history. The inclusion of 62 additional areas is also considered necessary due to their cultural importance.

Table 3.20

Cultural Heritage by Country

Belize	2	11	4
Guatemala	7	37	6
El Salvador	0	46	nd
Honduras	5	9	4
Nicaragua	0	nd	nd
Costa Rica	8	29	0
Panama	7	12	2
Central America	29	144	16

Source: R. McCarthy, A. Salas. Sistemas Nacionales de Areas Protegidas de Centroamérica. IUCN-ORMA, 1997.

Note: nd = no data available.

Coastal Resources and Cloud Forests

The geographic history of the region, its localization and its geological configuration have made Central America an appropriate place for a wide diversity of ecosystems, among which are coastal systems and cloud forests, and the conservation of which is of special importance for the region.

The Central American System of Protected Areas includes 152 sites protecting coastal resources, with

Nicaragua standing out among them with 65 per cent of its national protected areas system made up of this type of ecosystem.

With regard to cloud forests, SICAP includes 98 sites without considering those existing in Costa Rica. In Honduras these forests make up 98 per cent of the country's declared areas.

Protected Areas on National Borders

With the seven Central American countries situated on just 500,000 km², 36 protected areas are located on national frontiers. These frontier protected areas – 20 binational and one trinational – allow for transfrontier

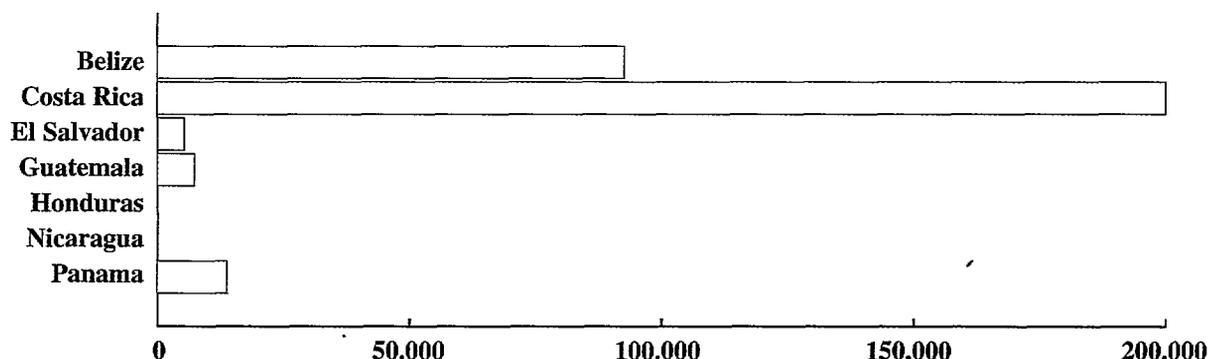
conservation efforts. These are of particular importance for the Mesoamerican Biological Corridor proposal which takes into consideration 31 of the frontier areas.

Private Protected Areas

The private management of protected areas in Central America has contributed to a greater or lesser degree to resource conservation in the different countries.

While 85 private protected areas (200,000 ha) exist in Costa Rica, and in Belize 132,436 ha are managed privately, this management option is lacking in other countries such as Honduras and Nicaragua.

Figure 3.9
Extensions of Private Protected Areas (hectares)



Source: R. MC Carthy, A Salas, *Sistemas Nacionales de Áreas Protegidas de Centroamérica*, UICN/ORMA, 1997

Institutional and NGO Presence

One of the most serious problems faced in the management of protected areas is the lack of personnel. Of SICAP's 704 protected areas, only 32.5 per cent (229 protected areas) have an institutional presence. It is important to stress that a presence in no way guarantees an adequate management of the area as in many cases there is only one person in charge. In addition, it is frequently not even possible to meet the basic needs of field personnel for the carrying out of their duties.

The distribution of personnel in many countries of the region does not reflect defined criteria regarding extension or management requirements (threats, hunting or illegal timber cutting). For example, in El Salvador the Montecristo National Park with an extension of 2,000 ha, has 42 wardens, while the Jocotal Lagoon of half the size, has only six wardens; and the San Carlos National Park has no wardens whatsoever to manage its 602 hectares.

Total State personnel available to SICAP amount to only 1,857 individuals, of whom 47 per cent are in Costa Rica, and the remaining six countries have only 993 individuals available to meet their management needs.

This scarcity of personnel means that responsibilities assumed by each employee are unrealistic. In taking into account the total extension of SICAP – and only considering those areas which are declared – in theory, each one of the 1,857 people would be responsible for 5,000 hectares. This problem is even more serious when one considers that only 88 per cent of personnel work in the field. Nonetheless, the decentralization process should have a beneficial effect on this situation. Although it would appear from Table 3.22 that the Salvadoran situation is more favorable, in reality the country has 125 proposed protected areas and of which only four have been officially declared; and of the total 78 per cent – or 98 areas – have an extension of less than 1,000 hectares.

Table 3.21
Protected Area Personnel

Belize	12	55	67	3.6
Guatemala	50	168	218	11.7
El Salvador	15	111	126	6.8
Honduras	14	152	166	8.9
Nicaragua	34	110	144	7.8
Costa Rica	79	785	864	46.5
Panama	18	254	272	14.6
Central America	222	1,635	1,857	100

Source: R. McCarthy, A. Salas. *Sistemas Nacionales de Areas Protegidas de Centroamérica*. IUCN-ORMA, 1997.

Management Planning

Planning as a regulating instrument has been little developed in the region. Of the total of SICAP declared protected areas (391) only 85 (21.7%) have

management plans, and of these many have not been implemented. In addition only 148 (38%) have operational plans and just 217 (55%) have plans for patrolling and fiscal control.

Table 3.22
Ratio of Field Personnel to Extension of Protected Areas

Belize	35,764
Guatemala	16,431
El Salvador	309
Honduras	10,803
Nicaragua	21,094
Costa Rica	2,053
Panama	7,965

Source: R. McCarthy, A. Salas. *Sistemas Nacionales de Areas Protegidas de Centroamérica*. IUCN-ORMA, 1997.

NGO Presence

The institutional presence in protected areas is being reinforced by the contribution made by different sectors of civil society. It is estimated that NGOs contribute with 234 staff to protected area management, 30 per cent of whom work in central offices of the State and 70 per cent in the field.

Participatory and Joint Management

The Central American countries have integrated different social civil society actors in the administration and management of protected areas. Approximately 68 participatory management experiences exist in the region involving NGOs, universities, local governments (municipalities), grassroots organizations such as indigenous groups and small farmers, as well as private enterprise.

The legal frameworks which support the participation of a variety of actors vary from country to country. These vary from national laws as in the case of the Mombacho National Park in Nicaragua, to agreements and letters of understanding. The last is

There are also opportunities which need to be maximized in the future through the greater integration and coordination with those sectors and actors directly involved with protected areas. Such is the case of indigenous organizations and small farmers. According to national data, 29 ethnic groups are represented in protected areas.

the most common procedure in the region. In spite of these precedents, to date no country has a national policy covering the joint management of protected areas.

An example of joint management in El Salvador are the Barra de Santiago Joint Use Areas. Their administration is shared between the National Parks and Wildlife Directorate (PANAVIS) and AMAR a nongovernmental organization. AMAR administers funds provided by the Americas Initiative Fund (FIAES), which are used to pay park wardens and technicians for the development of programs and activities in the protected area.

Table 3.23
Participatory Management Experiences

Belize	8
Guatemala	10
El Salvador	23
Honduras	17
Nicaragua	2
Costa Rica	1
Panama	7
Total:	68

Source: R. McCarthy, A. Salas. Sistemas Nacionales de Areas Protegidas de Centroamérica. IUCN-ORMA, 1997.

Technical Assistance and International Cooperation

Another important factor which has contributed towards protected area management in Central America is the presence of at least 33 international organizations through financial contributions and technical assistance. It is calculated that these organizations are currently collaborating in 70 of the region's principal projects. ... Approximately 111 protected areas and 10 conservation areas in Costa

Rica benefit from these efforts.

The economic contribution of this cooperation with the region exceeds US\$100 million, and Central American is currently negotiating 45 additional projects which involve one or more of the seven countries. Costa Rica is negotiating the greatest number of projects with 19 which are being considered by donors.

Typical Examples of On-Going Joint Management Agreements

- Research institute: Barro Colorado, National Monument, the Smithsonian Tropical Research Institute, Panama
- Municipalities: Yuscaran Biosphere Reserve, Municipalities of Oropoli, Guinope and Yuscaran, Honduras
- Neighborhood committee: El Pino National Park, Neighbors of the National Park, Guatemala
- NGO: El Imposible National Park, SalvaNATURA, El Salvador
- Community: Cahuita National Park, Cahuita Community, Costa Rica
- Indigenous community: Corregimiento de Nargara No. 1 Wildlife Area, Comarca Kuna Lala, Panama
- One organization managing more than one protected area: Tapir Mountain Natural Reserve, Bird Cayes, Blue Hole National Park, Guanacaste National Park, Half-Moon Cay National Park, Cockscomb Basin Wildlife Reserve, Crooked Tree Wildlife Reserve, Audubon Society, Belize

Tourism and Protected Areas

Tourism provides the greatest source of income to protected areas through the sale of services. Within SICAP 135 areas benefit from national and international tourism, and of these it is considered that 112 provide at least the minimal conditions required for attending the public, and 26 of these are marketed at the international level, not counting those of Costa Rica.

Costa Rica has the highest visitor rate, which shows a

steady increase in the use of protected areas for tourism. In 1992 tourism provided an income of US\$579,486 to protected areas, and in 1995 this figure reached US\$2,585,595.

Although in countries such as El Salvador, Honduras, Nicaragua, and Panama tourist activity in protected areas is still limited, their potential is recognized by all sectors involved for the direct and indirect generation of income.

SICAP Problems and Limitations

A summary is presented below of the principal problems and limitations relating to the Central American System of Protected Areas.

Global Problems

- Limited civil society involvement in protected area management
- Weak legal framework to allow for adequate involvement and shared responsibilities
- Current management policies do not satisfy socioeconomic and ecological expectations of the population (they have no defined socio-environmental role)
- Human resources are poorly trained for joint/participatory management
- Lack of follow up to agreements
- Focus has been on providing incentives mainly to NGOs and not to groups directly involved with resource use
- Social sectors have not received adequate training to allow them to undertake new ventures Inadequate Funding
- Institutional support does not respond to any strategic national policy
- State contribution does not even cover the operational costs of SINAPs
- Budgets are treated as “State secrets”
- Few protected areas generate their own resources, and the few resources which are generated are not reinvested in the development of the protected areas
- The socio-environmental value – of goods and services – of protected areas is not recognized
- Funds managed by other sectors cannot be optimized due to the lack of national strategies

Land-Use Conflicts

- The agricultural frontier has already moved into protected areas
- National land holding problems are expected to be solved to the detriment of protected areas
- State lands have not been officially titled in the name of SINAP
- The majority of protected areas lack defined limits in the field and in some cases do not even exist in decrees
- National land use policies are at odds with protected area requirements Deficient Policies and Legislation Inconsistent with the Needs of the SINAP
- Laws drafted without taking into account technical aspects or consulting involved sectors
- Lack of regulations for implementing the laws
- Other legislation and the power and capacity of local governments and grassroots organizations not exploited (a lack of coordination)

Lack of Strategies for Training

- Training has been focused on the public sector and certain professional levels
- Training is given according to the supply of courses and is not geared to demand
- The cost of traditional training is high
- Training has been oriented towards a “hands off” pattern, rather than sustainable use Limited Management
- The majority of protected areas have no institutional presence
- Serious disproportion between available staff and areas to be covered
- Lack of basic equipment for field work
- Management tools lacking (management plans, annual operational plans, patrol and surveillance plans)
- Nonexistence of effective decentralization in management and administration
- Few PAs can count on the necessary support of interdisciplinary teams
- No strategy has been developed for the exchange of experiences between countries and PAs
- No tradition exists for the evaluation and follow-up of management experiences

Lack of Knowledge of Existing Natural and Cultural Resources

- The State is incapable of promoting research for managerial ends
- Lack of coordination and follow-up of research undertaken, and clear research policies
- SINAPs have not defined action strategies or priorities oriented towards the solution of their main needs
- Other national sectors have not been provided with incentives necessary for joint action
- Local knowledge has not been exploited as a contribution to PA management Lack of Coordination Between Regional Projects and the SINAPs
- SINAPs see regional projects as external actions and not as potential contributors to resolving their problems
- Agendas of regional projects are developed without consideration for real needs of SINAPs
- SINAPs feel that regional projects and initiatives result in additional responsibilities
- SINAPs and their projects have not developed mechanisms for the smooth flow of information

Zoos, Botanical Gardens and Germplasm Banks (*Ex Situ Conservation Mechanisms*)

The long term maintenance and conservation of natural resources, as an essential part of biodiversity, is vital for the region's development. The creation of protected areas, as a means to ensure in situ conservation, is perhaps the best way to ensure their survival.

However, the region has made some important efforts in the development of complementary ex situ conservation initiatives (Table 3.24), i.e. those which conserve species outside their natural habitats, in the form of zoos, botanical gardens, germplasm and/or seed banks.

It can be seen from the following table that zoos and botanical gardens are present in each country. The important role of private enterprise in ex situ conservation mechanisms is also to be noted.

With regard to germplasm and seed banks, it is worth stressing that the majority of pine plantations in Venezuela and other South American countries have been established with seeds from Honduras; and the fact that trade in seeds of forest species is currently an important business is an indication of the commercial viability of such enterprises.

Table 3.24 *Ex Situ* Conservation

Belize

Belize Zoo

Guatemala

- Aurora Zoo
- Quetzaltenango Zoo
- Santo Tomas de Castilla Zoo
- Petencito, Municipality of Flores
- Escuela de San Carlos & Peten University Center
- ARCAS Rescue Center

- Chapin Autosafari
- National Workers Recreational Institute (INTRA) Zoo
- Collections Hotel Coban, Casa Presidencial de Santo Tomas. Mariana Aviary (parrot breeding); Park Hotel; Coban, Alta Verapaz. Collection of wild turkeys (Santiago Billy). Other collections registered with CONAP •

El Salvador

- National Zoo

Honduras

- Metropolitan Zoo

Some small ones

Nicaragua

- Edgar Lan National Zoo
- Chontales Zoo

Costa Rica

- Simon Bolivar National Zoo

- Zoo Ave, Alajuela
- San Ramon Zoo
- Gaia Garden, Quepos
- La Marina Zoo

Panamá

- Summit Zoo
- Justo Arosemena Institute

- El Nispero, Valle de Aton

Herbarium and
Departments of Forestry &
Agriculture

CECON
• Botanical Garden, School
of Biology, University of
San Carlos

• CECON
• National Forest Institute
(INAB)

• Private collections of
bromeliads & orchids
registered with CONAP

La Laguna Botanical
Garden

CENTA-MAG

• Department of Biology,
National University
• Herbarium of the Pan-
American Agricultural
School

• Seed bank, School of
Forest Sciences.
• Germplasm bank in
Ceiba

• National Herbarium,
UCA
• National Herbarium,
UNAN-Leon (in process)

• Ministry of Agriculture
seed bank

• National Herbarium
• Costa Rican National
Museum
• El Naranjo, Golfito
• National University

• Summit Botanical Garden

• Wilson Botanical Garden,
San Vito
(Organization for Tropical
Studies)

• Seed banks of forest
species
• CATIE seedbank

• Center for Molecular
Biology, University of
Costa Rica
• INBio collections
• CATIE-EARTH bank

• Smithsonian Institute

• INRENARE bank
• Training Center for
Renewable Natural
Resource Management

ACRONYMS

A

ACCC	Central American Agreement on Climate Change
ALIDES	Central American Alliance for Sustainable Development
AMAR	Amigos del Arbol, El Salvador
ASLAP	Panamanian Association for Environmental Law
ASOCODE	Association of Small Farmer Organizations for Cooperation and Development
ASOREMA	National Association of Natural Resource, Ecological and Environmental NGOs, Guatemala

B

BIELPO	Belize Institute for Environmental Law and Policy
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C

CABEI	Central American Bank for Economic Integration
CAPRE	Regional Coordinating Committee on Drinking Water and Environmental Health Institutions of Central America, Panama and the Dominican Republic
CATC	Central American Tourist Council
CATIE	Tropical Agricultural Research and Training Centre, Costa Rica
CBD	Convention on Biological Diversity
CCAB	Central American Council on Forests
CCAB-AP	Central American Council on Forests and Protected Areas
CCACIF	Coordinating Committee of Agricultural, Commercial, Industrial and Financial Associations, Guatemala
CCAD	Central American Commission on Environment and Development
CCAP	Central American Council on Protected Areas
CCCC	Central American Council on Climate Change
CECON	Center for Conservation Studies, University of San Carlos, Guatemala
CEDAPRODE	Center for Environmental Law and Development Promotion, Nicaragua
CEDARENA	Center for Environmental Law and Natural Resources, Costa Rica
CEMAT	Mesoamerican Center on Technology Studies, Guatemala
CEMDA	Mexican Center for Environmental Law
CENDAH	Honduran Environmental Law Center
CENDEPESCA	Fisheries Development Center, El Salvador
CENTA	National Center for Agricultural Technology, El Salvador
CICAD	Interparliamentary Commission on Environment and Development

CICAFOC	Small Farmer Indigenous Coordinator of Community Agroforestry
CITES	Convention on International Trade in Endangered Species of Fauna and Flora
CNE	National Emergency Commission, Costa Rica
COABIO	Advisory Commission on Biodiversity
COHDEFOR	Honduran Corporation for Forestry Development
CONABI	National Biodiversity Commission
CONACYT	National Council on Science and Technology, El Salvador
CONAMA	National Commission on the Environment, Guatemala
CONAP	National Council on Protected Areas, Guatemala
COP	Conference of the Parties
CORBANA	National Banana Corporation, Costa Rica
CRRH	Regional Committee on Water Resources
CURLA???	Honduras (XXXannex 2)

D

DGAP	General Directorate of Protected Areas, Nicaragua
DGRNR	General Directorate of Renewable Natural Resources, El Salvador

E

EARTH	EARTH College, Costa Rica
ECLAC	Economic Commission for Latin America and the Caribbean, United Nations
ECOSAL	Central American Conferences on Ecology and Health, PAHO
EE	environmental education
ENSO	“El Niño” Southern Oscillation

F

FAO	Food and Agriculture Organization of the United Nations
FCCC	Framework Convention on Climate Change, United Nations
FEDEPRICAP	Federation of Private Enterprise for Central America and Panama
FIA	Foundation for Agricultural Research, Honduras
FIAES	Americas Initiative Fund
FMU	forest management unit
FOCADES	Central American Fund for Sustainable Development
FSC	Forest Stewardship Council
FTPP	Forests, Trees and People Programme, FAO
FUNDASALDA	Salvadorean Foundation for Environmental Law
FUSADES	Salvadorean Foundation for Economic and Social Development

G

GDP	gross domestic product
GEF	Global Environment Facility
GTZ	German Agency for Technical Cooperation
Guatel	Guatemalan telecommunications company

I

ICAITI	Central American Institute for Research and Industrial Technology
ICED	Interparliamentary Commission on Environment and Development
ICO	International Coffee Organization
ICTA	Institute of Science and Technology, Guatemala
IDB	Inter-American Development Bank
IDEADS	Institute for Environmental Law and Sustainable Development, Guatemala
IICA	Inter-American Institute for Cooperation on Agriculture
INAB	National Forest Institute, Guatemala
INBio	National Biodiversity Institute, Costa Rica
INCOPESCA	Costa Rican Institute of Fisheries and Fish Farming
INPESCA	Nicaraguan Fisheries Institute
INRENARE	National Institute for Renewable Natural Resources, Panama
IUCN	World Conservation Union

L

LUCS	land use carbon sequestration
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M

MAN	Nicaraguan Environmental Movement
MARENA	Ministry of Environment and Natural Resources, Nicaragua
MARN	Ministry of the Environment and Natural Resources, El Salvador
MASICA	Programme for Environment and Health in the Central American Isthmus,
PAHO	
MBC	Mesoamerican Biological Corridor
MCS	Mesoamerican Coral Reef System
MEDE	Ministry of Economy and Development, Nicaragua
MERCOMUN	Central American Common Market
MINAE	Ministry of Environment and Energy, Costa Rica (formerly MIRENEM)
MIRENEM	Ministry of Natural Resources, Energy and Mines, Costa Rica (replaced by MINAE)

N

NCCC	National Commission on Climate Change
NCSO	National Council for Sustainable Development
NGO	non governmental organization
NSPA	National System of Protected Areas

O

ODS	ozone depleting substance
ORMA	Regional Office for Mesoamerica, IUCN
OTS	Organization for Tropical Studies

P

PAANIC	Environmental Action Plan for Nicaragua
PACASADHS	Central American Action Plan on Health and Environment in Sustainable Human Development

PAFT-CA	Central American Tropical Forest Action Plan
PAHO	Pan American Health Organization
PANAVIS	National Parks and Wildlife Directorate, Panama
PARLACEN	Central American Parliament
PCCC Central	American Climate Change Project
PFA	Agricultural Frontier Program
PRISMA	Regional Program for Research on Society and Environment
PROAGUA	Project for the Conservation of Water Resources and the Monitoring of Water Quality
PROARCA	Regional Environmental Program for Central America, CCAD-USAID
PROCAFOR	Central American Forest Program, Honduras

R

Ramsar	Convention on Wetlands of International Importance Especially as Waterfowl Habitat (signed in Ramsar, Iran, 1971)
RECOSMO	Conservation and Development of the Sarstun-Montagua Region, Guatemala
RESSCA	??
RODA	Mesoamerican Network of Non Governmental Environmental Law Organizations
RUTA	Regional Unit of Technical Assistance

S

SEDA	Environmental Secretariat, Honduras
SEMA	Secretariat for the Environment, El Salvador
SERNA	Secretariat of Natural Resources and the Environment, Honduras
SIAPAZ	International System of Protected Areas for Peace
SICA	Central American System for Integration
SICAP	Central American System of Protected Areas
SIECA	Permanent Secretariat of the General Treaty on Central American Economic Integration
SIEPAC	Central American Interconnected Electrical System
SIGAP	Guatemalan System of Protected Areas
SINAC	National System of Conservation Areas
SINAP	National System of Protected Areas
SISAP	Salvadorean System of Protected Areas
SITCA	Secretariat for Tourist Integration in Central America

T

TCA	Amazonian Cooperation Treaty
TFAP-CA	Tropical Forest Action Plan for Central America
TOGA	Tropical Oceans and Global Atmosphere Program

U

UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNFPA	United Nations Population Fund
UPOV	International Union for the Protection of New Varieties of Plants
USAID	United States Agency for International Development

W

WCPA	World Commission on Protected Areas
WRI	World Resources Institute

BIBLIOGRAPHY

AFE-COHDEFOR, 1996. *Anuario Estadístico Forestal, 1996*, Planning Department. Tegucigalpa, Honduras.

Aguilar, G. 1997. *El Sistema de Evaluación de Impacto Ambiental en Centroamérica: Política y Régimen Legal*. La Experiencia de Costa Rica. Internal Document. San Jose: IUCN-ORMA.

Almanaque Mundial. 1997. Virginia: Editorial América.

Amador, J. and E. Alfaro. 1995. *La Oscilación Cuasi-bienal, ENOS y el Acoplamiento de Algunos Parámetros Superficiales y Estratosféricos sobre Costa Rica*. San Jose: Department of Geophysical Research: University of Costa Rica.

Arias Sánchez, O. 1993. Preface. **In** *Los VNU en Centroamérica: Trabajando por la Paz.*, 5. Geneva: UNDP-VNU.

Bank of Guatemala, 1996. Production, export, import statistics, and prices of principal agricultural products. Department of Economic Data, National Accounts Section. Internal document. November, 1996.

Barry, D. 1994. *El Acuífero de San Salvador*. PRISMA Journal, no. 7: 1-6.

Carazo, C. 1997. Un Siglo XXI ¿sin extrema pobreza? *In* *Hombres de Maíz* 7, no. 48:19-20.

Castillo, L. 1996. Preliminary Report presented to the CCAF, San Jose: Central American Commission on Environmental Pollution.

CCAD (Central American Commission on Environment and Development), CCAB-AP and IUCN-ORMA. 1997. National Forest Sector Review of Belize. Preliminary version. San Jose.

———. 1997. Diagnóstico Forestal de Costa Rica. Preliminary version. San Jose.

———. 1997. Diagnóstico Forestal de Guatemala. Preliminary version. San Jose.

———. 1997. Diagnóstico Forestal de Honduras. Preliminary version. San Jose.

———. 1997. Diagnóstico Forestal de Nicaragua. Preliminary version. San Jose.

———. 1997. Diagnóstico Forestal de Panama. Preliminary version. San Jose.

CCAD (Central American Commission on Environment and Development), FAO and CCAF-AP. 1997a.

Propuesta de Criterios e Indicadores a Nivel de Unidad de Manejo (UMF) para la Ordenación Forestal Sostenible en Centroamérica. San Jose, Costa Rica.

———. 1997b. Reunión de Expertos sobre Criterios e Indicadores para la Ordenación Forestal Sostenible en Centroamérica (Tegucigalpa, January 20-24, 1997). Report. Tegucigalpa, Honduras.

CCAD (Central American Commission on Environment and Development). 1992. Agenda Centroamericana de Ambiente y Desarrollo. UNDP, WRI, IUCN-CI.

———. 1997a. Documento Biodiversidad. Análisis Regional de la Situación Marino-costera de Centroamérica.

———. 1997b. Sistema Arrecifal del Caribe Mesoamericano.

CONAP (National Council for Protected Areas), USAID and The Peregrine Fund. 1996. El estado de la Reserva de la Biosfera Maya en 1996. Guatemala.

Cornelius, S. 1996. Options for the Establishment of a TRAFFIC Presence in Central America. Washington, D.C.: WWF.

Corrales, L. and A. Salas. 1997. Diagnóstico Ambiental de la Actividad Bananera en Sarapiquí, Tortuguero y Talamanca, Costa Rica 1990-1992: con actualizaciones parciales a 1996. San Jose, Costa Rica: IUCN-ORMA; Comisión Ambiental Bananera.

D'Arcy, W. G. 1977. Endangered Landscapes in Panama and Central America: the Threat to Plant Species. In *Extinction is Forever*. G. Prance, and T. Elias, eds. New York: New York Botanical Gardens.

Davidson, I., and M. Gauthier. 1993. A Perspective on Wetlands in Central America. Quebec, Canada: Canadian International Development Agency.

Dinerstein, E. et al. 1995. Una Evaluación del Estado de las Eco-regiones Terrestres de América Latina y el Caribe. Washington, D.C.: WWF; World Bank.

ECLAC (Economic Commission for Latin America and the Caribbean). 1997. Actividades Regionales en el Subsector Eléctrico del Istmo Centroamericano. Mexico.

FAO (Food and Agriculture Organization of the United Nations). 1994. El Desafío de la Ordenación Forestal Sostenible. Rome, Italy.

FAO (Food and Agriculture Organization of the United Nations). 1997. State of the World's Forests. Oxford (GB): Words and Publications.

FAOSTATS. 1997. FAO Data Base: www.fao.org.

FAO (Food and Agriculture Organization of the United Nations), CCAD and CCAF-PA. 1997. Basic reference document on the certification of forest products in Central America and the effect on their commercialization. Unpublished.

Faustino, J. 1997. Agua: Recurso Estratégico en el Futuro de Centroamérica. *Revista Forestal Centroamericana* 6, no. 18: 6-12.

Figueres, C. et al. 1996. Ejecutando la Implementación Conjunta: una Guía para Establecer Programas Nacionales de Implementación Conjunta. Washington, D.C.: Department for Sustainable Development in the Americas.

FSC (Forest Stewardship Council). 1996. Principios y Criterios para el Manejo de Bosques Naturales. Document no. 1. January 1996. Oaxaca, Mexico.

Gentry, A. H. 1978. Floristic Knowledge and Needs in Pacific Tropical America. *Brittania* 30:134-53.
———. 1982. Neotropical Floristic Diversity: Phytogeographical Connections between Central and South America, Pleistocene Climatic Fluctuations, or an Accident of the Andean Orogeny. *Annals of the Missouri Botanical Garden* 69:557-93.

Godoy, J.C. 1996. Hacia el Consenso del Sistema Centroamericano de Areas Protegidas (SICAP). Un Análisis de la Representatividad de Eco-regiones. Consultancy Report for PROARCA/CAPAS/CCAD. Guatemala City, Guatemala.

González, M. 1997. Estado de la Legislación y Gestión Ambiental en Centroamérica. Unpublished.

Gutiérrez M., I. 1996. Aportes de un proyecto de manejo de vida silvestre a la calidad de vida de las poblaciones rurales: el caso de la Cooperativa Omar Bacca, Cosigüina, Nicaragua. M. Sc. Thesis. Turrialba, Costa Rica: CATIE.

IDB (Inter-American Development Bank). 1994. Barbados: Coastal Conservation Program . Phase I. Operational Plan.

INBio. 1996. Annual Report 1996. Heredia, Costa Rica.

Ingebrikt, A. 1997. Joint-implementation: a Sustainable Way to Reduce Carbon Emissions? M.Sc. Thesis. Aalborg, Denmark: Aalborg University.

INRENARE (National Institute for Renewable Natural Resources). 1996, Protected Areas and Wildlife Department, Panama.

IUCN (World Conservation Union), UNEP and WWF. 1991. Caring for the Earth. A Strategy for Sustainable Living. Gland, Switzerland.

IUCN-ORMA (World Conservation Union – Regional Office for Mesoamerica). Wildlife Program. 1997. Diagnóstico Jurídico-Institucional de la Biodiversidad en Nicaragua. San Jose.

Kaimowitz, D. 1996. Livestock and Deforestation, Central America in the 1980s and 1990s: Policy Perspective. Jakarta, Indonesia: CIFOR.

La Nación. 1997. Economy and Business Section. San Jose, Costa Rica.

Leonard, J. 1987. Recursos Naturales y Desarrollo Económico en Centroamérica: un Perfil Ambiental Regional. San Jose, Costa Rica: CATIE.

Leroux M., R. 1997. In press. Turismo en Centroamérica: Integración y Microempresa.

Lücke, O. and P. Cussianovich. 1996. Escenarios Socioambientales para Cambio Climático en Centroamérica. Informe de Consultoría, Central American Climatic Change Project. Guatemala: CCAD-CRRH, USAID, EPA.

Madrigal C., P., and V. Solís. 1993. La Participación Comunitaria en el Manejo de la Vida Silvestre: Perspectivas Jurídicas. Paper presented at The International Wildlife Management Congress (San Jose, September 19-25, 1993). San Jose, Costa Rica: IUCN-ORMA.

Madrigal C., P. 1996. Derecho Ambiental en Centroamérica. San Jose, Costa Rica: Escuela Judicial, Supreme Court of Justice.

MAG (Ministry of Agriculture and Livestock). 1996. General Directorate of Renewable Natural Resources. National Parks and Wildlife Office. San Salvador, El Salvador.

MAN (Movimiento Ambientalista Nicaragüense). 1997. Aprobación de la Ley General del Ambiente y los Recursos Naturales: un Caso de Incidencia. San Jose, Costa Rica: Fundación Arias para la Paz y el Progreso Humano.

MARN (Ministry of the Environmental and Natural Resources). 1997. Costo Humano del Deterioro Ambiental. 1998 Work Plan. San Salvador, El Salvador.

Marozzi, M. 1997. Revisando Cuentas en el Sector Forestal Centroamericano. IUCN: San Jose, Costa Rica.

MASICA (Medio Ambiente y Salud en el Istmo Centroamericano). 1996. Por la Salud y el Ambiente en Centroamérica. Memoria 5 aniversario del Programa MASICA/OPS. Programa Medio Ambiente y Salud en el Istmo centroamericano, División de Salud y Ambiente.

McCarthy, R. et al. Eds. 1997. Buscando Respuestas: Nuevos Arreglos para la Gestión de Areas Protegidas y el Corredor Biológico en Centroamérica. IUCN: San José, Costa Rica.

MINAE (Ministry of Environment and Energy). 1993. Energy Sector Office. El Sector Energético de la América Latina y el Caribe: 15 Años de Evolución. San Jose, Costa Rica.

Ocampo, R.; J. Rodríguez, and A. Salas. 1995. El Papel de los Productos No Maderables en el Manejo Diversificado del Bosque: Consulta para Centroamérica y el Caribe. Turrialba, Costa Rica: CATIE; CCAB-AP; IUCN.

PAHO (Pan-American Health Organization). 1997. Plan de Acción Centroamericano de Salud y Ambiente en el Desarrollo Humano Sostenible (PACASADHS).

PAHO (Pan-American Health Organization). 1994. Las Condiciones de Salud en las Américas. Washington, D.C.

Paolisso, M., and S Yudelman. 1991. Women, Poverty and the Environment in Latin America. Washington, D.C.: International Center for Research on Women.

Pasos, R. et al. 1994. El Ultimo Despale...: la Frontera Agrícola Centroamericana. San Jose, Costa Rica: Fundación para el Desarrollo Económico y Social para Centroamérica (FUNDESCA).

Perfecto, I. et al. 1996. Shade Coffee: a Disappearing Refuge for Biodiversity. *BioScience* 46, no. 8:598-608.

PROARCAS/CAPAS, 1997. La Certificación Forestal en Centroamérica. Preliminary draft.

PROECO and National University. 1997. Informe Anual 1997. Heredia, Costa Rica.

Quirós, R. 1997. Representante de Costa Rica en las reuniones de la Secretaría de Integración Social Centroamericana. Personal Communication.

RECOPE (Refinadora Costarricense de Petróleo). Dirección de Energía. 1997. Situación del Mercado de Hidrocarburos en Centroamérica. San Jose, Costa Rica.

RESSCA (Red de Salud y Medio Ambiente en Centroamérica). 1996. La Salud Ambiental en Centroamérica: una Visión de Futuro en el Marco de la Integración (12, Panamá, August 1996). Panama: OPS.

Rodríguez, J. and N. Windevoxhel. 1995. Análisis Regional de la Situación de la Zona Marino Costera de Centroamérica. Internal Document: Inter-American Development Bank.

Salazar, J. M. 1995. Marco Conceptual del Desarrollo Sostenible y Posición del Sector Privado Centroamericano. Revista Integración en Marcha, 14: 25-29.

SEDA (Environmental Secretariat). 1993. Plan de Acción Ambiente y Desarrollo. Tegucigalpa, Honduras.

Sheng, T. C. 1992. Manual de Campo para la Ordenación de Cuencas Hidrográficas: Estudio y Planificación de Cuencas Hidrográficas. Rome: FAO.

Sobenes G., M. A. 1990. Legislación Guatemalteca Relativa a la Contaminación Ambiental Producida por la Industria. Thesis, Faculty of Legal and Social Sciences, Rafael Landivar University. Guatemala.

State of the Nation Project. ???

TCA (Amazonian Cooperation Treaty). 1996. Análisis de la Propuesta de Tarapoto sobre Criterios e Indicadores de Sostenibilidad del Bosque Amazónico. Secretaría Pro Tempore. Lima, Peru.

TOGA (Tropical Oceans and Global Atmosphere Program), and National Research Council. 1996. Learning to Predict Climate Variations Associated with El Niño and the Southern Oscillation. Washington, D.C.: National Academy Press.

Tuomasjukka, T. 1997a. Síntesis del Estado del Sector Forestal de Centroamérica. CCAD/CCAF-PA/IUCN-ORMA/PFA. November, 1997. Unpublished.

Tuomasjukka, T. 1997b. Situación de Uso de Leña en Centroamérica. CCAD/CCAF-PA/IUCN-ORMA. November, 1997. Unpublished.

Ugalde, A. and J. C. Godoy. 1992. Centroamérica. In: Regional reviews. 4th World Congress on National Parks and Protected Areas (4, Caracas, Venezuela, February 10-20, 1992). Gland, Switzerland: IUCN.

UNDP (United Nations Development Programme). 1997. Human Development Report 1997.

———. 1996. Human Development Report 1996.

———. 1995. Human Development Report 1995.

UNEP (United Nations Environment Programme). 1996. Development Report 1996.

UNFPA (United Nations Population Fund). 1997. State of the World's Population 1997. New York.

Utting, P. 1996. Bosques, Sociedad y Poder. Managua, Nicaragua: UCA.

Vargas, G. 1992. Capacidad de Uso y Uso Actual de la Tierra en Centroamérica. Anuario de Estudios Centroamericanos 18, no. 2:7-23.

Vásquez R., A. 1997. Manejo de Cuencas Hidrográficas y Desastres Naturales Originados por Inundaciones en Centroamérica. Draft Proposal.

Vega, C. 1997. Chiquita Brands. Personal Communication.

West, R., and J. Augelli. 1989. Middle America: its Lands and Peoples. New Jersey: Prentice Hall.

Wetzel, R. 1981. Limnología. Barcelona, Spain: Ediciones Omega.

Wickens G.E. 1995. Ordenación Sostenible de los Bosques de las Zonas Tropicales y Subtropicales para la Obtención de Productos Forestales No Madereros en FAO. 1995. "Sistemas de Realización de la Ordenación Forestal Sostenible". Estudio FAO, Montes, 122. Rome, Italy.

Windevoxhel, N. J.; J. Rodríguez, and E. J. Lahmann. 1997. In press. Situation of Integrated Coastal Zone Management in Central America: Experiences of the IUCN Wetlands and Coastal Zone Conservation Program. San Jose, Costa Rica.

WRI (World Resources Institute), UNDP, UNEP, and World Bank. 1996. World Resources 1996-1997. New York: Oxford University Press.

WRI (World Resources Institute), UNEP and UNDP. 1992. World Resources 1992-1993. New York: Oxford University Press.

Annex 1. Comparative Analysis of Central American Agreements on Environment and Development

Convention on Biological Diversity (CBD)

PRINCIPLE

States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or to areas beyond the limits of national jurisdiction.

OBJECTIVES

- The conservation of biological diversity
- The sustainable use of its components
- The just and equitable participation in the benefits derived from the use of genetic resources.

MECHANISMS

- Adequate access to these resources, taking into consideration all rights over them.
- Appropriate transfer of pertinent technologies, taking into consideration all rights over them.
- Appropriate finance.

Central American Agreement on Biodiversity Conservation and the Protection of Priority Wildland Areas

PRINCIPLES

States signatories to this Agreement reaffirm their sovereign right to conserve and exploit their biological resources according to their own policies and regulations with regard to:

- a. the conservation and use of biological resources in a sustainable manner and for social ends; and
- b. ensuring that activities within its jurisdiction or control do not cause damage to the biological diversity of States or to areas which border on national jurisdiction.

OBJECTIVE

Conserve terrestrial and marine coastal biological diversity of the Central American region to the greatest extent possible, for the benefit of present and future generations.

MEANS OF IMPLEMENTATION

Creation of the Central American Council on Protected Areas (CCPA) made up of directors or national parks services of each country of the region, and specialists of the World Commission on Protected Areas (WCPA) (Article 21).

Central American Alliance for Sustainable Development (ALIDES)

PRINCIPLES

1. Respect for life in all its manifestations.
2. Improvement in the quality of human life.
3. Respect for and sustainable use of the planet's vitality and diversity.
4. Promotion of peace and democracy as basic forms of human coexistence.
5. Respect for the region's multiculturalism and ethnic diversity.
6. Achievement of greater levels of economic integration between countries of the region and between these and the rest of the world.
7. An intergenerational responsibility with regards sustainable development.

OBJECTIVES

- Make the isthmus a region of peace, liberty, democracy and development
- The integral and sustainable management of territories
- Transmit the significance of the Alliance to the international community, as well as the importance of joint benefits to be gained from the support of this Central American model of sustainability.
- Promote conditions which permanently strengthen society's participation and capacity to improve the quality of life today and in the future.

MECHANISMS

- National Council for Sustainable Development
- Central American Council for Sustainable Development.

Natural resource and biodiversity commitments:

- a. Establish Central American Biological Corridor to strengthen national protected area systems.
- b. Biodiversity centers and botanical gardens.
- c. Draw up a Central American list of species of flora and fauna in danger of extinction through appropriate national authorities.

Note: Both the CBD and the Central American Agreement of Biodiversity Conservation have been ratified by Central American Countries, and thus form part of national legal frameworks. ALIDES is a policy declaration which has no binding force, but has been included in this annex as it is the international legal instrument which defines policy at the regional level.

Annex 2. Compliance Status of the Convention on Biological Diversity*

	BELIZE	GUATEMALA	EL SALVADOR
1. Ratificación	October 30, 1993	February 21, 1995	May 19, 1994 October
2. Policy Development	No information available	<ul style="list-style-type: none"> • CONADIBIO created • Coordinating Committee of Agricultural, Commercial, Industrial and Financial Associations (CCACIF) • National Association of Natural Resource, Ecological and Environmental NGOs (ASOREMA) • Private universities • University of San Carlos • National Commission on the Environment (CONAMA) • National Council on Protected Areas (CONAP) 	<ul style="list-style-type: none"> • Creation of Ministry of the Environment and Natural Resources (1997) • National protected areas policy (1996) • National consultations on drafts of a) General Law on the Environment (1995-96); b) National Law on Protected Areas; c) Forest Law (1997) • Naming of inter-institutional technical working groups on: a) biodiversity knowledge and research; b) biotechnology; c) biosecurity (May 1997)

Source: Central American Wildlife Program, ORMA-IUCN, 1998. The material presented in this annex was the product of one of the working groups of the Latin American Biodiversity Forum held in Santa Marta, Colombia in May 1996, organized by the Fundación Pro Sierra Nevada and the World Conservation Union. The information presented herein does not reflect any official position but was drawn up by people working in different disciplines from both governmental and non governmental sectors.

HONDURAS

28, 1995

- General Biodiversity Directorate (DIBIO) within Secretariat of Natural Resources and the Environment (SERNA)
- Proposed creation of CONABIOH as high level technical advisory commission involving representatives of public and private sectors, NGOs and academia
- Technical committees exist on: conservation, biogenetics, sustainable use, biotechnology, bio-security, ecotourism

NICARAGUA

September 29, 1995

- National Council on Sustainable Development (CONADES) created by Decree N° 31-97 of June 5, 1997

COSTA RICA

June 30, 1994 June 17,

- Naming of Biodiversity Advisory Council (COABIO) of MIRENEM-PLAN, Decree N° 24555, August 18, 1995
- Regional Environmental Councils and National Environmental Commission created through Organic Environmental Law N° 7554

PANAMA

1994

- National Bio-diversity Commission named made up of:
- National Association for Nature Conservation
 - Ministries of Commerce, Industry, and Economic Planning
 - Institute of Environmental Sciences of University of Panama
 - Indigenous representatives
 - Biology and forest colleges
 - National Coordinator of Panamanian Environmental Groups, Universities and PEMASKY (indigenous organization) coordinated by INRENARE

* Note: The title in the left-hand column is an abbreviated form of the following questions: 1. Has your country ratified the CBD?; 2. What is the state of development of government policies relating to biological diversity?; 2.1 Do you have a National Biodiversity Study?; 2.2 Has a National Biodiversity Strategy been drafted?; 2.3 What is the institutional framework and the body responsible for defining policies in this field; 2.4 Do you have an action plan?; 3. What is the legal framework which regulates biodiversity?; 3.1 Is there a framework law which regulates biodiversity use?; 3.2 Are there any other agreements or supranational bodies?; 4. What are the criteria and mechanisms for the definition priorities for the conservation of biological diversity?; 5. Is any funding available from multilateral organizations (such as the World Bank) or international funds

(such as GEF)?; 6. Is there an inventory or follow-up of biological diversity?; 7. What is the situation regarding traditional knowledge?; 8. Is there any form of protection for the intellectual property of living organisms?; 8.1 Law on patenting?; 8.2 Farmers' rights?; 9. Are there any regulations regarding access to genetic resources?; 10. Are there any regulations relating to technology transfer?; 11. Have the commitments of the Conferences of the Parties (COP) been met?; 12. Are there any economic incentives?; 13. Has a National Report on Biodiversity been prepared?; 14. Are there any norms on biotechnology? 15. Are there any examples of economic assessment having been undertaken of different components of biological diversity?; 16. What is the situation regarding training of human resources in this field?; 17. What is the situation regarding potrea, some of the principal means of in situ conservation of biological diversity.

	BELIZE	GUATEMALA	EL SALVADOR
2.1 Biodiversity Studies	<ul style="list-style-type: none"> • Specific studies carried out • Wildlife Conservation Society 	<ul style="list-style-type: none"> • Specific studies carried out on species, ecosystems, geographic areas. Inventories also exist on groups of vertebrates (except fish). • Universities of San Carlos and Del Valle, some NGOs and the Centre for Conservation Studies (CDC-CECON) are carrying out research and inventories in different parts of the country 	<ul style="list-style-type: none"> • Mesoamerican Biological Corridor (MBC) project • "Historia Natural y Ecológica de El Salvador", Ministry of Education, 1995 • "Biodiversidad del Parque Nacional El Imposible", SalvaNatura, 1994
2.2 National Strategy	<ul style="list-style-type: none"> • Forestry Department of Ministry of Natural Resources has started drafting with GEF funds 	<ul style="list-style-type: none"> • In process. US\$214,700 support from GEF to CONADIBIO, through CONAMA 	<ul style="list-style-type: none"> • Has not been developed. In August 1994 UNDP contracted (with GEF funds) team of 3 national consultants, to coordinate consultation process for drafting of strategy and action plan
2.2.1 Obstacles	<ul style="list-style-type: none"> • Need to systematize disperse information both within and outside country 	<ul style="list-style-type: none"> • None 	<ul style="list-style-type: none"> • To date, availability of funding has been principal obstacle

HONDURAS

- Studies of country's flora and fauna have been carried out
- There is no systematic inventory of the country
- Great interest in sustainable use of wildlife generates specific studies

NICARAGUA

- State: flora and fauna studies
- NGOs, universities, theses on flora and fauna of protected areas & genetic resources
- Institutional legal analysis of biodiversity in Nicaragua

COSTA RICA

- National Biodiversity Study carried out in 1992 by MIRENEM, National Museum of Costa Rica, and National Biodiversity Institute (INBio)

PANAMA

- National Biodiversity Report in process

- In process and agreement with GEF for US\$189,000. Government is focal point through SERNA

- 1993. Drafting and approval through Executive Decree for National Biodiversity Strategy. Joint participation of State, National Assembly, NGOs and civil society

- Proposal for financial support from GEF approved and project initiated 1998

- Project approved with GEF

- Lack of decisions taken to consolidate activities
- Lack of biodiversity policy

- Weak institutional capacity to develop activities
- Unstable government structures

- None

- Lack of national species inventory

BELIZE**GUATEMALA****EL SALVADOR****2.2.2
Identification/
Monitoring**

- Has not been defined

- Has not been defined

- Has not been defined

**2.2.3
Civil Society
Participation**

- More participation required
- Support has been given to some civil society initiatives for protected area conservation

- Initial planning of bases upon which to develop strategy carried out by group of persons mainly representing civil society
- CONADIBIO made up of 59% of civil society

- Representatives of 4 environmental NGOs have been included in institutional technical working groups

**2.3 Institutional
Framework**

- Focal point for CBD Secretariat is Ministry of Tourism and Environment; but strategy drafting carried out by Ministry of Natural Resources

- CONAMA
- CONAP
- CONADIBIO

- MARN through Executive Secretariat for the Environment (SEMA) of General Directorate of Renewable Natural Resources (DGRNR)
- Director of National Technological Center for Agriculture and Forestry
- Executive Director of National Council on Science and Technology
- Representatives of universities and research institutions, NGOs and advisory committees

HONDURAS

- Has not been defined
- Budgetary deficiency for seeking of financial support

NICARAGUA

- Necessary policies not identified for development of implementation or monitoring of implementation

COSTA RICA

- Necessary policies not identified for development or monitoring of implementation

PANAMA

- Participation in training courses in monitoring and evaluation PRO-ARCAS-CAPAS

- Only technical committees exist on different aspects

- National biodiversity strategy is the product of a civil society process, with periodic feedback until its enforcement

- Renowned scientists participate in COABIO

- Consideration being given to incorporation of NGOs, private enterprise, trades unions, local governments in CONABI
- Indigenous groups and small farmers consulted re MBC

- SERNA
- DIBIO

- Ministry of the Environment and Natural Resources (MARENA) according to responsibilities established in 1993 Environmental Action Plan for Nicaragua (PAANIC), through General Directorate on Protected Areas, Fish and Fauna, especially directorate on protected areas.
- CITES–Nicaragua (scientific authority)
- Ministry of Economy and Development (MEDE)
- General Directorate of Protected Areas (DGAP–MARENA)

- MINAE
- COABIO

- INRENARE

BELIZE**GUATEMALA****EL SALVADOR****2.4 Action Plan**

- Does not exist

- Directed by CONADIBIO

- Does not exist

3. Legal Framework

- Has not ratified Central American Biodiversity Agreement
- Wildlife Protection Act, 1981
- Law on National Parks System, 1981
- Environmental Protection Law, 1992
- Fisheries Law, 1987
- CITES ratification, September 21, 1981

- Central American Biodiversity Agreement ratified May 19, 1994
- Law for Environmental Protection and Improvement, Decree N° 68-86 established CONAMA
- Protected Areas Law, Executive Decree N°110-96
- Forest Law, Executive Decree N° 102-96, December 4, 1996
- CITES ratification, October 2, 1979

Various laws and regulations exist:

- Forest Law, Decree N° 269, February 8, 1973
- Wildlife Conservation Law, Executive Decree N° 844, April 14, 1994
- Regulation for Establishment of Salt Pans and their Exploitation for Marine Fish Farming in Salt Forests, 1986
- General Law on Fishing Activities, Decree N° 799, September 14, 1981
- CITES ratification, May 16, 1986

HONDURAS

- Does not exist
- 1993 Environmental Action Plan has not been updated
- National environmental profile in process

NICARAGUA

- Drafted as a result of national consultation in 1995. Approved by Executive Power

COSTA RICA

- Does not exist

PANAMA

- In process

-
- Central American Biodiversity Agreement ratified February 21, 1995
 - General Law on the Environment, Decree N° 104-93, June 30, 1993 with chapter on flora and fauna
 - Current Forest Law in process of reform
 - Fisheries Law of 1959
 - CITES ratification, March 15, 1985

- Central American Biodiversity Agreement ratified October 23, 1995
- General Law on the Environment and Natural Resources, Decree N° 217, March 27, 1996. Chapter II on biodiversity and national genetic heritage; Chapter III on natural resources
- Law on the Conservation, Protection and Development of Forest Wealth, Decree N° 1381, October 21, 1967
- CITES ratification, August, 1977

- Central American Biodiversity Agreement ratified December 12, 1994
- Organic Law on the Environment, N° 7554, September 28, 1995 (Chapter on Biodiversity)
- Wildlife Conservation Law, N° 7317, October 19, 1992
- Forest Law, N° 7575, April 16, 1996
- Law N° 7384, Costa Rican Institute of Fisheries and Fish Farming (INCOPECSA), March 8, 1994
- There is a large number of laws in this area
- CITES ratification, January 28, 1975

- Central American Biodiversity Agreement ratified May 26, 1995
- Wildlife Law N° 24, June 7, 1995
- Forest Law N° 1, February 3, 1994
- Draft Law on Protected Areas
- General Law on the Environment in process of approval by cabinet.
- CITES ratification October 28, 1977

BELIZE**GUATEMALA****EL SALVADOR****3.1 Framework Law on Biodiversity**

- Does not exist

- Does not exist

- The CBD is law of the republic and as such prevails over others. No other national law exists

3.2 SupraNational Category

- Summit of Central American Presidents
- ALIDES
- SICA

- Summit of Central American Presidents
- ALIDES
- SICA

- Summit of Central American Presidents
- ALIDES
- SICA

4. Criteria & Mechanisms for Biodiversity Priorities

- Defined by Ministry of Natural Resources

- Only in relation to those aspects to be covered and developed in the strategy

- To date no consulting processes have taken place as drafting of national strategy and action plan is just starting. Criteria applied to date include a combination of: a) that established in Convention; b) commitments of COPs; and c) relations between these two, as established in draft National Environment Strategy

HONDURAS

- Does not exist

NICARAGUA

- General Law on the Environment and Natural Resources, Decree N° 217, March 27, 1996.
- Biodiversity law in process at specific level

COSTA RICA

- The CBD is law of the republic and as such prevails over others
- A draft biodiversity law (ref. 12635) currently with legislative commission on the environment

PANAMA

- The CBD is law of the republic and as such prevails over others
- A draft biodiversity law (ref. 12635) currently with legislative commission on the environment

- Summit of Central American Presidents
- ALIDES
- SICA

- Summit of Central American Presidents
- ALIDES
- SICA

- Summit of Central American Presidents
- ALIDES
- SICA

- Summit of Central American Presidents
- ALIDES
- SICA

- Do not exist

- Do not exist

- COABIO through MINAE and the Regional Environment Commissions
- Based on international commitments (assistance to COPs)

No consulting processes take place at national or local levels

- Defined by Wildlife and Protected Areas Secretariat of INRENARE

	BELIZE	GUATEMALA	EL SALVADOR
5. Funding (<i>GEF & others</i>)	<ul style="list-style-type: none"> • UNDP-GEF funding exists 	<ul style="list-style-type: none"> • UNDP-GEF funding US\$214,700 for biodiversity strategy • UNDP-GEF funding US\$200,000 for one year, for programme of small subsidies for NGOs • UNDP-GEF funding US\$4,000 for 1997-2000 period, for Conservation and Development of Sarstun-Montagua Region (RECOSMO) 	<ul style="list-style-type: none"> • UNDP-GEF small grants programme, US\$200,000 for drafting of national strategy and action plan
6. Biodiversity Monitoring & Follow-up	<ul style="list-style-type: none"> • In protected areas if it takes place. • Forestry Dept. holds responsibility for control of wildlife populations. 	<ul style="list-style-type: none"> • There is no national or “official” inventory process, follow-up, or monitoring of biodiversity and its use, except for specific projects and programs of NGOs and academic bodies 	<ul style="list-style-type: none"> • There is no systematic program oriented towards biodiversity follow-up or monitoring. Isolated efforts have been made to make inventories of biodiversity in specific protected areas (El Imposible, Barra de Santiago, Nancuchiname, Laguna El Jocotal, Montecristo)
7. Traditional Knowledge	<ul style="list-style-type: none"> • Some case studies have been carried out (New York Botanical Gardens, National Cancer Institute, Ichel Farms, Belizean Association of Traditional Healers) 	<ul style="list-style-type: none"> • Yes, there is abundant but disperse information on knowledge and use of biodiversity resources in indigenous communities since pre-Columbian times (Mayas) ‘till present day 	<ul style="list-style-type: none"> • Biodiversity knowledge and forms of use by different small farmer, fishing and indigenous communities is very rich and varied, but has not been systematized to date. Some efforts are taking place through the National Council for Culture and Art (CONCULTURA) of the Ministry of Education

HONDURAS

- Proposal has been requested for Strategy and Action Plan

NICARAGUA

- GEF, World Bank, UNDP, CCED, AID, GTZ for Protected Areas Law, Fisheries, Atlantic Biodiversity Corridors. Regional and national biodiversity strategies within framework of Mesoamerican Biological Corridor

COSTA RICA

- UNDP, Programme for biodiversity conservation and sustainable use of Osa and La Amistad Conservation Areas
- UNDP-GEF small grants programme, US\$200,000 annually

PANAMA

- UNDP-GEF funding for national biodiversity strategy, country study and action plan

-
- Systematic follow-up or monitoring does not exist

- Systematic follow-up or monitoring does not exist, except in the case of some species (e.g. marine turtles)

- A process oriented towards the inventory of biodiversity in protected areas is being carried out by INBio. There is no follow-up or monitoring of biodiversity

- Project for the monitoring of the Panama Canal watershed including forest cover, hydrology, soils and vertebrates with support from AID and the Smithsonian

-
- It has not been discussed
 - Discussion is expected within CONABIOH

- Information available on indigenous communities of Atlantic Region (ethnic groups of the Autonomous Regional Governments) and rural communities, but it has not been systematized

- Knowledge exists in indigenous populations and among small farmers. This has not been systematized or valued at the national level

- There is no protection

	BELIZE	GUATEMALA	EL SALVADOR
8. Intellectual Property	<ul style="list-style-type: none"> • No 	<ul style="list-style-type: none"> • No 	<ul style="list-style-type: none"> • Uruguay Round of GATT Agreements.
8.1 Patents	<ul style="list-style-type: none"> • There is a Patents Law referring to industrial property which makes no specific reference to biodiversity 	<ul style="list-style-type: none"> • Patents Law N° 153-85 does not consider vegetable varieties and races of animals as inventions 	<ul style="list-style-type: none"> • National Law on the Registry of Patents. • Law on the Creation of the National Registry Center
8.2 Farmers' Rights	<ul style="list-style-type: none"> • No information available 	<ul style="list-style-type: none"> • Yes 	<ul style="list-style-type: none"> • There is no national law which explicitly recognizes the rights to access and equitable distribution of benefits of biodiversity use on the part of the farmer
8.3 Others		<ul style="list-style-type: none"> • Yes 	<ul style="list-style-type: none"> • Ministry of Agriculture and Livestock currently working on draft National Law on Seed Certification

HONDURAS

- There is a law on intellectual property but the theme of biological diversity has not been well analyzed

NICARAGUA

- There is a current law

COSTA RICA

- Seed Law for which modifications are being attempted within the framework of International Union for the Protection of New Varieties of Plants (UPOV), 1992
- Uruguay Round of GATT Agreements
- Law N° 7475, December 26, 1994
- Draft biodiversity law

PANAMA

- No information available

- Industrial Property Law N° 142-93 does not consider vegetable varieties and races of animals as inventions

- Law for the Patenting of Inventions of October 14, 1899. Administrative disposition does not allow for patenting of biological products or processes
- General Law on the Environment and Natural Resources establishes a patent in favor of the State on germplasm and native species (principally endemic ones)

- Patents Law N° 6867, April 5, 1983

- Law on Industrial Property, Article 15 does not consider vegetable varieties and races of animals as inventions

- Law on the Modernization of the Agricultural Sector approved

- General Law on the Environment and Natural Resources, N° 217, March 27, 1996

- Seed Law N° 6289 . In general the rights of the farmer are not recognized at national level
- No legal framework which regulates it

- General Law on the Environment makes some mention
- RUTA project of Ministry of Agricultural Development and INRENARE in aspects of biodiversity conservation

- New draft Seed Law being worked on which will be adapted to GATT

9. Access to Genetic Resources

BELIZE

- Letter of intent to be signed prior to negotiation. Nothing signed to date
- Ixhel Farms has an agreement with local populations

GUATEMALA

- Yes, Varios germplasm and native species banks exist
- A Ministerial Agreement N° 276-89 prohibits the collection of vegetable germplasm of any species on national territory

EL SALVADOR

- No regulations exists. No knowledge of draft laws on the subject. Since 1993 a technical working network made up of small farmer unions and agricultural enterprises has been developed on phytogetic resources; carried out within framework of National Center for Agricultural Technology (CENTA) of the Ministry of Agricultura and Livestock with support from IICA and CATIE

10. Technology Transfer

- No information available

- Yes, the Institute of Science and Technology (ICTA) carries out technology transfer in phytogetic resources
- Mesoamerican Center on Technology Studies (CEMAT), an NGO, carries out technology transfer relating to medicinal plants, forest management, and ecotourism
- Universities to some extent also play a similar role

- National Council on Science and Technology (CONACYT) is preparing technical and administrative norms regarding use and transfer of technology relating to the use of living resources



HONDURAS

- Germplasm bank in Ceiba
- National School of Forest Sciences
- Lancetilla Botanical Gardens

NICARAGUA

- General Law on the Environment and Natural Resources, Decree N° 217, March 27, 1996

COSTA RICA

- Agreements with pharmaceutical companies and INBio (private body)
- Potential agreements lined up
- Agreement INBio-MINAE
- No current regulations in this field. Draft law being processed

PANAMA

- Commission on Phytogenetic Resources provides policy guidelines

-
- Honduran Foundation for Agricultural Research (FIA)
 - Science and Agricultural Technology Directorate

- No

- No
- Certain agreements exist between public universities and private companies and other academic centers

- In the Darien Conservation Project there is a component (sustainable use)

	BELIZE	GUATEMALA	EL SALVADOR
11. COP Commitments Met	<ul style="list-style-type: none"> • Participated in COP1 	<ul style="list-style-type: none"> • Has participated in COPs but has not prepared country reports. • Biodiversity strategy in process of drafting will include an action plan and country report to be presented at COP4 	<ul style="list-style-type: none"> • Government representatives have participated in COP1, COP2, and COP3. Country reports not available
12. Economic Incentives	<ul style="list-style-type: none"> • Reform of Forest Law, which includes incentives, pending discussion 	<ul style="list-style-type: none"> • Yes. Forest Law, Legislative Decree N° 101-96, Title VII: Promotion of Forestry, Reforestation, Rural Development and Forest Industries. Articles 71-86 • Law on Protected Areas. Legislative Decree N° 4-89 	<ul style="list-style-type: none"> • Do not exist within current legislation. Draft General Law on the Environment contemplates economic incentives for forest activities and natural resource management
13. First National Report	<ul style="list-style-type: none"> • Yes. Periodically presented in summit meetings through the Ministry of Foreign Affairs 	<ul style="list-style-type: none"> • Will be drafted as part of the biodiversity strategy to be presented at COP4 	<ul style="list-style-type: none"> • No country report has been prepared within the CBD framework
14. Biosecurity	<ul style="list-style-type: none"> • None exist 	<ul style="list-style-type: none"> • No information available 	<ul style="list-style-type: none"> • No norms drafted • Technical working group formed under coordination of Executive Secretariat on the Environment (see under Policy Development above) as part of strategy and action plan (see National Strategy above)

HONDURAS

- There are no country reports

NICARAGUA

- No information available

COSTA RICA

- Has participated in COP1, COP2, and COP3.
- Country reports not available

PANAMA

- Has participated in COP1, COP2, and COP3.
- Country report in process

- Law on Forest Incentives
- Lack of economic resources

- Article 42 of General Law on the Environment and Natural Resources. Pending regulatory decree

- Only exist for the conservation of natural forests and reforestation

- Law on Reforestation Incentives, N° 24, November 23, 1992 but it has not been implemented
- General Law on the Environment (in process) considers them

- In process

- No country report has been prepared within the CBD framework

- No country report has been prepared within the CBD framework

- In process

- None exist

- Law on Animal and Vegetable Health oriented towards agricultural species

- National Biosecurity Commission named through Executive Decree N° 24555-MIRENEM-PLAN, August 18, 1995
- Interest in preparation of protocol
- Draft Biodiversity Law

- None exist

	BELIZE	GUATEMALA	EL SALVADOR
15. Biodiversity Valuation & Market	<ul style="list-style-type: none"> • No economic valuation 	<ul style="list-style-type: none"> • No information available 	<ul style="list-style-type: none"> • No official advances • Salvadorian Foundation for Economic and Social Development (FUSADES) has developed proposals to consider economic valuation and market criteria within draft General Law on the Environment
16. Training	<ul style="list-style-type: none"> • Has participated in a few Central American fora 	<ul style="list-style-type: none"> • Has various training centers 	<ul style="list-style-type: none"> • No specific training activities in themes relating to biodiversity have been developed
17. Protected Areas	<ul style="list-style-type: none"> • National System of Protected Areas (SINAP) covers approx. 40-47% of forested territory 	<ul style="list-style-type: none"> • Guatemalan System of Protected Areas (SIGAP) 	<ul style="list-style-type: none"> • A plan and strategy for the Salvadorian System of Protected Areas (SISAP) has been developed • Draft Law on Protected Areas which would provide SISAP with legal base • Total system includes a total of 126 areas of different sizes, the majority being less than 500 ha. • SISAP would cover 2% of national territory

HONDURAS

- No economic valuation

NICARAGUA

- No economic valuation

COSTA RICA

- Little carried out at official level
- INBio and Master's program in economic policy at National University

PANAMA

- National Commission with environmental statistics and valuation of natural resources (in preliminary stage) coordinated by Auditor General

• COHDEFOR and on aspects relating to protected areas and wildlife

• There are no specialists in biological diversity

• At the regional level
• Master's program in biodiversity at CATIE

• Various training courses
• AID and CATIE program for park guards

• SINAP covers 20% of national territory

• SINAP covers 13% of national territory

• SINAP within MINAE covers 24% of national territory under some category of protection

• Draft law
• SINAP covers 23% of national territory

Source: Central American Wildlife Program, ORMA-IUCN, 1998. The material presented in this annex was the product of one of the working groups of the Latin American Biodiversity Forum held in Santa Marta, Colombia in May 1996 organized by the Fundación Pro Sierra Nevada and the World Conservation Union. The information presented herein does not reflect any official position but was drawn up by people working in different disciplines from both governmental and non governmental sectors.