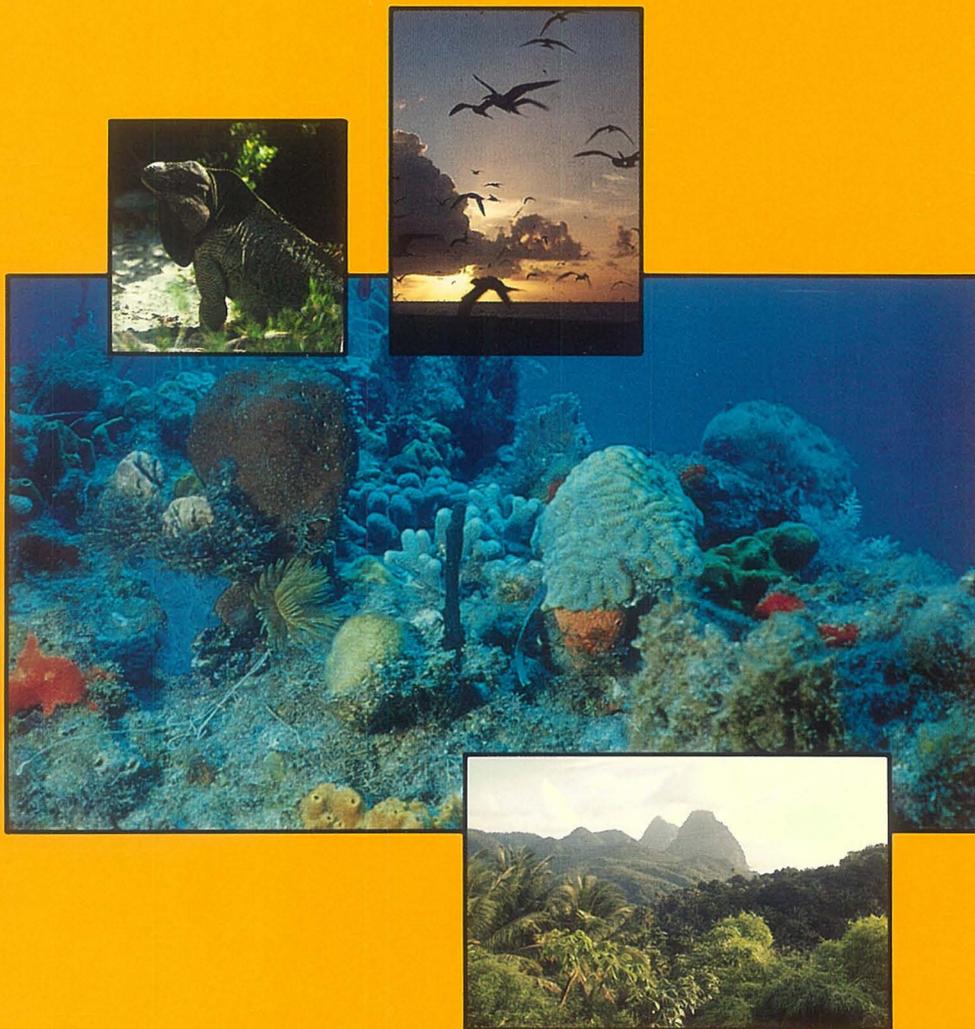

Environmental Agenda for the 1990's

A SYNTHESIS OF THE EASTERN CARIBBEAN
COUNTRY ENVIRONMENTAL PROFILE SERIES



CARIBBEAN CONSERVATION ASSOCIATION

ISLAND RESOURCES FOUNDATION

U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT

ACKNOWLEDGEMENTS

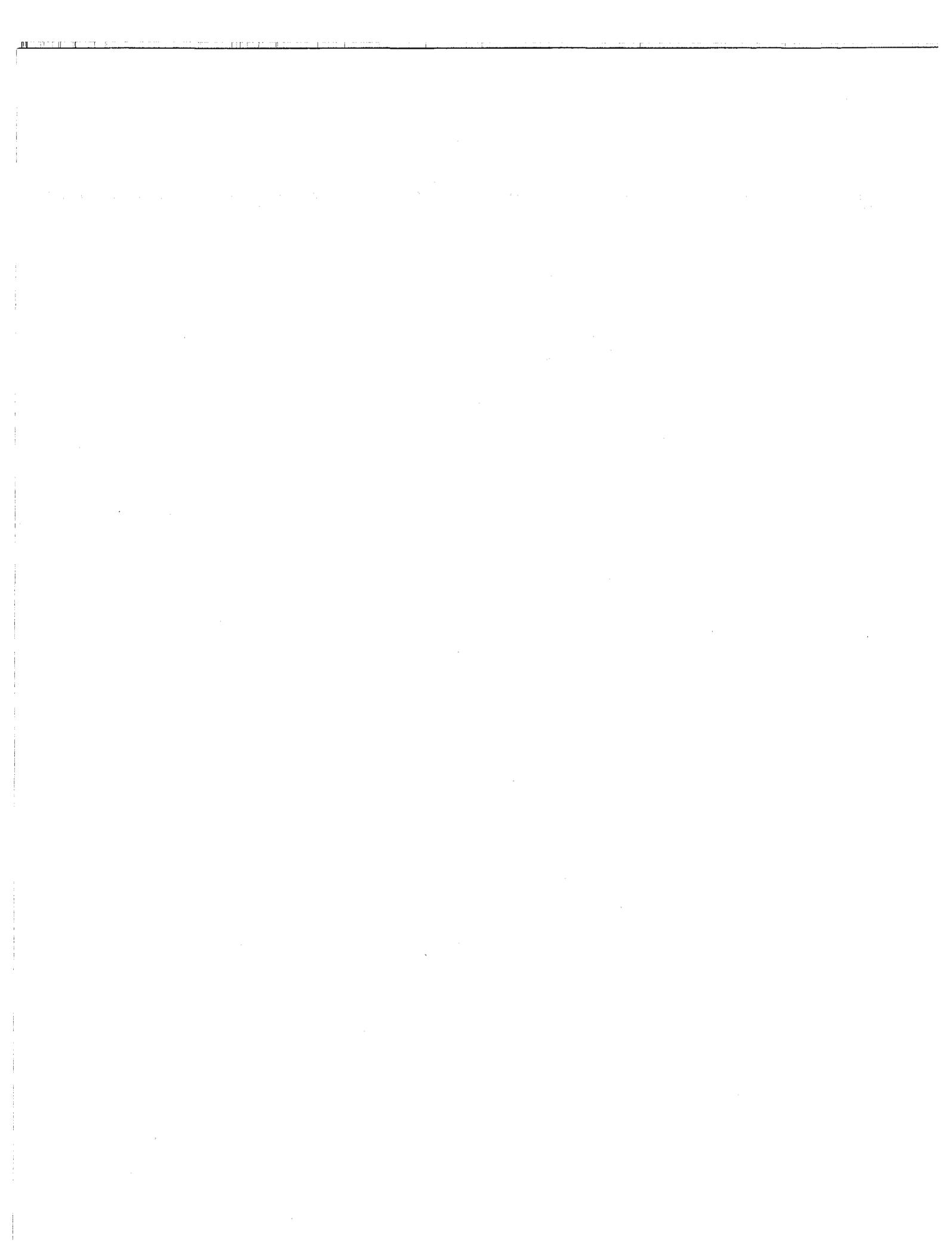
Technical preparation of this synthesis report was the responsibility of Judith A. Towle, vice president of Island Resources Foundation. She was assisted by Edward L. Towle, president of the Foundation, who helped in the final editing; Jean-Pierre Bacle, who coordinated report production; and Neva Carlson, who provided additional technical review.

The report reflects the priorities and recommendations of the six National Committees established in each Profile Country. This information was first published in June of 1991 by the Caribbean Conservation Association and Island Resources Foundation as part of a six volume *Environmental Profile* series for Antigua-Barbuda, Dominica, Grenada, St. Kitts-Nevis, St. Lucia, and St. Vincent and the Grenadines.

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CONTENTS

	<i>Page</i>
Acronyms	iii
Foreword: Caribbean Conservation Association	v
Foreword: Island Resources Foundation	vii
Introduction	1
The Genius of the Place	3
Sector Summaries	
1. FORESTS AND FORESTRY	7
2. WILDLIFE, HABITATS, AND BIODIVERSITY	13
3. FRESHWATER RESOURCES AND WATERSHED MANAGEMENT	17
4. COASTAL AND MARINE ENVIRONMENTS	23
5. AGRICULTURE	29
6. TOURISM	35
7. POLLUTION	41
8. PARKS AND OTHER PROTECTED AREAS	47
9. INSTITUTIONAL FRAMEWORK	53
Recommendations For Action: An Agenda For The 1990's	61



ACRONYMS

BOD	BIOCHEMICAL OXYGEN DEMAND
CANARI	CARIBBEAN NATURAL RESOURCES INSTITUTE
CARICOM	CARIBBEAN COMMUNITY
CCA	CARIBBEAN CONSERVATION ASSOCIATION
CEHI	CARIBBEAN ENVIRONMENTAL HEALTH INSTITUTE
CEP	COUNTRY ENVIRONMENTAL PROFILE
CIDA	CANADIAN INTERNATIONAL DEVELOPMENT AGENCY
CITES	CONVENTION ON INTERNATIONAL TRADE OF ENDANGERED SPECIES OF WILD FLORA AND FAUNA
CZM	COASTAL ZONE MANAGEMENT
EIA	ENVIRONMENTAL IMPACT ASSESSMENT
FAO	FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
GDP	GROSS DOMESTIC PRODUCT
GIS	GEOGRAPHIC INFORMATION SYSTEM
IRF	ISLAND RESOURCES FOUNDATION
IUCN	WORLD CONSERVATION UNION
MOU	MEMORANDUM OF UNDERSTANDING
NGO	NON-GOVERNMENTAL ORGANIZATION
OAS	ORGANIZATION OF AMERICAN STATES
OECS	ORGANIZATION OF EASTERN CARIBBEAN STATES
PAHO	PAN AMERICAN HEALTH ORGANIZATION
UK	UNITED KINGDOM
UNDP	UNITED NATIONS DEVELOPMENT PROGRAM
UNEP	UNITED NATIONS ENVIRONMENT PROGRAM
USAID	UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT



FOREWORD

Agriculture, forestry, fishing and tourism have traditionally been the main income-generating activities on which Caribbean countries depend for their economic viability. The natural resource base upon which these activities rely has over time been subjected to over-exploitation, mis-use, and mis-management as people have continuously taken more from the natural environment than they have given in return.

The resulting decline in the state of the Caribbean environment has been accompanied by population increases and a deterioration in the standard of living in several countries of the region, and indications are that this trend is likely to worsen before it gets better.

In an attempt to arrest this situation and put in place mitigative measures to aggressively tackle and rectify the deterioration in our natural resource base, a series of six Country Environmental Profiles has been prepared for Antigua and Barbuda, Dominica, Grenada, St. Lucia, St. Kitts and Nevis, and St. Vincent and the Grenadines.

These documents are intended to facilitate environmentally-sound development planning and pave the way for a new development thrust into the twenty-first century and beyond. Funding for the Environmental Profile Project was provided by the United States Agency for International Development.

This summary document attempts to synthesize the principal elements of the six profile reports and present the main issues and recommendations in an easily assimilated format. It is our hope that the approaches and recommendations offered in the document will help in the creation of policy shifts that will bring to the region the type of development which is indeed sustainable.

The Caribbean Conservation Association is very pleased to have had this opportunity to contribute in a tangible way to the on-going environment/development debate and to the research collection and data analysis so vital to sound management of the Caribbean environment.

Calvin A. Howell, Executive Director
Caribbean Conservation Association



FOREWORD

In early 1987 when the Caribbean Conservation Association and the Island Resources Foundation took on the task of preparing Country Environmental Profiles for six Eastern Caribbean countries, we knew it would be a formidable assignment. What we did not fully realize was the magnitude of that effort, which would not be completed until four years later.

Before the Profile Project ended, an unprecedented assemblage of institutions, government agencies, non-governmental organizations, and individuals would become involved in a first-of-its-kind effort to examine and assess priority environmental issues in six Eastern Caribbean countries.

CCA and IRF were told at the beginning of this process by our in-country partners that there would be considerable value in taking a retrospective look at and reporting on environmental change as it has taken place in selected OECS countries in the last several decades. It was long overdue.

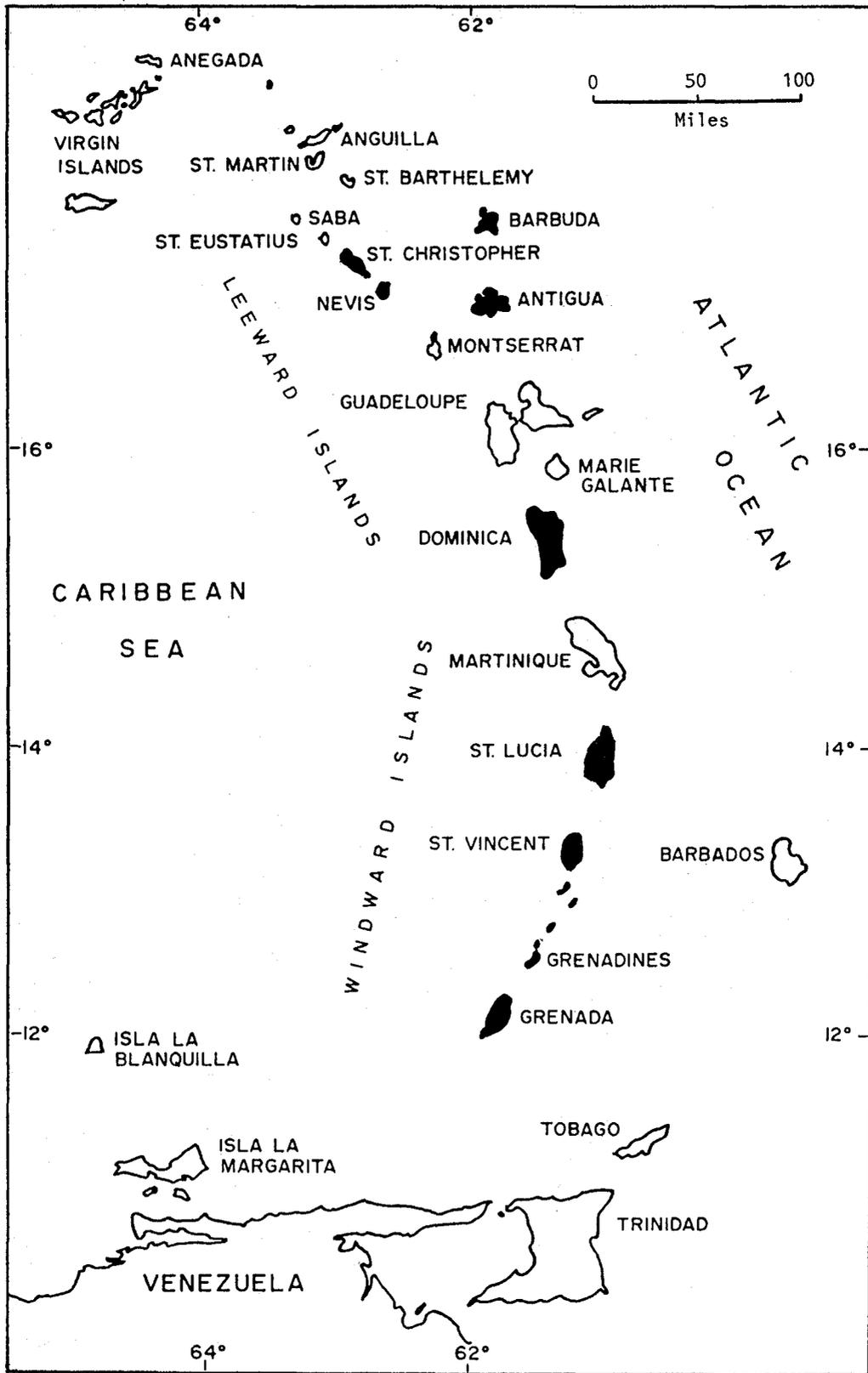
But in addition to looking back, the CEP reports look to the future. To implement even a portion of the policy recommendations presented will require inter-disciplinary cooperation and coordination by both government and private sector entities, working together more or less as partners. Indeed, one of the purposes of the Country Environmental Profile Project was to improve channels of dialogue in the search for workable solutions.

We believe that this synthesis report -- the final document in the current series of Environmental Profiles -- will be a particularly important contribution to this ongoing dialogue. It was designed to provide easy access to Profile findings and recommendations and therefore to increase their visibility to a wider audience of Caribbean leaders -- both political and environmental.

Island Resources Foundation is proud to have been associated with this project and to

have contributed not only to the production of the Profile reports but to the ongoing process of assembling data, assessing priorities, and identifying solutions for sustainable -- and achievable -- resource management policies and programs in the Eastern Caribbean.

Edward L. Towle
CEP Project Team Leader
and
Judith A. Towle
CEP Report Series Editor
Island Resources Foundation



General map of the Eastern Caribbean, showing the location of the six CEP countries.

INTRODUCTION

Preparation of Country Environmental Profiles (CEPs) has proven to be an effective means to help ensure that environmental issues are addressed in the development process. Since 1979, the U.S. Agency for International Development (USAID) has supported Environmental Profiles in over one hundred USAID-assisted countries.

Profiles have highlighted gaps in the existing information base, suggested new guidelines for the design and funding of development programs, pinpointed weaknesses in regulatory or planning mechanisms, and illustrated the need for changes in policies. Most importantly, the process of carrying out a profile project has in many cases helped establish new working relationships and even consensus among governmental and non-governmental bodies concerned with environmental issues. It has also served to strengthen local institutions and improve their capacity for incorporating environmental information into development planning.

PROFILES FOR THE EASTERN CARIBBEAN

The potential utility of CEPs in the Eastern Caribbean sub-region (essentially the OECS countries) has been a subject of discussion since the early 1980's. The need for the profiling process to begin in those countries was reaffirmed during a seminar on Industry, Environment and Development sponsored by the Caribbean Conservation Association (CCA) and the University of the West Indies in August 1986.

Shortly thereafter, USAID entered into a Cooperative Agreement with CCA for the preparation of a series of Profiles for the Eastern Caribbean. The project would begin in the country of St. Lucia as a pilot effort, to be followed by Profiles for Grenada, Dominica, St. Vincent, Antigua-Barbuda, and St. Kitts-Nevis.

Early in 1987, CCA and the Island Resources Foundation (IRF), of St. Thomas, U.S. Virgin Islands, signed a Memorandum of Understanding (MOU) calling for IRF to provide technical assistance and support to CCA in the execution of the Profile Project for the Eastern Caribbean. The executive director of the Caribbean Conservation Association became the CEP Project Director, while the president of Island Resources Foundation served as CEP Project Manager and Team Leader. An IRF staff person was assigned as a Project Coordinator in each CEP country.

Eventually MOUs were signed by CCA and the governments of all six CEP countries -- Antigua-Barbuda, Commonwealth of Dominica, Grenada, St. Kitts-Nevis, St. Lucia, and St. Vincent and the Grenadines. In each Profile country, a National CEP Committee was established as an advisory, technical information, and review body for the CEP Project. Members of the National Committees represented both government agencies and private sector organizations concerned about development and environment issues.

Additionally, a local non-governmental organization (NGO) was designated by CCA and the participating government as the in-country implementing and coordinating group for the CEP Project. (In Dominica, a governmental committee, called YES for Year of the Environment and Shelter, provided the support functions for the CEP in that country. In St. Kitts-Nevis, one NGO was designated for St. Kitts and a second NGO for Nevis.)

ORGANIZATION OF THE CEP REPORTS

Although the format of each Environmental Profile was determined by a local CEP National Committee, the documents -- as a series -- share a common approach. Each Profile is designed as a guide for future development planning and resource management decision-making in the target country. A broad spectrum of sector-specific environment/development topics are examined -- for example,

marine and terrestrial systems, parks and protected areas, wildlife, land use planning, agriculture, industry, institutional capabilities.

Each topic forms a chapter (or sub-chapter) of the Profile. Each chapter, in turn, is sub-divided into three segments. First, a broad *Overview* is provided which constitutes an abbreviated "state of the environment" summary for each key resource sector. Secondly, an analysis of *Priority Environmental Issues or Problems* within each sector is presented, followed by *Policy Recommendations and Guidelines* which are also sector-specific.

All of the Profiles include an introductory chapter that incorporates background information on the general environmental setting for the country and reviews the historical, economic and social context within which environmental decision-making must take place. A comprehensive bibliography of source materials dealing with resource development and environmental management is found at the end of each Profile. Most references deal specifically with the target country or the Eastern Caribbean sub-region. The six bibliographies represent the most thorough assemblage of such information compiled to date.

COMPLETION OF SIX PROFILES

Work on the St. Lucia Environmental Profile began in mid-1987, and a final draft document was ready for review one year later in June of 1988. The St. Lucia report is a particularly comprehensive Profile, because it was the first CEP to be completed and because a larger volume of environmental data and literature is available on this Eastern Caribbean country.

An MOU was signed in early 1989 between CCA and the Government of Grenada to commence work on the Profile in that nation. Hurricane Hugo in September of that year slowed the project as Island Resources Foundation's headquarters in St. Thomas was hard hit by the storm, and the of-

fice and home of IRF's coordinator for the Grenada Profile (based in St. Croix) were destroyed by Hugo. The final draft of the Grenada CEP was ready for circulation by early 1990.

Thereafter, in fairly rapid succession, followed the completion of Profiles for Dominica (February-June), St. Vincent and the Grenadines (February-June), Antigua-Barbuda (June-August), and St. Kitts-Nevis (June-September). All Profiles were finished in final draft form by September of 1990.

A period for in-country review, followed by final edit and re-write by the IRF technical team, constituted the final steps in the CEP process. The six Profiles were published by June of 1991 and presented by USAID and CCA to government and NGO representatives at an official presentation ceremony in Barbados in July.

SYNTHESIS REPORT

Following completion of the six CEPs, a summary of the published reports was requested by USAID and the target Profile countries. This CEP Synthesis was prepared in response to that request. It provides an overview summary of the key environmental issues and problems identified in the six Profiles and presents this information within an Eastern Caribbean context. Indeed, many of the critical environmental issues confronting St. Lucia are similar to those faced by Grenada, and so forth. (For more detailed information on country-specific assessments and policy recommendations, the reader is referred to the six Environmental Profiles published earlier in 1991.)

The Synthesis also highlights those recommendations and guidelines which are common to the Profile countries and, by so doing, provides an updated and organized framework for change in environmental policies and resource management programs in the targeted OECS countries.

THE GENIUS OF THE PLACE

"IN EVERYTHING, RESPECT THE GENIUS OF THE PLACE"

Alexander Pope, *Essays on Man* (1733)

The countries participating in the Environmental Profile Project (Antigua-Barbuda, Dominica, Grenada, St. Kitts-Nevis, St. Lucia, and St. Vincent and the Grenadines) are but six of an extended archipelagic clustering of oceanic islands in the Eastern Caribbean Sea known collectively as the Lesser Antilles. This biogeographic grouping, which sweeps in a graceful curve from Puerto Rico in the north to Trinidad in the south, is notable among scholars and tourists alike for its cultural, environmental and geomorphological diversity. The four-year environmental profiling exercise, of which this volume is the last in a series of seven, has helped define the extent to which the differences and commonalities among the islands in natural and physical resource endowments have shaped and continue to affect human and institutional development.

As part of the Lesser Antilles cluster, the CEP islands are truly "archipelagic," enjoying the characteristic features of both oceanic and coastal islands. On the one hand, they share qualities of insular isolation -- e.g., smallness, psychological independence, unambiguous national identities and generally pristine environments distant from more polluted continental areas. At the same time, they are situated within well-serviced sea and air transport routes, and each is surrounded at a near distance by non-threatening small island neighbors. Beyond lie the continental edges and centers, attractive and threatening at the same time.

The CEP islands are at once both compact and complex, coherent and vulnerable, with closely interlocked ecosystems. Perhaps their most obvious physical characteristic (and development constraint) is their size -- they are all very small.

The largest and most mountainous is Dominica (just under 290 square miles). St. Lucia -- like Dominica, without significant satellite islands -- follows with 238 square miles. The dual island nation St. Kitts-Nevis is the smallest of the six countries, with a total land mass of only 104 square miles. Antigua-Barbuda, the other two-island state, is 170 square miles, with a physical and natural environment quite unlike its CEP neighbors. Grenada and its two larger satellite islands (Carriacou and Petit Martinique) comprise 133 square miles in total, while St. Vincent and its gem-like string of Grenadine Islands are spread over a land area totaling 150 square miles, with the main island encompassing 133 square miles.

CONTRASTING LANDSCAPES

While all Eastern Caribbean islands share certain valuable natural amenities, such as a favorable climate, a rich cultural heritage, luxuriant coral reefs and a wide selection of colorful and attractive people, flora and fauna, not everything is distributed evenly.

Some islands, like Antigua-Barbuda, have insufficient rainfall and a surfeit of droughts. Others, like Dominica, experience an excess of rainfall with associated cloudy weather, landslides and flooding.

St. Lucia is volcanic and monolithic, comprising one main island with only a few miniscule nearshore satellite islets. St. Vincent and the Grenadines, by way of contrast, is an archipelagic state within its own right, composed of over 30 islands, islets and cays which extend from St. Vincent, the largest, southward for some 60 miles toward the neighboring country of Grenada.

The once densely forested landscapes of Grenada and St. Kitts-Nevis have been largely transformed to agricultural use. Along the way, due to its successful, specialized production of nutmeg and mace, Grenada acquired a reputation as the region's "Spice Island." In St. Kitts, the island's continuous cultivation of cane has earned it a different reputation and landscape; here centuries of conscientious land husbandry on sugar estates have left an aesthetically pleasing, orderly, and well-proportioned rural landscape, quite unlike the other CEP states which abandoned sugar in the past three decades.

But despite these differences in appearance, much of which is geomorphological, all Eastern Caribbean islands share one common characteristic -- their landscapes are as much derived from cultural factors as natural forces, shaped by human needs and institutions and by historical events. These contemporary cultural landscapes often show the pernicious influence of careless exploitation, sometimes reveal the benign effects of good husbandry, and on occasion display artifactual evidence of earlier visionary policies, land use planning, landscape design, and sound nature conservation practices.

ENVIRONMENTAL SETTING

The normal climate of the oceanic region at the latitude of the Lesser Antillean islands is a humid tropical marine type, with little seasonal or diurnal variation and a fairly constant, strong wind out of the east. Rain is distributed roughly into a drier season from January to May and a wetter season from June to December. This island grouping is located within the belt of "trade winds" famous among seamen for their directional reliability and generally predictable schedule. Disturbances can be induced by the passage of so-called "easterly waves" in the upper atmosphere and other low pressure systems during the "wet season." All the CEP islands have suffered the impacts of severe storms and hurricanes in the past, although Grenada lies just south of the

path of most tropical storms and is only rarely affected by hurricanes.

Within this climatic belt, moisture-laden trade winds are commonly forced upwards when they confront the land mass of even small tropical islands with central peaks, like all of the CEP islands except Antigua and Barbuda. The cooled moisture in the air precipitates as rain, falling most consistently on the upper slopes. Therefore, island vegetation at higher elevations receives the highest rainfall, while the leeward side of such islands customarily receives slightly more rain than the windward side because the air masses and clouds formed at the peak move in a westerly direction under the influence of the prevailing winds.

An extraordinary variety of "microclimates" can exist in small island systems like the CEP cluster. Altitude, temperature, humidity, saltiness of the air, the intensity and incidence of sunshine, wind exposure, and soil type all interact and conspire to create numerous site-specific variable "climates" within each island. These variations are mirrored by each island's mosaic-like overlay of diverse combinations of natural vegetation which, in turn, are the very substance of the habitat side of biodiversity. Without them, the landscape would be less interesting, less colorful, and less productive. It would also be more uniform and therefore more at risk.

The present vegetation of the CEP islands shows evidence of great disturbance by human activity. It also represents an intermixture of high and low, wet and dry, volcanic and limestone islands. The extent of undisturbed vegetation in Dominica is more extensive than on any other island in the Lesser Antilles, and its rain forest is considered the finest in the Caribbean. In other CEP islands, Antigua in particular, the natural vegetation has been altered more significantly by human manipulation.

PHYSICAL FEATURES

The Antillean arc of islands is geologically young and predominantly volcanic in origin. Some islands were formed primarily by subaqueous and subaerial lava flows and pyroclastics followed by seabed uplift (for example, St. Lucia, Dominica). Some of these acquired thick coral reef caps while still submerged and emerged from the sea looking like limestone islands (for example, parts of Antigua).

At the present time, the active tectonic or mountain forming process has all but ceased in the region except for St. Vincent's Soufriere, which last erupted in 1979, and the rambunctious underwater volcano north of Grenada known as Kick 'em Jenny. But within the arc, there are still eight active volcanic sites on as many islands -- some with gas vents, some sulphurous steam vents, one real boiling lake (Dominica), and a few, like St. Lucia, with near-surface hydrothermal hot spots that have geothermal energy potential.

The windward side of most Eastern Caribbean islands is exposed to the full impact of the Atlantic Ocean and its easterly and northeasterly trade winds, waves, swells and storm systems. By way of contrast, the Leeward coasts are more likely to have generally secure protection against heavy swells, abnormal tidal currents and contrary winds. The islands' capitals and most important harbors are located on the Leeward coasts -- St. George's in Grenada, Kingstown in St. Vincent, Castries in St. Lucia, Basseterre in St. Kitts, Roseau in Dominica, and St. John's in Antigua. Of these, only two -- Grenada and St. Lucia -- have good, naturally-protected harbors.

The so-called Windward islands of Dominica, St. Lucia, St. Vincent, and Grenada all exhibit a mountainous interior of volcanic origin which dominates the topography, with sharply dissected ridges, isolated valleys and lush vegetation falling away to a narrow coastal plain of varying width and densely-populated land. The generally high relief has had an im-

portant influence on climate, on land use, and on general physical development. Nowhere is this more evident than in Dominica where landscape features like tree-covered mountainsides, generally rugged and steep intermediate terrain, and relatively little flat arable land at lower elevations have been and continue to be considerable constraints to development.

The absence of a mountainous landscape and lush green vegetation distinguishes Antigua-Barbuda from the other CEP islands. In Antigua, flat dry plains give rise to gently rolling hills in the north and to modest volcanic hills in the south. About a third of Antigua has been classified as of limestone origin, while Barbuda to the northeast is entirely a low-lying coralline island.

By way of contrast, St. Kitts and Nevis have only a little of the flatness and dryness of Antigua and Barbuda, and almost none of the rugged mountainous irregularity of the Windward Islands. Each island is dominated by a single, centrally-located volcanic peak surrounded by fertile slopes, with the so-called hinterland open from coastline to mountain top in one continuously graceful sweep.

THE INSULAR DILEMMA

Whatever the physical attributes of his or her home island, the Antiguan, Barbudan, Dominican, Grenadian, Kittitian, Nevisian, St. Lucian, and Vincentian resource planner in the 1990's confronts a shared dilemma, as each tries to manage external development pressures while also being responsive to local environmental imperatives. Fundamentally, all islands face the same combination of opportunity and risk, the same marketing strategies for continentally-generated development programs, the same pressures of exogenous influences, the same influx of proposed "high-tech" quick fixes for complex local problems, and the same siren song of growth and modernization and material progress. Balancing these is not easy.

Some may eventually lose their sense of place, while others will find creative alternatives. Some may even lead the way because they appreciate that the difference between just growth and real development is largely a question of how the environment is managed, and only sustainable development will ensure the viability of the supporting natural resource base upon which all development is dependent.

The six Country Environmental Profiles for the Eastern Caribbean, and this summary or synthesis document, are about the state of the resource base at the beginning of the decade of the 1990's in each of six Caribbean nations. An important question, however, remains: What will it be like in the year 2000?

As the twentieth century draws to a close, the smaller island systems of the Lesser Antilles, formerly isolated -- and to a degree buffered if not wholly protected by that isolation -- are having to face up to an end to their quasi-isolation and to the influx of a variety of new pressures from the outside. Ease of access by cruise ship and jet aircraft, telecommunication by fibre-optic cable and telefax machine, and a proliferation of television signals from satellites overhead are now taken for granted. But the effect of these newer media and transport technologies on local consumer expectations and on the supply of affordable goods and services has changed political priorities and made development projections a very difficult task.

The new growth pressures from inside and outside have already generated island-wide disruptions of the self-regulating processes of nature -- and, in the end, may very well

threaten the viability of insular wildlife, of water supply systems, and of the very shorelines of these islands with their associated coral reef, mangrove, and seagrass buffering systems. This island dilemma of limiting the impacts of outside forces while seeking to be responsive to local needs is somewhat poignantly summed up by a poet best known for her retrospective forecasting:

*"The tidal wave devours the shore
There are no islands anymore."*

(Edna St. Vincent Millay)

It is only briefly comforting to note that the poet was not necessarily referring to the Caribbean, for all islands face a similar problem -- only the timing and leadership are different. Nevertheless, it is clear that island environments are at risk -- of sinking, metaphorically speaking, under a sea of waste, pollution, and environmental damage. Perhaps not today, but soon if something is not done.

Fortunately, in the same way that good planning and timely action can develop sea defenses -- familiar to those who live in a hurricane zone -- that will hold back or diminish the effects of a tidal wave or its environmental equivalent, then so can adroit, creative national and regional leadership save the island ecosystem from inundation. The 1985 plea of the Trinidadian Calysonian is not irrelevant here: *"Captain, the ship is sinking!"* But, in truth, his words to the citizens of the Eastern Caribbean are a call to action -- not a cry of despair.

1. FORESTS AND FORESTRY

OVERVIEW

The forests of the Eastern Caribbean have been steadily exploited since the time of the first settlements -- as wood for construction, as a source of food, fuel, and folk medicines, and as an expendable resource in the clearing of land for roads, housing and agricultural development. Gradually, the natural forest has disappeared from the coastal areas, and today, in all of the target CEP countries (except Antigua-Barbuda), the forest is largely confined to the more mountainous areas of the interior. Even in this montane, theoretically inaccessible region -- in St. Lucia, St. Vincent, Grenada, and Dominica -- illicit shifting cultivation practices have had a marked effect, and isolated patches of bananas, coconuts, citrus and dasheen are not uncommon throughout the forest.

The forested core, and especially its peripheral edge, continue to provide downslope communities in CEP countries with a wide variety of useful goods and services such as building materials, fuelwood, natural medicines, wild fruits, and habitat for game species and other wildlife. By far, however, the most important service provided by the forest is as a reliable source of domestic water. In a most orderly sequence, the forest catches the rainfall, stores the water, arranges for its distribution islandwide and releases it over time at various locations.

Of the six CEP countries, Dominica is the most heavily forested, with over two-thirds of its land surface covered by forests. Indeed, in the Eastern Caribbean, the words "rain forest" are almost synonymous with the name Dominica. Antigua is at the other end of the spectrum; in this country recurrent planting of sugar cane over several centuries, combined with the extensive area once under cane production, has destroyed for all practical purposes all evidence of the natural vegetation. Each CEP report provides extended documentation on the primary vegetation types of the target island, the extent of coverage of the

various forest classifications, and a description of reforestation efforts.

Principal forest management policies of the Eastern Caribbean sub-region date to the 1940's when, between 1942 and 1946, Dr. J.S. Beard, Assistant Conservator of Forests in Trinidad and Tobago, carried out a now well-known reconnaissance of forests in the Windward and Leeward Islands. His report and recommendations ultimately provided the legal basis for many of the forest management and conservation policies established in these islands. However, the first forest reserve in the Eastern Caribbean -- the King's Hill Forest Reserve in St. Vincent -- long pre-dates Beard, having been established in 1791.

Recent efforts to update forest management policies and legislation have often been assisted by donor agencies working in the region. For example, CIDA-funded forestry assistance programs in St. Lucia and St. Vincent have emphasized the development of long-term Forest Management Plans. Similar planning exercises in Grenada and Dominica have been supported by FAO.

The forestry units of government in several CEP countries have generally been charged with a broad array of significant environmental duties ranging from watershed protection to environmental education to parks management -- in addition to more traditional responsibilities related to the economic development of forests. In Dominica and St. Lucia, in particular, forestry personnel have played a central role in the conservation and management of natural resources. In Dominica, all of the country's legally designated protected areas are under the management control of the Forestry Division. In Grenada, the Forestry Department has been designated the appropriate administrative unit to manage a proposed National Parks and Protected Areas System. In St. Vincent, the government's Forestry Division has assumed a principal role in the development of environmental education materials, and the St. Lucia Department of Forest and Lands is a regional leader in the

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MUCH OF THE PRESSURE ON FORESTS COULD BE MET THROUGH MORE EFFICIENT UTILIZATION OF THE RESOURCE BASE IN AREAS ALREADY CLEARED OR OTHERWISE DISTURBED

development of interpretive programs for natural areas and in the design of conservation education materials for children and adults.

THE VALUE OF FORESTS

The forests of the CEP countries (with the exception of Antigua-Barbuda where climate and terrain are substantially different) perform an essential function in regulating stream flow, protecting water supplies, preventing erosion and landslides, and maintaining a well-distributed rainfall for the production of agricultural crops. The remaining natural forest owes its survival in large measure to the ruggedness of terrain, lack of access, and, to some degree, government protection. Unfortunately, the constraints of the past may not afford adequate protection in the future.

In these countries -- even in Dominica where there has been a viable timber industry in the recent past -- the value of timber and wood products is a small proportion of the overall economic value of the forest resource base. To assess the importance of forests, equal consideration must be given to the resource's traditional energy value (for fuelwood), its community value (for agroforestry), its wildlife and biodiversity value (as habitat), its water catchment and storage value (to promote soil and water conservation), its recreational and educational value (for residents and tourists alike), and the quality-of-landscape value afforded by access to undisturbed vegetation and green space. In these islands, it is important that the governments recognize the multi-dimensional value of the forests -- and take appropriate steps to conserve and promote this important resource.

*ENVIRONMENTAL ISSUE:
DEFORESTATION AND HILLSIDE FARMING
[with emphasis on St. Lucia, Dominica,
St. Vincent, and Grenada]*

In St. Lucia, pressure to increase banana cultivation for export has necessitated the

clearing (often illegal) of more and more new land, which in turn has resulted in the establishment of agricultural plots on steeper slopes highly susceptible to erosion. Soil erosion and excessive downstream siltation are the common result of such deforestation. While erosion has serious implications for reduced agricultural productivity, it can also raise the risk of landslides and diminish the value of valley land by contributing to excessive flooding and sediment deposition.

Deforestation is considered one of the most crucial issues confronting Dominica according to a 1990 document prepared by YES (for Year of Environment and Shelter), a Government-sponsored environmental awareness committee. Agricultural expansion and timber harvesting are causing rapid removal of vegetation on both private and public lands. In many areas, especially on steep slopes, lands being cleared for agriculture are unsuitable for such uses, particularly in the absence of specialized controls to protect against soil erosion.

Similar patterns of deforestation can be identified in St. Vincent and Grenada. In St. Vincent, most of the area below the 1,000 foot elevation is under permanent agriculture and has been deforested for centuries. More rapid upslope expansion of agriculture at the expense of the forested areas has been occurring in recent years, especially for banana cultivation. In Grenada, deforestation and consequent soil erosion due to agricultural clearing, production forestry, fuelwood cutting, road-building, and construction activities on steep slopes and unsuitable soils is a problem which will become increasingly severe as the country continues to open up new lands for development.

In general, the most fundamental problem facing the managers of forests in these CEP countries is the rapidly expanding pressure on the resource as a source of timber, fuelwood and charcoal and as an area increasingly utilized for crop cultivation. Much of this pressure, however, could be reduced, inasmuch as most of the requirements for forest re-

sources or for land now under natural forest could be met (1) in areas already cleared or otherwise disturbed and (2) through more efficient utilization of the resource base.

Recommendation. To reduce the loss of forest cover, government conservation and resource development policies must focus on ways to reduce and phase out illegal banana production, land clearing, and farming in general on very steep upland slopes, in critical water catchment areas, and in designated forest reserves. It is essential that government policies rigorously defend water catchments against encroachment and permit no extractive land use other than controlled forestry in such areas. This will require improved monitoring and regulatory control initiatives, as well as a variety of positive -- even economic -- incentives that present alternatives to illegal squatting or illegal land clearing.

More specific recommendations to assist in carrying out these general policy objectives include:

- Implementation and enforcement of *land use regulations* designed to prevent agricultural and residential encroachment and the informal harvesting of trees in designated "protected" forest areas;
- Greater emphasis on promoting agroforestry practices and plantation forestry on private land in an effort to improve the involvement of small farmers as part of the forestry resource management team;
- Assessment of incentives to increase the practice of private forestry (e.g., tax credits);
- Enactment of supporting legislation that will strengthen the ability of governments to protect and manage critical land areas, including private watersheds;

- Identification of funds to finance protective measures, such as:

- 1) purchase of conservation easements;
- 2) purchase of development rights;
- 3) payment of a premium to landowners for improved landscape/forest management practices (e.g., terracing or reforestation);
- 4) payment for a long-term lease of watershed land needing protection;
- 5) compensation to landowners for down-zoning (re-classifying) land as a restricted or no development "protected area" that might allow certain uses but not others, by definition.

Recommendation. The best use of the remaining mature or nearly mature forest stands may well derive from conserving a major portion for their potential as a generic reserve, for wildlife habitat, for watershed protection, for education, for scientific research, and for nature tourism development. Secondary forests and plantation forests are generally more suited for the production of forest products.

Steps need to be taken by governments to ensure the protection of those areas which are appropriate *only* for wildlife conservation, watershed protection, recreation, nature tourism and biological diversity. Examples include lands too steep for sustainable cultivation, commercial forestry or other human activity and areas which are unique by virtue of their scenic, floral or faunal characteristics or their overall contribution to the natural heritage of the country.

**GOVERNMENT
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MENT AND
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FORESTRY IN
SUCH AREAS**

FOREST MANAGEMENT ISSUES IN ST. KITTS-NEVIS

Forests have not as a matter of public policy figured largely in the history or development of St. Kitts and Nevis (unlike Dominica, for example, where forests dominate the island's landscape and have been a key geographic determinant in shaping its history and development options). As a result, the composition, condition, area and resources of the upland forest regions in St. Kitts-Nevis are poorly defined; furthermore, the extent to which these areas are presently used, by whom and for what purposes has not been evaluated or documented on a consistent basis.

One emerging forestry issue is the more recent availability of former cane production acreage for alternative land use activities. Since much of this land should not have been cleared for agriculture in the first place, it is important that the Government recognize the need to protect and utilize some of this acreage in appropriate forest plantation and/or agroforestry programs.

Recommendation. An updated forest resource inventory and assessment should be launched as soon as possible for St. Kitts-Nevis. A comprehensive forest resources policy and plan needs to be prepared (ideally under the mandate of the newly established National Conservation Commission) and should include associated regulations covering: production forestry, agroforestry, watersheds, forest reserves, and fuelwood production and other plantation development on forested lands. Guidelines for the restoration/recovery of abandoned cane lands should be provided.

FOREST MANAGEMENT ISSUES IN ANTIGUA-BARBUDA

In the drier, less steep areas of CEP countries, uncontrolled livestock grazing adversely affects vegetative land cover. Given its drier climate and flatter terrain, this is an especially important issue in Antigua-Barbuda.

Here over-grazing has contributed to land deterioration (especially during wet periods), deforestation, erosion, and general denudation of the landscape.

Recommendation. Agroforestry techniques need to be encouraged to improve the economic viability of small farmers while conserving the natural resource base. Live-stock projects can incorporate forage trees into pasture improvement activities.

ENVIRONMENTAL ISSUE: FUELWOOD PRODUCTION

The continued demand of generally poor and marginalized rural populations for charcoal and to a lesser extent firewood as a fuel source contributes to the overall exploitation of forest resources in CEP countries. During the 1980's, concern about the contributory role played by fuelwood production in deforestation has increased, but conclusive documentation is not presently available to confirm the extent of environmental risk associated with this traditional practice.

Recommendation. A more systematic evaluation of fuelwood extraction rates in CEP countries (particularly the Windward Islands) is required in order to identify specific areas within each country where continued harvesting for this purpose poses a substantial environmental problem. Obvious areas of concern are the forest reserves as well as primary watersheds where removal of ground cover for any reason endangers key water supplies.

It needs to be noted that the "fuelwood production issue" is as much a development issue as it is an environmental issue. As a by-product of larger land-clearing activities (e.g., for agriculture or infrastructure), the fuelwood issue is but one component of intensifying land use pressures being felt throughout the CEP islands. Furthermore, as a traditional technology for rural communities, it cannot be ignored as an important economic and social -- as well as environmental -- issue.

KEY ENVIRONMENTAL ISSUES RELATED TO FORESTS

- ECONOMIC PRESSURES TO INCREASE EXPORT CROP PRODUCTION WHICH HAVE RESULTED IN ACCELERATED CLEARING OF FORESTED LAND AND THE ESTABLISHMENT OF AGRICULTURAL PLOTS ON EVER STEEPER HILLSIDES -- AREAS HIGHLY SUSCEPTIBLE TO EROSION.
- THE ABSENCE OF CONTROLS TO PROTECT AGAINST SOIL EROSION, RESULTING IN AN INCREASED RISK OF LANDSLIDES, FLOODING, AND EXCESSIVE DOWNSTREAM SILTATION WHEN FORESTED LANDS ON STEEP SLOPES AND UNSUITABLE SOILS ARE CLEARED FOR AGRICULTURE, PRODUCTION FORESTRY, FUELWOOD, ROAD BUILDING AND OTHER CONSTRUCTION ACTIVITIES.
- THE FAILURE OF EASTERN CARIBBEAN GOVERNMENTS TO CONSISTENTLY DEFEND CRITICAL WATER CATCHMENTS AGAINST NON-FORESTED LAND USE ACTIVITIES, THUS PLACING AT RISK THE CONTINUED AVAILABILITY OF RELIABLE SOURCES OF DOMESTIC WATER.
- THE LACK OF LAND USE REGULATIONS DESIGNED TO PREVENT AGRICULTURAL AND RESIDENTIAL ENCROACHMENT IN DESIGNATED "PROTECTED" FOREST AREAS.
- UNCONTROLLED LIVESTOCK GRAZING, CONTRIBUTING TO LAND DETERIORATION, DEFORESTATION, EROSION, AND GENERAL DENUDATION OF THE LANDSCAPE.
- THE ABSENCE OF INCENTIVES TO INCREASE AGROFORESTRY AND PLANTATION FORESTRY ON PRIVATE LANDS OR TO COMPENSATE LANDOWNERS FOR IMPROVED LANDSCAPE/FORREST MANAGEMENT PRACTICES SUCH AS TERRACING OR REFORESTATION.
- THE NEED TO IMPROVE THE UNDERSTANDING OF POLITICAL DECISION-MAKERS ABOUT THE VALUE OF FORESTS, PARTICULARLY WITH REGARD TO SOIL AND WATER CONSERVATION.



St. Lucia Parrot, *Amazona versicolor*.

2. WILDLIFE, HABITATS, AND BIODIVERSITY

OVERVIEW

From the earliest colonial period to modern times, export agriculture has dominated the land use patterns of the CEP countries and produced major changes in terrestrial habitats and biodiversity in all the islands. Nearly three centuries of deforestation and land clearing for intensive agricultural use have resulted in the removal or degradation of much of the original vegetation and contributed to the loss of wildlife habitat and the subsequent reduction of species richness. To a lesser extent, urban development, new residential housing, and sporadic hurricanes have further modified natural habitats, while the introduction of exotic (non-native) species -- such as food plants, domestic animals, "weeds" and animal "pests" -- have, in more subtle ways, also altered natural biogeographic patterns.

Uncontrolled livestock grazing, most notably in Antigua-Barbuda, continues to have a detrimental effect on native plant communities. More recently, accelerated tourism development in CEP countries, again most notably in Antigua, has resulted in major bio-physical alterations to the coastline and destruction of coastal and marine habitats (a specific discussion of coastal and marine habitats is found in Section 4 of this report).

The combined result of these impacts is that there now are endemic species in all CEP islands which are considered threatened or endangered. Some of these endemic species and sub-species (either regional endemics or island endemics) are of scientific interest. Many have also become symbols of national pride in their native country -- for example, the endangered St. Lucia Parrot (*Amazona versicolor*); St. Vincent Parrot (*Amazona guildingii*); and two parrots in Dominica, the Imperial Parrot (*Amazona imperialis*) and the Red-Necked Parrot (*Amazona arausiaca*).

The six Environmental Profiles provide an overview of biodiversity and wildlife resources in the six CEP countries and assess the status of threatened and endangered

species to the extent that such information is available. Furthermore, each Profile describes those areas which have been set aside for the protection of wildlife and makes detailed recommendations for additional sites.

ENVIRONMENTAL ISSUE: LOSS OF NATIVE WILDLIFE HABITAT

In CEP countries, habitat reduction is the principal negative impact of development activities on wildlife. Habitat is reduced or destroyed when forested wildlands are converted to other habitat types and land uses.

Unfortunately, the home range requirements and minimum viable population sizes for most wildlife species in these islands are as yet poorly known. The limited land mass of individual CEP countries means that any system of parks or other protected areas (e.g., wildlife reserves) will, of necessity, consist of small, probably isolated "pockets" of more-or-less "natural" habitat surrounded by a matrix of more intensive land uses. If maintained largely as *native vegetation*, such reserves can include sufficient area to protect smaller species of wildlife requiring that particular type of habitat, but this is very much a matter of individual species characteristics.

The importance of *native forest* for wildlife needs to be underscored. Regeneration of forests which favor exotic or pioneering forms of vegetation will be of more limited value in promoting biodiversity. An active program of selective reforestation and natural avian dispersal of native plant species may be more beneficial to the recovery of biodiversity than passive regeneration of forests.

Many so-called marginal lands or former agricultural lands now reverting to scrub (particularly in Antigua-Barbuda and St. Kitts-Nevis) are often considered of minimal economic importance, primarily because they cannot be profitably developed for agricultural production. However, the value of such acreage extends beyond its potential economic

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productivity; most importantly, such lands can be developed as wildlife habitat and for watershed protection. From a biodiversity perspective, these "marginal lands" have considerable potential value and therefore require the development of appropriate management strategies.

Recommendation. Any land use planning efforts in CEP countries should include consideration of biodiversity issues. Restrictions should be placed on the clearing of native forests from agriculturally marginal lands in designated areas and habitat types. Since wildlife values are typically given little consideration in planning efforts, one requirement should be the development of an ecologically-sound, quantitative analysis of current land use practices and trends and their effects on wildlife.

Recommendation. Additionally, CEP governments should carefully examine the recommendations contained in the individual Country Environmental Profiles which specify the most critical areas requiring "protected area" status for wildlife protection and the preservation of biodiversity.

Recommendation. Natural resource data, including base line data, are limited in CEP countries, which makes assessment of biological diversity very difficult. To maintain biodiversity in the face of increasing demands on wildlife habitat for development requires at least a semi-quantitative knowledge of what is needed to maintain species or communities. Priority consideration should be given to those species that are endemic, locally or internationally endangered or threatened, migratory species, or those species legally hunted. Population monitoring needs to be undertaken for critical species.

Since government resources are limited, much of the required research could be carried out with the assistance of local non-governmental organizations. NGOs could assist in collecting data and in providing support for already over-burdened forestry and

wildlife staffs. Building on local research efforts, educational programs for schools could be developed cooperatively by government agencies and NGOs to promote interest in wildlife conservation.

**ENVIRONMENTAL ISSUE:
IMPACT OF BIOCIDES ON WILDLIFE**

The CEP countries are importers of significant amounts of pesticides and herbicides (collectively referred to as biocides). Water pollutants, including biocides, have reportedly caused fish-kills in many CEP countries, and there have been isolated instances of bird mortality associated with agrochemicals applied during planting seasons. However, the effects of biocides on wildlife and the terrestrial and marine ecosystems of these islands remains mostly undocumented and therefore unknown. While there is cause for concern, if only from a human water quality perspective, the dimension of the problem is unclear.

Even if standard toxicological data were routinely available in the Eastern Caribbean, such data by themselves are frequently not sufficient to predict the consequences of releasing toxic synthetic compounds in an ecosystem. Quantitative evaluation of the effects of biocides requires a fairly detailed ecological picture which is rarely available for tropical vertebrates and which is exceedingly labor-intensive to acquire. Furthermore, the consequences for wildlife populations of exposure to sublethal levels of one or more biocides, often in combination with additional environmental stress such as habitat reduction or an unusually dry season, cannot yet be predicted even at the single-species level.

Nevertheless, some broad statements in reference to vertebrate wildlife can be made. Birds are generally more sensitive to biocides than mammals. Fish are frequently, but not consistently, more sensitive than warm-blooded vertebrates. There is also a general developmental hierarchy of sensitivity within each species. Vertebrate embryos, eggs and larvae

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are often more sensitive to toxicants than adults because they are less protected from the surrounding environment, have limited means for detoxifying absorbed substances, and are less able to move away from noxious substances.

Recommendation. A long-term record-keeping capability should be developed by an appropriate government agency in each CEP country for logging and documenting pollutant impacts on wildlife by means of a simple database. Descriptive information, even if unconfirmed by site visits, would provide a perspective on the frequency and distribution of events. The members of environmental NGOs or national trusts could be called upon to assist with monitoring and data collection.

**ENVIRONMENTAL ISSUE:
INSTITUTIONAL CONSIDERATIONS**

Legislative oversight for the protection of wildlife differs among the CEP target countries. A new Wildlife Protection Act was enacted in St. Vincent in 1987 but is undergoing review to correct some oversights. The St. Lucia Wildlife Protection Act of 1980 is comprehensive and effective in curtailing gross violations against threatened or endangered wildlife by hunters and collectors; it could be strengthened by incorporating specific requirements of appropriate international conventions (e.g. CITES). The laws pertaining to wildlife in Antigua-Barbuda and in Grenada are outdated and not effectively enforced; these are being updated in Antigua with the assistance of FAO. A Forestry and Wildlife Act has been in effect in Dominica since 1976, but it lacks regulations. The new (1987) National Conservation and Environment Protection Act in St. Kitts-Nevis includes several sections pertaining to wildlife and the maintenance of biodiversity; however, regulations which would make the provisions of the law fully operational have not been enacted.

Wildlife management is generally an adjunct responsibility of the forestry divisions in CEP governments. However, implementation of specific wildlife protection and education programs, usually requiring specialized training or expertise, is often delegated to persons provided through foreign assistance agencies. Ideally, in each CEP country, an officially recognized, professionally trained wildlife unit should be established within an appropriate government agency (or perhaps two agencies to separate terrestrial from marine requirements), with designated responsibilities for applied research in wildlife management for selected species, as well as long-term monitoring of wildlife populations and habitats.

International trade is a major threat to the survival of many wildlife species in the Caribbean. Many Caribbean countries permit commercial export of wildlife including species listed as endangered by IUCN. The *Convention on International Trade in Endangered Species of Wild Fauna and Flora* (known as CITES) attempts to regulate wildlife trade through a worldwide system of import and export controls for listed species. Of the CEP countries, only the Government of St. Lucia and the Government of St. Vincent and the Grenadines have joined CITES.

Recommendation. Each Profile includes a discussion of steps which should be taken to strengthen, update, or revise existing wildlife protection legislation. Additionally, forestry divisions should seek funding from appropriate donor agencies for staff training, technical support and equipment for wildlife management and education programs. Staff training is needed in such areas as: basic veterinary skills, wildlife management techniques, and natural area interpretation.

Recommendation. The Governments of Antigua-Barbuda, Dominica, Grenada, and St. Kitts-Nevis should become members of CITES, since membership offers access to a wealth of materials, training, and expertise on species conservation and wildlife trade regulation.

**KEY ENVIRONMENTAL ISSUES
RELATED TO BIODIVERSITY AND WILDLIFE**

- SIGNIFICANT LOSS OF WILDLIFE HABITAT AND THE SUBSEQUENT REDUCTION OF SPECIES RICHNESS AS FORMERLY FORESTED WILDLANDS ARE CONVERTED TO OTHER LAND USES.
- LIMITED NATURAL RESOURCE DATA, INCLUDING BASE LINE DATA, MAKING ASSESSMENT OF BIODIVERSITY REQUIREMENTS VERY DIFFICULT.
- FAILURE OF GOVERNMENTS TO CONSIDER BIODIVERSITY ISSUES IN THE PLANNING PROCESS, RESULTING IN INEFFECTIVE RESTRICTIONS ON THE CLEARING OF NATIVE FORESTS AND LITTLE APPRECIATION OF THE VALUE OF AGRICULTURALLY MARGINAL LANDS AS POTENTIAL WILDLIFE HABITAT.
- LACK OF DOCUMENTATION ON THE EFFECTS OF BIOCIDES ON WILDLIFE AND ON TERRESTRIAL AND MARINE ECOSYSTEMS.
- THE NEED FOR PROFESSIONAL EXPERTISE WITHIN CEP GOVERNMENTS AND NGOs FOR THE IMPLEMENTATION OF A FULL SPECTRUM OF WILDLIFE MANAGEMENT ACTIVITIES WHICH, AT PRESENT, ARE LARGELY DEPENDENT ON EXTERNAL TECHNICAL ASSISTANCE PROGRAMS.
- LACK OF INVOLVEMENT OF LOCAL NON-GOVERNMENTAL ORGANIZATIONS IN MONITORING AND DATA COLLECTION TASKS RELATED TO WILDLIFE RESOURCES AND BIODIVERSITY.

3. FRESHWATER RESOURCES and WATERSHED MANAGEMENT

OVERVIEW

Rainfall distribution patterns differ significantly among the six CEP countries. Dominica is the recipient of the most rainfall, as much as 300 inches per year in some areas at high elevations. The island also has the highest ratio of forest cover as a proportion of total area and boasts a total of 365 "rivers" (many of which are really small streams). The country has been *exporting* freshwater for at least ten years.

Antigua-Barbuda, at the other extreme, is characterized by low rainfall (annual average in Antigua, 42-45 inches; in Barbuda, 30-39 inches), a situation made worse by the fact that the amount of precipitation varies sharply between the wet and dry seasons and is highly variable between years. There are no permanent natural lakes or perennial rivers in Antigua or Barbuda. Although much of the country's groundwater is saline, some estimates indicate that 25 percent of Antigua's water supply comes from this source. Approximately 500 ponds are distributed throughout Antigua; the majority are less than one acre-foot in storage capacity and are used primarily for agriculture. Reservoirs serve both agricultural and non-agricultural needs, while many individual residences have cisterns.

The other CEP islands fall between these two extremes.

Rainfall over the main elevated land-mass of St. Kitts is relatively plentiful. The up-lift effect of its central mountain range produces an annual average of 64 inches for the entire island; however, in the driest area, the Southeast Peninsula, precipitation ranges from only 34 to 39 inches per year. Until the early 1970's, groundwater on St. Kitts was virtually a virgin resource as the island's needs were satisfied entirely by surface water from springs and streams. Attention has turned increasingly to the island's groundwater resources as a potential source of supply, necessitated by a growing water deficit and because surface water resources are fully developed. Never-

theless, surface water -- rather than groundwater -- continues to dominate the St. Kitts system.

Nevis is somewhat drier than its sister island, St. Kitts; this is primarily a function of the lower elevation of its central mountain. Annual rainfall varies from approximately 35 inches in the drier, coastal regions of the southeast to a maximum of 100 inches at Nevis Peak, the highest point on the island. Nevis' water needs are met by a combination of surface water, rainwater (collected in cisterns for domestic consumption), and groundwater. The island is drawing increasingly on groundwater (about 80 percent of the public piped supply) because no lakes or ponds and virtually no rivers (only intermittent streams) exist.

Annual rainfall in Grenada varies from about 50 inches in dry coastal regions to 160 inches in the wet central mountains. Surface water from streams, rivers and ponds is the major source of freshwater for both human consumption and agriculture. Surveys have shown that there is good groundwater potential in several areas of the island.

Annual rainfall in St. Vincent proper varies from approximately 67 inches in dry coastal locations to 276 inches in the wet central mountains; in the Grenadines, annual rainfall is variously estimated at between 30 and 54 inches. Surface water (streams, rivers and springs) constitutes the major source of freshwater for human consumption and agriculture in St. Vincent, while household water supplies in the Grenadines depend almost entirely upon rainwater collected and stored in cisterns.

St. Lucia's rainfall is highest in the hilly or mountainous south-central part of the country which normally receives more than 120 inches of rain a year. By way of contrast, most of the valleys and coastal plains are relatively dry, with annual precipitation of less than 80 inches. Cap Estate to the north and Vieux Fort to the south, which are quasi-peninsulas with mostly low relief, both average less than

DEMAND FOR WATER IS INCREASING, PARTICULARLY NEAR URBAN AREAS AND CLUSTERED TOURISM FACILITIES

60 inches and are therefore the driest parts of the country. Rainfall is the primary source of freshwater in the country. However, due to the rugged topography and the absence of lakes and ponds to serve as storage reservoirs, most of this water flows quickly to the sea. Only a small proportion is stored naturally as groundwater because of the generally impervious nature of the volcanic bedrock.

Each Environmental Profile provides detailed information on primary sources of freshwater and on major watersheds and key catchment areas in the CEP target countries.

INCREASED DEMAND, DECLINING QUALITY AND QUANTITY

In all CEP countries, as a result of centuries of agriculturally-based economies, and more recently because of tourism, accelerated land development, road building, and increased demand in virtually all sectors, both the quality and quantity of water resources are declining. Demand is increasing for ever higher rates of water extraction near urban areas and near clustered coastal tourism facilities.

In Dominica, Grenada, St. Lucia and St. Vincent, there is continuing pressure to clear undeveloped forested areas for more agricultural land, primarily as small plots for landless farmers. In countries like St. Lucia, there is also pressure for more irrigation water for downstream farmers in the alluvial valleys and drier coastal plains.

In this context, one of the most critical problems facing the higher-elevation CEP islands is the need for improved management of the surviving, increasingly degraded forested lands and steeper, upland watersheds. The issue is considered critical because almost all water consumed or used in these islands is the run-off product of catchment areas in the upper reaches of major river basins, most of which have headwaters in each island's central, forested mountain core.

In Antigua-Barbuda, because water is a limited resource, water-related issues are increasingly seen as critical factors in shaping national policies -- particularly in light of the water demands of a rapidly expanding tourism-based economy. Droughts occur every 5-10 years and are a regular, if unpredictable, feature of the environment. When several low-rainfall years occur consecutively (as in 1964-68 and 1983-84), the country faces critical water shortages. In the 1983-84 drought, water had to be imported from neighboring islands.

ENVIRONMENTAL ISSUE: WATERSHED MANAGEMENT AND PROTECTION OF THE WATER SUPPLY

Upper slope catchment and forest reserves, particularly in the higher-elevation CEP islands, are not adequately protected against deforestation and other, often illegal, land uses. Additionally, there has been very little expansion (by formal land acquisition and protection) of areas previously identified as important for water production, further placing at risk water supplies required for downstream consumers. Present legislative measures and land use controls, where private land is involved, have also proven to be generally ineffective.

Government ownership of some key water catchments at higher elevations in mountainous interiors should, in theory, enable most of the catchments above water supply intake points to be kept unoccupied and free of cultivation, agricultural chemicals, and all settlement. Unfortunately, CEP governments have found it difficult to exercise authority in most "protected" areas sufficient to prevent non-compatible development activities, including surreptitious timber harvesting, charcoal production, and other smaller-scale illicit extraction of forest resources. At lower elevations, land tends to be privately owned; here, too, land use control measures have generally not been adequate to ensure protection of water supplies.

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(NOT ONLY
TECHNICAL)
SOLUTIONS**

Recommendation. A comprehensive national water policy and development plan for water resources and watershed management, including land acquisition programs to protect and maintain water supplies, needs to be developed by the government of each CEP country.

Perhaps nowhere is the need for a national water policy more urgent than in Antigua-Barbuda where water is a very limited resource. In that country, most of the more recent improvements in the supply and delivery of municipal water were an offshoot of the severe drought of 1983-84. It would be unfortunate if another such crisis is required before the country's critical water situation is fully assessed and integrated as an essential part of national economic and development planning. Water policy planning in Antigua-Barbuda needs to include a serious assessment of the growing water demands of the country's lead economic sector -- tourism -- in view of limitations on the availability of water.

Recommendation. The difficult political issues, such as a solution to the problem of illegal squatting and land clearing in key watersheds, need to be addressed by CEP governments. In fact, many of the difficulties in dealing with water issues in CEP countries appear to be primarily social and political, rather than technical.

**ENVIRONMENTAL ISSUE:
EROSION AND DOWNSTREAM SEDIMENT
POLLUTION AND FLOODING**

Excessive silt and sediment are being eroded in rainy seasons from carelessly, often illegally, devegetated upland areas and carried away by extremely rapid run-off. The silting-up of dams and streams due to soil erosion in catchment areas and the consequent loss of water quality and storage capacity at water production facilities is a growing problem in CEP countries. Additionally, agricultural encroachment in catchment areas used for drinking water intakes is causing increasing

concern about water contamination from agrochemical, automotive, animal, and human wastes.

Devegetated areas also soak up less water, and paved or cleared areas permit more direct sheet run-off of rainwater. This results in less water infiltrating the soil to underground storage and instead produces immediate, more rapid run-off downslope. As a result, areas normally immune from floods are increasingly subject to inundation and damage to roads and bridges following heavy rains.

Recommendation. Nearly all land use activities are potentially harmful to potable water supplies within steep-slope water catchment areas, while illegal clearing, road building, and farming continue to place vital catchments at risk. It is therefore important that the public authority responsible for water distribution in each CEP country adopt a more aggressive program of identifying and protecting the most productive water resource areas. Government foresters, planners, and decision-makers must then incorporate this information into national planning, land use zoning, and development permitting policies in order to ensure that future water supply demands and potable water quality requirements are met.

Recommendation. In many CEP countries, a significant amount of the watershed catchment area needed for the longer-term maintenance and expansion of water systems does not fall within the boundaries of currently designated "protected areas" under the control of government authorities. In fact, in some, a large proportion of water catchments falls under private ownership, protected mostly by present day inaccessibility. Inevitably, it will become imperative for use-limiting restrictions and incentives to be introduced to limit the development of private lands within all catchment areas. Ideally, these lands should be acquired by governments for protection. Either alternative will be expensive, although steps to limit the type of development activity in catchments will cost less than fee simple acquisition or condemnation and adjudication. Nevertheless,

securing the funds or other resources necessary for limiting development or for compensation to private landowners should be actively pursued. Over the long term, doing so will most likely prove to be the most cost-effective approach for ensuring a safe and reliable water supply for CEP island residents.

**ENVIRONMENTAL ISSUE:
MINIMIZING LEAKAGE AND WASTE
IN THE DISTRIBUTION SYSTEM**

CEP countries report varying degrees of water loss through leaks in the distribution network. Often projections for future water supply needs are made on the assumption that these losses will be traced and that conservation measures will be implemented. If this is not done, then there is a real possibility of serious shortfalls in water supplies in CEP countries.

Recommendation. Accelerated programs of leak detection and repair are needed in CEP countries. Continuing repair work needs to be treated as an ongoing maintenance requirement since leaks are a recurring phenomenon. Donor assistance may be necessary to carry out this recommendation.

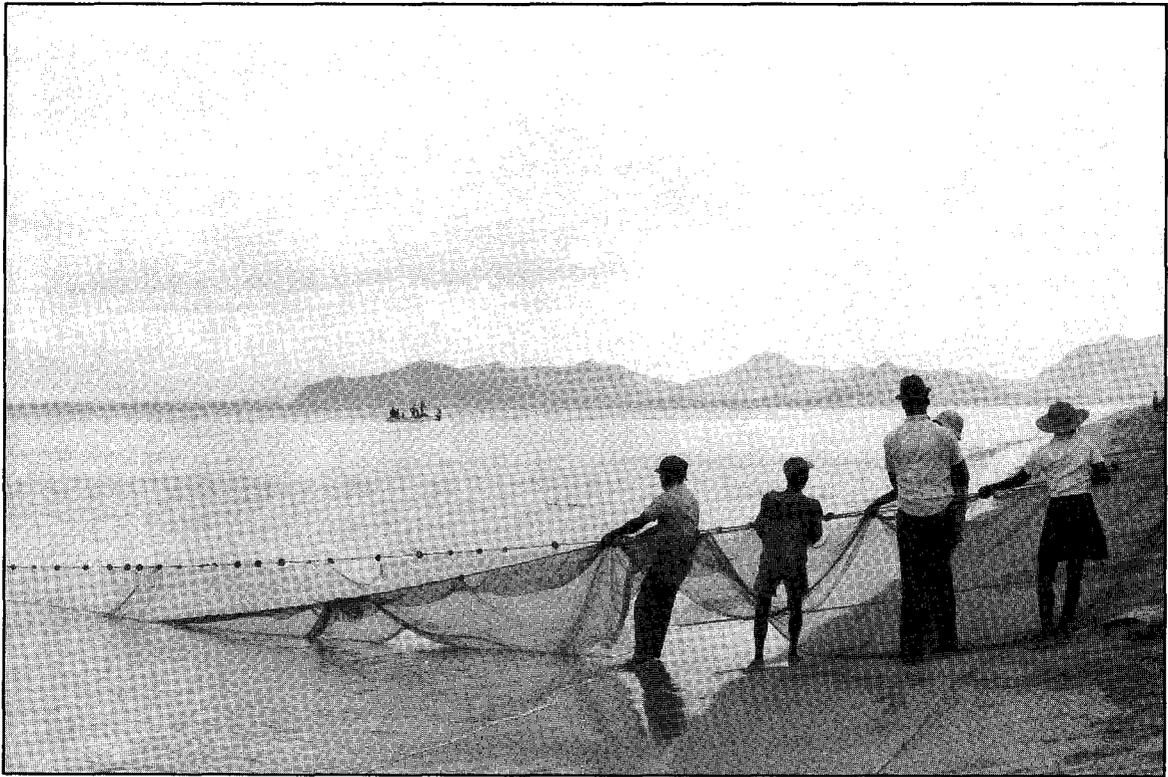
**ENVIRONMENTAL ISSUE:
GROUNDWATER CONTAMINATION**

There is a growing interest in and reliance on groundwater in some CEP countries, for example, in St. Kitts and Nevis. Considerable attention to the development of groundwater resources has gone forward in that country in the absence of an overall master plan for water or even an economic analysis to determine the optimal ratio of surface to groundwater exploitation. Such planning considerations are particularly important in view of the higher overall costs of groundwater development -- i.e., both capital and recurring pumping costs are involved while, because of gravity flow, surface water use primarily involves only capital expenditure.

Recommendation. In order to make more informed decisions about allocations of surface and groundwater resources, base line hydrological data need to be collected and analyzed. Additionally, in light of groundwater contamination concerns, attention must be directed to analyzing and correcting existing potable water quality problems and to ensuring that future supplies (i.e., the aquifers) remain safe. A master plan for future water (and sewage) management is advisable, with a firm schedule for routing updates and revisions reflecting previously unanticipated development activity.

**KEY ENVIRONMENTAL ISSUES RELATED TO
WATERSHED MANAGEMENT AND
PROTECTION OF THE WATER SUPPLY**

- INCREASED DEMAND FOR A RELIABLE SOURCE OF SAFE DRINKING WATER, PARTICULARLY NEAR URBANIZED AREAS AND CLUSTERED TOURISM FACILITIES, AT THE SAME TIME THAT PRESSURES TO EXPAND NON-COMPATIBLE LAND USES TO CRITICAL WATER CATCHMENT AREAS HAVE ALSO INCREASED.
- THE FAILURE OF LEGISLATIVE RESTRAINTS AND EXISTING LAND USE CONTROL MEASURES TO FULLY PROTECT UPPER WATER CATCHMENTS AND FOREST RESERVES AGAINST DEFORESTATION AND ENCROACHMENT.
- LIMITED EXPANSION OF PROTECTED WATERSHEDS BY PLANNED PROGRAMS OF LAND ACQUISITION.
- THE RELATIVE INEFFECTIVENESS OF LAND USE CONTROLS IN PLACING RESTRICTIONS ON THE USE OF PRIVATE LANDS WITHIN CATCHMENT AREAS, A PARTICULARLY CRITICAL ISSUE SINCE A SIGNIFICANT PROPORTION OF THE CATCHMENT AREA NEEDED FOR THE MAINTENANCE OF WATER SYSTEMS IS UNDER PRIVATE OWNERSHIP.
- THE DIFFICULTY OF FINDING SOLUTIONS TO WATER-RELATED PROBLEMS WHEN THE ISSUES INVOLVED ARE POLITICAL AND SOCIAL -- AS WELL AS TECHNICAL.
- FAILURE TO TIE METERED WATER INCOME TO REVENUE REQUIREMENTS FOR WATERSHED MANAGEMENT AND ACREAGE EXPANSION.
- THE NEED FOR MORE COMPREHENSIVE WATER POLICIES AND THE INTEGRATION OF WATER SUPPLY REQUIREMENTS INTO NATIONAL DEVELOPMENT PLANNING AND DECISION-MAKING.



Bringing in the nets, Pinneys Beach, Nevis.

4. COASTAL AND MARINE ENVIRONMENTS

COASTAL ECOSYSTEMS ARE THE FRAGILE INTERFACE BETWEEN THE LAND AND SEA

SYSTEM PRODUCTIVITY AND CRITICAL HABITATS

Three habitats -- mangroves, coral reefs, and seagrass meadows -- are of critical importance in nearshore tropical marine environments. There are many direct links between the extent and health of these habitats and the productivity of inshore fisheries. The majority of bottom-dwelling fish species in the shallow nearshore waters of the Eastern Caribbean (more than 300 species, of which an estimated 180 species are landed for human consumption) are associated with coral reefs as adults.

Many of these reef fishes, including species important in local fisheries, also utilize mangrove swamps and/or seagrass beds as "nursery" habitats for post-larval juvenile stages of growth. Commercially important invertebrates such as conch and lobster also are found in these habitats as juveniles and in some cases as adults.

Seagrass beds provide significant energy inputs to the reef system by serving as feeding grounds for adult reef fishes. Mangroves and seagrass beds also serve important functions in protecting coral reefs by filtering out sediments from land run-off, and reefs in turn protect mangroves, grass beds and beaches from the destructive effects of storm-driven waves.

For the most part, only a generalized distribution of these primary marine habitat types could be identified for the six target countries. In general, there is a lack of detailed information on marine bottom communities, while comprehensive marine benthic surveys and mapping have been carried out in only a few locations. Much of the coastline and shelf area of the CEP countries is unsurveyed and generally unevaluated.

Additionally, the complex -- and therefore easily disturbed -- nature of the marine environment is not well understood, de-

spite the fact that marine and coastal habitats are areas of:

- high energy,
- high risk, and
- *intense resource use conflict.*

They are also the least known and probably the most poorly managed of insular ecosystems in the Eastern Caribbean. Additionally, perhaps as high as 80 to 85 percent of the problems affecting the marine environment and its associated ecosystems originate from land-based sources.

HISTORIC USE OF THE COASTAL ENVIRONMENT

Major marine-based industries -- e.g., fisheries, sea transportation (upon which the agricultural sector has always been dependent), sand mining for construction aggregate, and, more recently, tourism -- have played an important role in the development of the CEP countries. Major population centers in all six nations have been located in coastal areas, a settlement pattern reflecting their more rugged interior terrain (with the exception of Antigua) and their collective dependence on marine transportation. Along selected coastlines in each country, mangroves and coralline structures have been important (although too often unrecognized) controls of shoreline erosion. Fisheries have provided the major source of local animal protein for West Indian populations, and the use of mangrove wood for fuel is a well-established practice.

But neither this tradition, nor indigenous fisheries, nor even the importance of natural harbors has stimulated national commitments for improved understanding and management of coastal resources. Historically, the importance of these resources has not been widely appreciated, perhaps because traditional uses have been partitioned among different resource users in different sectors. More recently, however, with the emergence of tourism as a key economic sector and with its heavy re-

THE COASTAL ZONE IS THE MOST HEAVILY POPULATED AND HEAVILY UTILIZED AREA IN ALL CEP TARGET COUNTRIES

liance on the coastal environment (especially beaches), there is a new incentive for developing a broader, more holistic management approach for this important resource sector.

ENVIRONMENTAL ISSUE: MANAGEMENT OF FISHERIES

The paucity of accurate information on landings, fishing effort, exploited stock and the multi-species nature of reef fisheries makes it difficult to estimate yields for Caribbean nearshore fisheries and to develop appropriate resource management programs using such estimates. Recommendations in fishery development proposals are often based on guesswork by experts or rely on abundance or yield estimates determined by extrapolating results of experimental fishing or visual censuses of known smaller areas to larger oceanic areas. These procedures may provide a useful starting point, but there are many uncertainties and difficulties of interpretation inherent in such methods. The wide range in published estimates of maximum sustainable yields for nearshore fisheries in the Eastern Caribbean illustrates the inadequacy of available information.

It often appears that more attention is devoted by OECS governments to the development of the fishing industry than to the management of the resources upon which the industry is based. Nevertheless, a current emphasis on improving harvest capabilities for offshore resources may be an effective short-term means of reducing pressure on nearshore stocks that have been identified as over-exploited. At the same time, the need for effective management of deepwater resources and shared stocks cannot be ignored, but this can only be accomplished at a regional (and in some cases hemispheric) level.

Recommendation. The working principle for fishery managers should be that most fisheries, even those that are artisanal and relatively low-technology, tend towards over-exploitation and excessive fishing effort if

not regulated. Fishery management plans should be oriented toward conserving the resource and attempting to optimize its long-term returns, rather than toward the classical objective of maximizing long-term catches. Management efforts need to focus on stabilizing the trend of declining landings and optimizing the harvest of species important to local nutrition and tourism.

Recommendation. Given the scarcity of economic resources and the generally poor performance in the tropics of traditional stock assessment procedures, CEP countries should consider a strategy of *adaptive management* of fisheries, i.e., implementation of common sense, trial and error management measures while simultaneously emphasizing monitoring of the fishery to evaluate the impact of those measures.

Recommendation. At the same time, a priority consideration for improving fisheries management programs in the Eastern Caribbean should be the expansion of existing data collection systems, e.g., by implementing sampling routines for minor landing sites; purchase slips for middlemen, hotels and restaurants; enforcement of export licenses; logbooks for large offshore boats; and monitoring strategies for foreign fishing.

Recommendation. Where appropriate, levels of fishing effort should be regulated by control measures such as gear restrictions, closed areas, closed seasons, and limited entry and economic limitations such as user fees. Provision for such measures has been made in the harmonized fisheries legislation of all OECS countries, but improved *implementation and monitoring* are required.

ENVIRONMENTAL ISSUE: COASTAL ZONE MANAGEMENT

The coastal zone is the most heavily populated area in all CEP countries and figures prominently in the recreational pursuits of citizens and visitors alike. Almost all industrial

activities are sited in the coastal zone, while the emerging tourism sector is dependent upon the natural features and built infrastructure located within the coastal environment.

Significant environmental problems affecting the coastal zone were identified in the course of preparing the Environmental Profiles, including:

- Accelerated "piecemeal" development of the coastal zone, with minimum consideration of the *cumulative* effects of coastal development projects and activities;
- Unregulated removal of sand and vegetation in the coastal zone resulting in increased rates of coastal erosion and elevated risks of storm damage;
- Increasing threats to marine life and marine ecosystems as a result of unregulated development activities not only in the coastal zone but in upland watershed areas;
- Failure of artificial barriers to withstand the erosive force of sea swells during periods of high wave activity;
- In the absence of enforced coastal set-back requirements, increased risk of coastal flooding and destruction of structures in the coastal zone during periods of high tide and heavy sea swells;
- Significant habitat loss in coastal environments, including indiscriminate cutting of mangroves for construction of shore facilities (even though these systems are known to control erosion and provide nurseries for commercially important fisheries) and modification or destruction of salt ponds (even though their function of controlling sedi-

ment loading to reefs and seagrass habitat is well established);

- Increased water quality degradation, in the absence of effective coastal resource management policies combined with accelerated urbanization and development of tourist facilities in coastal areas.

Adverse impacts associated with *ad hoc*, unregulated development in the coastal zone of all CEP countries have been documented. While the tendency has been to focus on such problems *selectively*, their increasing *cumulative* visibility reflects the absence of comprehensive development control guidelines and policies committed to maintaining the quality of coastal resources. This, in turn, re-confirms the need for a full-fledged coastal zone resource assessment and management planning strategy.

Recommendation. An evaluation and design project for a coastal zone management program for all CEP target countries should be implemented to provide overall guidance for the eventual development of a CZM program. A useful island model with over a decade and a half of adaptive testing is provided by the U.S. Virgin Islands, a neighboring insular area which has had to face similar coastal-intensive development issues.

Oversight authority for CZM programs should reside in one agency, although responsibility for specific components almost certainly would have to be an interministerial undertaking. Procedures for better coordination of multi-agency responsibilities for coastal resources and wetlands must also be provided.

The issue focus of country-specific CZM programs might include the following:

- procedures to ensure water quality for multiple uses, e.g., fisheries habitat, human contact, and waste disposal;

EMPHASIS SHOULD NOT BE ON REGULATION ALONE . . . A CZM PROGRAM WHICH INCLUDES EDUCATION, INCENTIVES, TECHNICAL ASSISTANCE, COST-SHARING, AND RESOURCE USER COOPERATION WILL BE MORE EFFECTIVE THAN ISOLATED RULES AND PENALTIES

- port development and improved port management;
- construction and maintenance of sea defenses;
- implementation of impact assessment procedures for development projects in the coastal zone;
- a policy on oil spills and dumping of hazardous wastes;
- management of protected marine areas;
- waterfront renewal; and
- increased recreational opportunities, including marine tourism.

Consideration needs to be given to designing a permit system targeted at coastal developments, legislation to support a CZM program, monitoring and enforcement procedures to regulate development in the coastal zone, training and other assistance for appropriate government staff, and a public education campaign focused specifically on coastal environments and their importance to national development. Emphasis should not be on regulation alone, as experience suggests that a program emphasizing education, incentives, technical assistance, cost-sharing, and cooperation will be more effective than a proliferation of rules and penalties.

Recommendation. Control of upland erosion and sediment discharges and appropriate treatment of sewage and other discharges with high nutrient loads is vital to protect coastal water quality, public health and the integrity of coral reefs. Steps need to be taken to curb upland erosion and sources of sediment loading (such as construction sites) which impact on the marine environment. The extent of non-point source pollution, particu-

larly from agricultural run-off, needs to be assessed and steps taken to protect water quality.

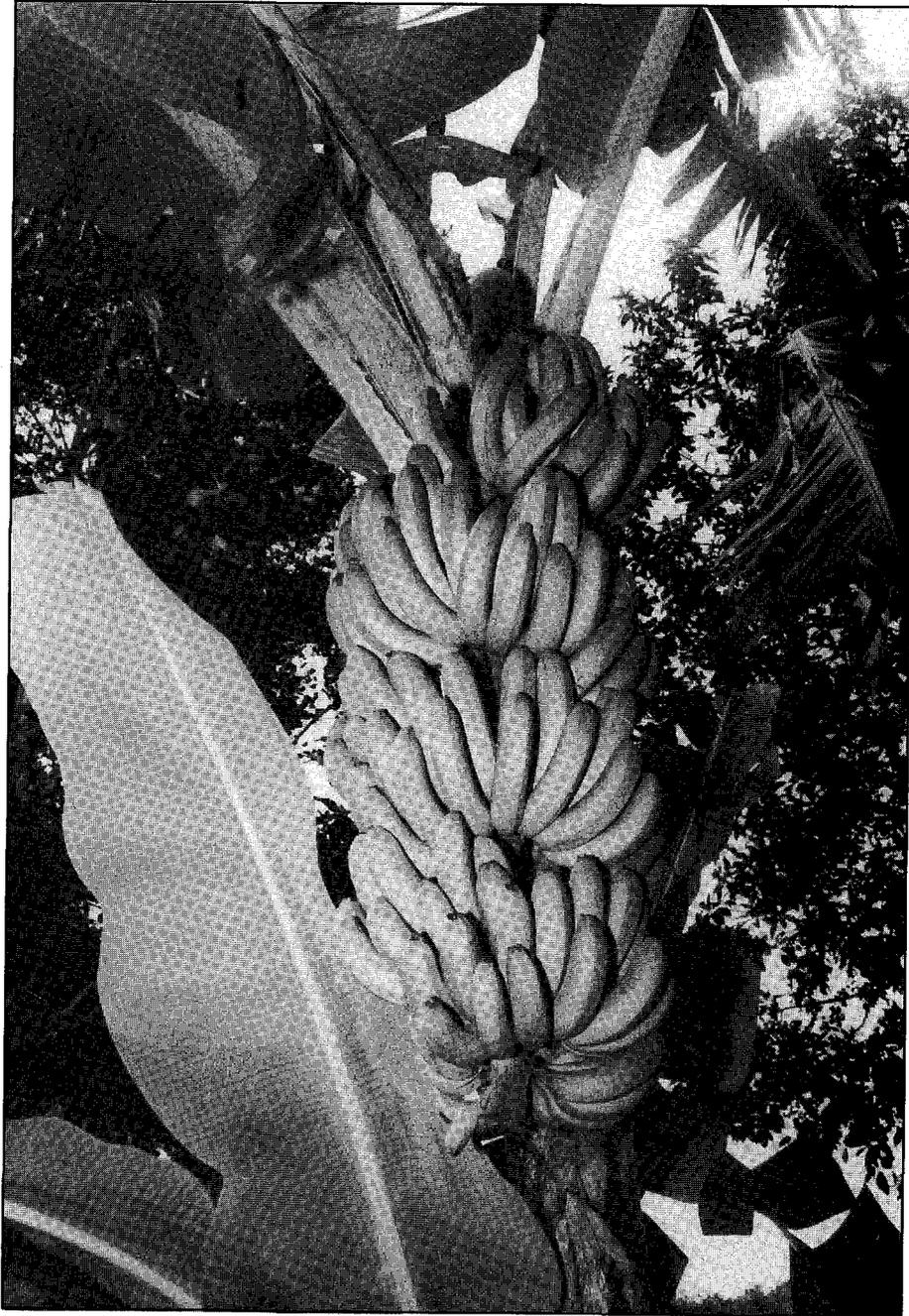
Recommendation. A program to monitor marine sand resources and commercial exploitation of these resources needs to be put in place in all CEP countries. Up-to-date assessments of the overall impact of sand mining on the rate of beach loss, particularly at critical sites, should be available to government resource managers, who need to make periodic judgments as to where continued sand removal will have the least detrimental impact and is most compatible with current site utilization. Priority, erosion-prone areas where sand removal will be absolutely prohibited should also be designated and then monitored, along with areas of lesser concern where regulated sand removal can be carried out at a pre-determined and managed level. Fees for removal need to be set, pegged to actual volumes extracted.

Recommendation. An environmental impact assessment should be required for all large coastal development projects, whether public or private sector-derived. The cumulative effects of such projects needs to be assessed rather than a case-by-case analysis of each project in isolation. A formal evaluation process should be established whereby appropriate government agencies have an opportunity for input into review procedures.

Recommendation. Where funding is available from donor agencies, CEP countries should consider development of a marine resource assessment and development plan, in the same way that such documents have been developed for other sectors such as forestry or agriculture. Primary focus should be on the growth potentials represented by the nation's marine resources, with identification of activities -- including traditional uses -- that will contribute to the sustainable development of these resources. A national focus is preferred to the present site-by-site development approach currently dominant in the CEP countries.

KEY ENVIRONMENTAL ISSUES IN THE COASTAL/MARINE SECTOR

- LACK OF DETAILED INFORMATION ON CRITICAL MARINE HABITATS FOR USE IN DECISION-MAKING.
- THE NEED FOR A BETTER BALANCE BETWEEN THE PRESSURE TO DEVELOP THE FISHING INDUSTRY AND THE NECESSITY FOR IMPROVED MANAGEMENT OF THE RESOURCES UPON WHICH THE INDUSTRY IS BASED.
- ACCELERATED "PIECEMEAL" DEVELOPMENT OF THE COASTAL ZONE WITH MINIMAL CONSIDERATION OF THE CUMULATIVE IMPACTS OF DEVELOPMENT ACTIVITIES AND PROJECTS.
- SIGNIFICANT LOSS OF CRITICAL COASTAL HABITATS SUCH AS MANGROVES AND CORALLINE STRUCTURES THAT SERVE AS IMPORTANT CONTROLS OF SHORELINE EROSION.
- INCREASED WATER QUALITY DEGRADATION, ASSOCIATED WITH ACCELERATED URBANIZATION AND TOURISM DEVELOPMENT IN THE COASTAL ZONE.
- UNREGULATED REMOVAL OF SAND AND VEGETATION IN THE COASTAL ZONE, RESULTING IN INCREASED RATES OF COASTAL EROSION.
- INCREASED RISK OF COASTAL FLOODING IN THE ABSENCE OF ENFORCED COASTAL SET-BACK REQUIREMENTS.
- ABSENCE OF A STANDARDIZED REQUIREMENT FOR ENVIRONMENTAL IMPACT ASSESSMENTS OF ALL LARGE COASTAL DEVELOPMENT PROJECTS.
- LACK OF COMPREHENSIVE DEVELOPMENT CONTROL GUIDELINES AND POLICIES COMMITTED TO MAINTAINING THE QUALITY OF COASTAL RESOURCES.



Bananas or "green gold" are the mainstay of agricultural output in the Windward Islands of Dominica, Grenada, St. Lucia, and St. Vincent.

5. AGRICULTURE

PROFILE OF THE AGRARIAN SECTOR

Agriculture has long been the mainstay of the economies in CEP countries. Only in Antigua-Barbuda has tourism replaced agriculture as the lead economic sector. In that country, the previously dominant sugar industry collapsed in 1967; although a revival was attempted in 1972, it was abandoned after two years of low rainfall and poor sugar prices. Today tourism accounts for approximately half of Antigua's Gross Domestic Product and employment. In only one other CEP country -- St. Lucia -- is tourism seen as a rival to agriculture in economic importance.

Historically, in the Eastern Caribbean, agriculture has been the most productive sector of the economy since the first settlers cleared small patches of land for subsistence crops. In the colonial period, early export crops included cotton, tobacco, cocoa, coffee, and ginger, followed by the emergence of sugar cane -- grown for the production of both sugar and rum -- as the dominant plantation crop. The sugar industry has since failed in all the CEP islands with the exception of St. Kitts, where sugar cane has been grown continuously since the second half of the seventeenth century and where cane fields continue to monopolize the landscape.

In the Windward Islands of Dominica, Grenada, St. Lucia and St. Vincent, bananas have replaced sugar as the major export crop. Dominica, for one, had experimented for a time with other crops (for example, in the 1920's, Dominica was the world's largest producer of limes), and Grenada's continued export of nutmeg and mace has earned it its reputation as the "Isle of Spice". Nevertheless, by the second half of the twentieth century, bananas had surpassed all other export crops in influence in the Windwards, particularly as large fertile valleys, formerly under cane cultivation, were released for new agricultural pursuits.

However, the modern era of banana growing is at serious risk in the Eastern Caribbean. This export crop is bought exclusively in the Windwards by Geest Industries, which guarantees purchase on a fixed price basis. This transnational corporation in turn sells its produce almost entirely in the United Kingdom, where it enjoys preferential market treatment. Without such market protection, it is quite likely that the Windward Islands would lose much of their share of the international market to other banana-exporting countries that produce cheaper bananas of a consistently higher quality. Forthcoming agreements among the member countries of the European Economic Community may remove existing tariff and non-tariff barriers, a step which could devastate the banana industry in Dominica, Grenada, St. Lucia and St. Vincent unless new preferential arrangements are made with the United Kingdom.

Agricultural production in the Eastern Caribbean has historically comprised two distinct farming systems: (1) the export-oriented plantation system, characterized chiefly by monocultures on large estates, and (2) the small farmer agricultural system, often subsistence-based and developed on the more marginal agricultural lands.

Many of the difficulties facing the agricultural sector in the CEP countries have their roots in the legacy of the colonial past and, in particular, in its plantation-based economic structure. Under colonial rule, investment in agricultural production, infrastructure, technology, and marketing focused almost exclusively on the traditional export crops. Small farming, on the other hand, functioned as a secondary activity (at least in the view of the colonial authorities) on marginal lands at the fringes of commercial plantations. This secondary system lacked an adequate support structure to assist farmers in significantly increasing productivity.

However, the large estate system has declined since the end of World War Two, and it has become increasingly evident that the now

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CONTINUE TO
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IMPORTANCE
OF BANANAS
TO THE
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dominant small farm system (and thus the broader national economy) has suffered and will continue to suffer from this history of neglect. Poor cultivation practices, low productivity, soil losses, and a continuing conversion of good agricultural land to other uses remain entrenched features of the existing system.

On a more positive note, the small farm and other rural resource systems that have emerged in the last 40 years are characterized by a considerable degree of crop diversity, occupational multiplicity, and self-reliance. These features remain largely intact to the present and will contribute to efforts to develop a productive and thriving rural sector.

With the growing importance of the small farm system, the challenge ahead will be to improve the institutional structures, managerial performances, and technical expertise necessary to promote and support agricultural productivity and expansion. Concurrently, it is important to reverse existing patterns of resource degradation, now evident in the agricultural sector in all CEP countries.

**ENVIRONMENTAL ISSUE:
THE ENVIRONMENTAL IMPACTS OF
BANANA CULTIVATION**

Despite its dominant role in the overall economic development of the Windward Islands, banana cultivation comes with an environmental price tag which should not be overlooked.

In the first place, most of the marginal agricultural areas now supporting banana production have steep slopes which, if cropped at all, should be planted only with tree crops to ensure against soil erosion. The banana, an herbaceous semi-perennial species, has a very shallow rooting system and no tap root; therefore, erosion can be significant as the roots do little to stabilize the soil.

This is less of a problem where ground provisions or other crops are interplanted with

bananas, for example, on many small family farms. But, in too many instances, steep slopes are the focus of commercial banana growers seeking short-term profits with little regard for long-range impacts.

Furthermore, the ongoing destruction of forest cover as more profitable banana cultivation has expanded onto forested lands is slowly altering the hydrological regime of affected islands. Without forest cover to slow the downslope overland run-off of water, less water is infiltrating the ground, more water is running off, and less is stored within the natural water system or aquifer. One result is a lowered base flow in streams during dry periods, a development which reduces water flow from some catchments and produces high sedimentation rates from accelerated erosion in unprotected upland areas.

Finally, single crop farming, as in the case of bananas, exhausts the natural nutrients in the soil; these are only marginally replaced by the use of artificial fertilizers because in the wetter climates of the Windward Islands much of the fertilizer input is lost through leaching. Monocrop agriculture also is vulnerable to pest infestation and requires more pesticide use to control disease. Single crops also tend to lead to reduced biodiversity and increased dominance by a few species.

Recommendation. Present CEP governmental policies calling for diversification to a broader agricultural base need to be encouraged. Agricultural diversification not only protects the country economically, but it can help to address some of the environmental problems associated with banana cultivation, particularly in hillside areas. Agroforestry programs also need to be encouraged as they can provide a variety of products (e.g., cash crops, tree crops, food crops, fuelwood, fodder), thus making them well suited for national programs of agricultural diversification and soil conservation.

In general, one important long-term goal for the banana-producing CEP countries

**THE
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RESOURCE
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METHODS**

should be the promotion of policies which diversify the mix of crops being cultivated by small farmers, moving from the current emphasis on annual subsistence and semi-perennial export crops to a pattern incorporating tree crops capable of providing more permanent cover of land areas on steep, erosion-prone slopes. To make such cropping patterns profitable, appropriate input pricing, extension services, soil conservation investment subsidies, and marketing assistance have been suggested as desirable modes of government and NGO intervention.

**ENVIRONMENTAL ISSUE:
EROSION RELATED TO OVERGRAZING**

Soil erosion and general land degradation resulting from overgrazing of livestock have been significant problems in selected areas of CEP islands -- for example, Carriacou in Grenada, the Vieux Fort area of St. Lucia, the southern portion of Nevis, and throughout Antigua and Barbuda. The difficulty of implementing more effective livestock management policies in these areas is illustrated by a long-standing tradition in Carriacou known as the "let go" season. When gardens are being cultivated from June to December, animals remain fenced or tethered. But after the harvest, when vegetation on the island generally becomes drier, animals are permitted to roam and browse without restriction. Such grazing practices over time accelerate land deterioration, deforestation, erosion, and general denudation of the resource base.

Recommendation. A renewed focus on the small farmer as an active participant in the resource management system could help to improve environmental management practices in the agricultural sector. It is important that the entrepreneurial spirit that has led to the establishment of small farms, many of which combine cultivation with livestock raising, be supported and that farmers receive the help required to improve their resource management methods.

In this context, the introduction and application of agroforestry systems for small farmers is being promoted as one strategy for more effectively controlling erosion problems in CEP countries. Locally-based research is needed to identify agroforestry systems most applicable to each country and specific erosion-control requirements. Such systems might include forage banks, windbreaks, living fences, and intercropping with fruit trees.

**ENVIRONMENTAL ISSUE:
LAND TENURE AND THE ENVIRONMENT**

Many small farmers in CEP countries question the relevance of incorporating soil and water conservation practices as part of their cultivation methods since so many lack clear title to the acreage they farm or their long-term land tenure may not be guaranteed. Furthermore, the long-established tradition of jointly held "family lands" is a systemic problem which continues to perpetuate patterns of insecure land tenure and over-exploitation of small farms under temporal control. The uncertainties associated with land tenure therefore act as a subtle barrier to restrict commitment by small farmers to overall land conservation, since the benefits of doing so are expensive and may not accrue to the farmer in the future.

The problem is intensified by national government policies which -- within the surviving colonial framework of emphasis on large, export-oriented, estate agriculture -- have tended to overlook the small farm sector. The consequences of small farm underdevelopment are important not only economically but environmentally. Without adequate control, support and management from central government agencies, combined with the implications of land tenure insecurity, the small farm system has developed with a high degree of autonomy and without a proper regard for national concerns or goals regarding erosion control, deforestation, or soil conservation.

Finally, in a related issue, it is ironic that while land hunger is a widespread regional

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IN THE
FUTURE**

problem, many CEP countries are experiencing periodic shortages of agricultural labor. Many residents, particularly young persons, are increasingly drawn to the urbanized areas -- usually the capital city -- where they hope to earn a more secure income with better working conditions.

Recommendation. CEP governments need to expand agricultural extension services to small farmers, emphasizing both productivity and education and training programs in soil and water conservation techniques.

Recommendation. CEP governments should consider more innovative and near-term rewards, incentives, and subsidies to encourage the practice of environmentally-sound land management by small farmers, many of whom will continue to lack a long-term claim to their land. Also needed are low-cost loans for farmers or even public sector grant and project funds for the construction of bench terraces, grass and stone barriers, contour drains, stepped waterways, windbreaks, and other soil conservation techniques which are often very labor intensive.

**ENVIRONMENTAL ISSUE:
THE USE OF AGROCHEMICALS**

At present, the CEP countries lack good, consistent data on the types and quantities of agrochemicals imported and applied in the field. There are no (or very limited) in-country capabilities for sampling and analyzing pesticide residues and for on-going monitoring of the levels of these chemicals in drinking water, crops, soils, wildlife, or human tissues. Decision-makers therefore have little quantitative data on which to base decisions.

Pesticide Control Boards, where they are functional, lack pesticide inspectors, and all CEP countries lack adequate numbers of trained personnel and equipment to implement systematic pesticide monitoring programs. Farm workers, for example, are generally not

monitored with any regularity for the effects of pesticide exposure -- even though there is a relatively high level of misuse with farmers, using backpack sprayers, often seen wearing inadequate clothing for skin protection and no face masks.

CEP countries have enacted pesticide control legislation (often as long ago as ten years or more). Too often, however, such legislation has not been aggressively or efficiently implemented or lacks regulations which reflect new chemicals introduced, levels of safe tolerance, and modern application methods. Pesticide Control Boards in many CEP countries are inactive as operational bodies or do not exercise sufficient authority for monitoring and regulating the importation, sale, and distribution of agrochemicals.

Recommendation. CEP governments need to establish procedures for the regular testing of potable water and food stuffs for pesticide residue (with special attention to groundwater). Laboratory and personnel capabilities for water quality monitoring will have to be upgraded, and consideration should be given to creating a central environmental laboratory facility in each country serving various ministries and functions (including pesticide monitoring).

For more specialized kinds of testing procedures, especially in the case of pesticides, other toxic chemicals, and dangerous pathogens, an expanded regime of analytical services needs to be developed by the Caribbean Environmental Health Institute (CEHI) in St. Lucia, to accommodate the needs of the region.

Recommendation. Extant pesticide legislation needs to be more effectively implemented, and up-to-date regulations need to be put in place and conscientiously enforced. Pesticide Control Boards need to be reactivated where necessary, and all such boards need to be given sufficient authority and personnel to enable them to actively monitor and

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URGENTLY
REQUIRED**

regulate agrochemical importation, distribution and utilization.

Recommendation. Agricultural extension agents and representatives of farmers' organizations should be trained to certify farmers and other users in the safe use and application of agrochemicals. A pesticide application certification process for small farmers should be set up in CEP countries, using some combination of the extension agent system and local farmers' associations.

**ENVIRONMENTAL ISSUE:
LAND USE AND LAND MANAGEMENT**

Remaining prime lands in CEP countries must satisfy national needs for food, housing, recreation, waste disposal and many other human activities. And they must provide these things on a continuing basis for expanding populations of residents and visitors if these countries are to remain both ecologically and economically viable and competitive. In small islands with limited physical space, planning for the allocation and use of available land for various national purposes is particularly critical to orderly, efficient and truly sustainable development.

In the last two decades, prime, highly productive agricultural land in many CEP countries has been placed at risk in the face of alternative usages which tend to produce a greater economic return. In St. Lucia, for example, OAS estimates that slightly over 1,000 acres of good agricultural land have been taken out of production to accommodate road construction, urban activities, and village expansion. At the same time, many areas unsuitable

for cultivation in CEP countries are being farmed, while more suitable agricultural lands are underutilized, often due to the prevalence of traditionally constraining patterns of land use and ownership.

In light of these developments, more integrative kinds of agricultural land use planning cannot be postponed much longer without greatly increasing the risk of reduced productivity, lower farm income, and declining export earnings in the agricultural sector.

Recommendation. National Land Use Plans need to be prepared in each of the CEP countries, incorporating and updating some or all of the many sectoral plans which have already been written in each country. Land Use Plans should focus on the best means of achieving sustainable development over the long-term and should attempt to guide future development into areas which are best suited for particular kinds and densities of land use, based on physical and ecological constraints.

Recommendation. Zoning restrictions for various forms of agricultural land development need to be considered by CEP governments. Furthermore, a plan for island-wide zoning, which classifies and protects certain categories of land (e.g. for agriculture, recreation, forestry, water catchment, and wildlife) is becoming increasingly important throughout the Eastern Caribbean. It is particularly critical in the rural sector to prevent further displacement of small farmers to urban areas and to ensure the availability of suitable lands for environmentally-sound and profitable agricultural production.

KEY ENVIRONMENTAL ISSUES IN THE AGRICULTURAL SECTOR

- ECONOMIC PRESSURES TO EXPAND BANANA PRODUCTION AREAS AND INPUTS WITHOUT SUFFICIENT REGARD FOR THE ENVIRONMENTAL CONSEQUENCES OF UNREGULATED BANANA CULTIVATION ON THE NATURAL RESOURCE BASE.
- THE NEED TO IMPROVE THE INSTITUTIONAL STRUCTURES, MANAGERIAL PERFORMANCES, AND TECHNICAL EXPERTISE OF THE SMALL FARM SECTOR, FOLLOWING THE DECLINE OF THE PREVIOUSLY DOMINANT LARGE ESTATE SYSTEM.
- THE LACK OF SUFFICIENT INCENTIVES, EXTENSION SERVICES, SOIL CONSERVATION INVESTMENT SUBSIDIES, AND MARKETING ASSISTANCE TO FURTHER DIVERSIFY THE AGRICULTURAL BASE AWAY FROM ITS CURRENT EMPHASIS ON ANNUAL SUBSISTENCE AND SEMI-PERENNIAL EXPORT CROPS.
- THE PREVALENCE OF LAND TENURE INSECURITY AMONG SMALL FARMERS WHO -- IN THE ABSENCE OF OTHER INCENTIVES -- ARE UNWILLING TO PURSUE COSTLY LAND CONSERVATION STRATEGIES, THE BENEFITS OF WHICH MIGHT NOT ACCRUE TO THEM IN THE FUTURE.
- THE INADEQUACY OF QUANTITATIVE DATA ON AGROCHEMICALS (IMPORTATION, USE, IMPACTS) UPON WHICH TO BASE INFORMED DECISIONS.
- THE GENERAL FAILURE OF CEP COUNTRIES TO EFFECTIVELY IMPLEMENT EXISTING PESTICIDE LEGISLATION OR TO PROVIDE UP-TO-DATE PESTICIDE CONTROL REGULATIONS AND MONITORING PROCEDURES.
- THE LACK OF ADEQUATE LAND USE PLANNING OR ZONING RESTRICTIONS IN THE AGRICULTURAL SECTOR TO ENSURE THE CONTINUED AVAILABILITY OF ENVIRONMENTALLY-SUITABLE AND ECONOMICALLY-PRODUCTIVE LANDS FOR CULTIVATION.

6. TOURISM

Tourism has been a strong growth sector of the economies of the CEP countries in recent years, but the development of the industry has not been without problems -- some of which are clearly linked to environmental planning and growth management issues.

OVERVIEW

In Antigua-Barbuda, tourism has replaced sugar production as the lead economic sector and has rapidly grown to dominate the economy in the post-World War Two era. During the last 30 to 40 years, the Government has pursued a policy of heavy tourism investment, especially in air and sea port infrastructure during the 1960's which facilitated jet airline and cruise ship services to the country at a time when sugar was going into full decline. With the growth of the industry, concerns about its potential impacts were inevitable. Scarce land, particularly in the coastal zone, lost to the construction of tourism infrastructure is one such concern; others include environmental change as a result of yachting, scuba diving, and other tourist-oriented recreational pursuits.

In St. Lucia, tourism has emerged as the leading growth sector of the economy. The country's scenic and recreational assets and its strategic central location, with two airports and an excellent harbor providing access to major North American, European and Caribbean markets, have contributed to the successful development of the industry since the early 1960's. Generally speaking, its tourism base reflects two contrasting styles. On the one hand, the industry is characteristic of a style dominant in relatively new, emerging tourism destinations in the region -- e.g., low density, selectivity, long-staying and high-spending visitors, diversification. On the other hand, the country also demonstrates such features as low seasonality, relatively high proportion of large hotels, and tour charters, which are more common to the high density, mass market, short-staying style of more mature tourism

destinations like Barbados, Bermuda, the Bahamas, and the U.S. Virgin Islands.

Tourism in Grenada has developed more slowly in comparison to many other Eastern Caribbean destinations. The smaller size of the sector, however, is a potential advantage in planning future development -- i.e., the country is not yet overly-dependent on tourism and by balancing future development between improvements in agricultural exports, a modest increase in industrialization, and tourism, the country may well succeed in having a truly diversified economy. Additionally, the small size of the typical hotel or resort in Grenada has meant that many local business people have been able to finance the acquisition and operation of these facilities. Grenada also has a history as a yachting center in the southeastern Caribbean although it lacks a strong foundation for expanding its current base.

In St. Vincent and the Grenadines, the main island of St. Vincent has had to optimize tourism development opportunities within the context of what is primarily an agricultural island, where tourism is confined to a narrow coastal rim of land and where the industry must compete with other major coastal activities and settlement patterns. Given these restrictions, St. Vincent tourism relies almost entirely on one main enclave in the southwest of the island.

The second tourism focal point is the Grenadines, a group of off-shore satellite islands considerably smaller than St. Vincent proper but experiencing recent and substantial tourism expansion which is causing, in turn, concern about the lack of adequate infrastructure and support services for maintaining current levels of growth. One common denominator shared by the two "nodes" of Vincentian tourism is development of the yachting industry.

The Government of St. Kitts-Nevis has made major commitments to the development of tourism in the state in recent years, ac-

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THE SOCIAL
AND ENVIRON-
MENTAL
IMPLICATIONS
OF EACH
APPROACH**

knowledging in 1990 that tourism had surpassed sugar as the primary foreign exchange earner. In the 1960's and into the 1970's tourism in St. Kitts primarily revolved around small, locally-owned hotels and guest houses. This pattern changed in 1972 with the establishment of the Frigate Bay Development Corporation, a major tourism project which was owned and managed by the Government and which set the stage for the transformation of the tourism sector in St. Kitts. Seventeen years later, an access road to the undeveloped Southeast Peninsula was completed with primary financial assistance provided by USAID. This highway opened up for tourism development an area roughly one-fifth the size of St. Kitts; it includes the most attractive beach areas with the highest tourism potential on the island.

In Nevis, until the recent (1991) opening of the first major resort hotel, tourism development was traditionally small-scale. A distinguishing characteristic has been the dominance of an "up-scale" clientele which, despite the limited number of rooms available (prior to 1991), has nevertheless generated significant tourism revenues for the island. In Nevis, and to a certain extent in St. Kitts, there are still a number of historic inns in operation which seek to attract guests by offering low-key, high-quality, personalized service within historic settings.

Dominica's tourism product is not typical of most other Caribbean destinations, most significantly because of the limited availability of white sandy beaches which North American and European visitors generally prefer. On the other hand, the island does offer a variety of unique attractions (for example, spectacular scenery, rain forest hikes, hot springs, good diving, and national parks) which, when marketed as a package have earned Dominica its reputation as the region's "nature island".

**ENVIRONMENTAL ISSUE:
PLANNING, DEVELOPMENT CONTROL,
AND TOURISM STYLE**

In the absence of clearly articulated land use policies and environmental controls, the tourism development goals of the governments in CEP countries can have far-reaching consequences for the environment. Rapid expansion of the industry has already exacerbated existing problems with basic services and infrastructure in many CEP countries, e.g., water, electricity and roads. Until there is a strategic physical development plan to match economic growth targets, basic infrastructure is likely to lag behind demand. Physical development planning is also necessary for the efficient use of beach and shoreline lands (which are becoming increasingly scarce in most CEP countries) and for a cost-effective distribution of infrastructure services.

Planning studies on the adequacy of water and electrical power resources to support tourism are a special requirement for areas highly impacted by tourism development. Many such planning decisions are related to the scale of tourism which a given country desires to promote and the costs that the country expects tourism investors to assume. For example, is it appropriate for the national government to pay for all water and power needs to support tourism, or should major investors be expected to bear a significant portion of these costs?

Major social impacts from current tourism development thrusts in the Eastern Caribbean can also be expected. For example, in St. Kitts-Nevis, development of the Southeast Peninsula, the completion of expansion phases for the Frigate Bay Development Project, and substantially enlarged tourism development in Nevis will carry St. Kitts-Nevis well past the stage of full employment of its labor force. Since the country's labor base is small, shortages are inevitable. Given the experiences of other Caribbean islands with strong tourism economies, imported labor will then be needed to complement the local labor

MANY OF THE AMENITIES OR ATTRACTIONS WHICH FORM THE BASIS OF THE TOURISM INDUSTRY REQUIRE SPECIAL MANAGEMENT STRATEGIES BECAUSE THEY OFTEN HAVE SPECIAL CARRYING CAPACITY LIMITS

supply, with equivalent demands on infrastructure, schools, and other social services.

The question of tourism "style" is another planning issue confronting all CEP countries. Development projects or development approaches catering to the mass tourism market can significantly impact on many aspects of island life (physical, biological, socio-cultural). As has been well documented in development literature, often the economic benefits of mass tourism are illusory, the result of a failure to account for the social costs to the community and the environmental costs to the natural resource base.

Recommendation. CEP governments need to give more serious attention to an *integration* of economic planning and physical/land use planning so that tourism development is more clearly linked to carrying capacity considerations, to enhancement of the country's natural resource base, and to an appropriate and achievable level of infrastructural development.

Recommendation. As CEP countries continue to expand in the tourism sector, it will be more difficult to maintain current levels of local resource utilization unless proper planning considerations are focused on this specific issue. In other words, as the number of tourists increases, there is a tendency to increase the marginal purchase of imported goods and services to support them. Resource managers from both the private and public sectors need to identify those specific goods and services which should be "abandoned" to imports and those where better planning can actually increase the local content of the tourism product.

Recommendation. Large-scale tourism projects, particularly those sited in the coastal zone, need to be more carefully reviewed by CEP governments, preferably via formal environmental impact assessment procedures. Impacts on infrastructure can be minimized by policies requiring large tourism developments to be energy and potable water

self-sufficient and to have self-contained sewage treatment plants. Tipping fees should be charged for all solid waste generated by tourism facilities, and yardage extraction fees charged for construction sand.

Additionally, the geographic distribution of infrastructure and large-scale tourism facilities needs to be carefully evaluated and consideration given to "agglomeration versus dispersal" policy alternatives. Recent Caribbean experience with urban sprawl -- with attendant health, social, and quality-of-life problems -- suggests that, in general, a spread or dispersed approach is less intrusive and dislocating.

**ENVIRONMENTAL ISSUE:
TOURISM'S ALTERATION OF COASTAL
AND MARINE HABITATS**

Impacts on coastal and marine habitats, including beaches and mangrove forests, during the construction phase of tourism infrastructure in CEP countries are a major tourism/environment issue. The location and siting of structures as well as dredge and fill activities now occur in the absence of effectively enforced development control procedures (see also Section 4). Too often, the compounded effect of degrading or altering coastal environments for tourism development is a decline in coastal water quality which, in turn, can be detrimental to the well-being of the tourist industry as well as the health of local populations. Construction and visitor impacts could be minimized through the application of coastal planning guidelines and the introduction of impact mitigation procedures, which are now generally absent in CEP countries.

Recommendation. Immediate consideration needs to be given by each CEP country to the development of a national coastal zone management policy. To help ensure the long-term sustainability of coastal-dependent tourism, national CZM policies must:

- ensure coastal resources are devoted to water-dependent uses exclusively;
- institutionalize a permitting process for development activities in the coastal zone; and
- devise a protection and management control strategy for common property resources and amenities in the coastal zone.

**ENVIRONMENTAL ISSUE:
DEVELOPMENT OF TOURISM AMENITIES**

A destination becomes inherently more marketable and sustainable when the landscape is properly looked after and tourists and residents alike are provided with a wide choice of natural and cultural/historical attractions. The conservation, proper development, and utilization of such attractions is often unplanned and unmanaged in CEP countries. Failure to develop attractions results in potential loss of tourism revenues, and the absence of proper management results in degradation of resources that are part of the national patrimony.

Recommendation. CEP governments should work with NGOs and the private sector to design a comprehensive program for the development, use and management of attractions as a vital element of tourism marketing and as a means of increasing tourist revenues. Such a comprehensive plan for the development of natural and historical attractions and the general enhancement of the landscape should perhaps be the responsibility of an inter-ministerial task force with private sector representation, including NGOs.

**ENVIRONMENTAL ISSUE:
NATURE TOURISM**

Nature travel, also called ecotourism, is a booming industry worldwide. Clearly -- in

varying degrees -- all CEP countries could expand their tourism base by development of a more comprehensive nature-based tourism experience. In Dominica, in particular, that country's touristic future would appear to lie in its development as an ecotourism destination. Competing in this market, which remains largely undifferentiated to all but the most knowledgeable traveler, requires the formulation of very specialized, targeted merchandizing tactics as well as cooperative public and private sector support for promotional strategies. It is also important that other development activities do not conflict with attempts to expand nature tourism and will not degrade or diminish the value of the very amenities and natural areas which are part of an ecotourism promotion strategy.

The potential for developing "natural history tourism" (tourism catering to a very special clientele of research scientists and natural history enthusiasts) also needs to be explored by tourism planners in CEP countries.

In general, any national tourism development strategy should not place too heavy a reliance on a narrowly-defined tourism industry. The principle of customized diversification is important to the tourism sector as well as to the general economy of CEP countries, and there is room in each for a risk-spreading mix of touristic enterprises -- including ecotourism. Any overall increase in nature tourism will presumably reflect an increasing interest by CEP governments in the well-being of these natural assets.

Recommendation. Ecotourism amenities in CEP countries need to be more fully addressed in tourism marketing plans and promotional literature. In the development planning process, specific areas need to be granted special status and provided with a management framework as nature tourism amenities or sites; certain types of alternative tourism activities will need to be excluded from these areas. Governments need to recognize the potential of nature-based tourism in diversifying the nation's tourism market and in im-

proving opportunities for extending the length of stay and expenditure level of tourists.

At the same time, CEP governments need to be aware that excessive demands by ecotourists on delicate natural systems might

over the long term destroy the very attractions that first drew visitors -- *unless* site management plans and visitor impact management plans have been developed for such amenities and sufficient resources are available for plan implementation and site monitoring.

KEY ENVIRONMENTAL ISSUES IN THE TOURISM SECTOR

- UNQUANTIFIED AND UNRESOLVED LINKAGES BETWEEN GROWTH IN THE SECTOR AND ASSOCIATED ENVIRONMENTAL AND SOCIAL ISSUES.
- INADEQUATE STRATEGIC PLANNING IN THE SECTOR, RESULTING IN THE EMERGENCE OF TOURISM "STYLES" MORE OFTEN BY CHANCE THAN BY DELIBERATE CHOICE AS PART OF A PLANNING PROCESS WHICH HAS ASSESSED THE SOCIAL AND ENVIRONMENTAL IMPLICATIONS OF EACH ALTERNATIVE APPROACH.
- FAILURE OF CEP GOVERNMENTS TO GIVE SUFFICIENT ATTENTION TO AN INTEGRATION OF ECONOMIC PLANNING AND LAND USE PLANNING SO THAT TOURISM DEVELOPMENT REFLECTS CAREFULLY ANALYZED CARRYING CAPACITY CONSIDERATIONS.
- TENDENCY TO INCREASE THE IMPORTATION OF GOODS AND SERVICES TO SUPPORT TOURISM AS THE INDUSTRY EXPANDS.
- THE LACK OF COMPREHENSIVE COASTAL ZONE MANAGEMENT PROGRAMS TO REDUCE THE NEGATIVE ENVIRONMENTAL IMPACTS OF TOURISM INFRASTRUCTURE AND ACTIVITIES IN COASTAL AREAS.
- EXISTING PROBLEMS WITH BASIC SERVICES AND INFRASTRUCTURE EXACERBATED BY RAPID EXPANSION OF TOURISM.
- THE NEED FOR VISITOR IMPACT MITIGATION AND MANAGEMENT STRATEGIES.
- THE NEED FOR BETTER PUBLIC/PRIVATE SECTOR COORDINATION IN THE IDENTIFICATION, DEVELOPMENT AND MANAGEMENT OF NATURAL AND HISTORICAL ATTRACTIONS AND AMENITIES.
- THE NEED TO DIVERSIFY THE TOURISM BASE BY MORE AGGRESSIVE MARKETING OF NATURE-BASED TOURISM, ALONG WITH A CONCURRENT DEVELOPMENT OF SITE MANAGEMENT PLANS FOR TARGETED NATURAL AREAS AND THE IDENTIFICATION OF SUFFICIENT RESOURCES TO MANAGE EACH SITE.

7. POLLUTION

OVERVIEW

Primary pollution control and environmental health problems facing the Caribbean have been identified by regional and international agencies such as CARICOM, UNEP, and PAHO. Each set of issues has a counterpart in the CEP countries, with critical areas of immediate concern being:

- solid waste management;
- sewage and industrial waste collection, treatment and disposal;
- monitoring of chemical pollution of ground and surface water sources;
- marine and coastal pollution monitoring; and
- drinking water quality monitoring and control.

These problems have potentially injurious environmental implications both for public health and for the natural environment. There is also a risk of adverse economic impacts in neglecting pollution issues, particularly as the economies of CEP countries rely heavily on selling the Eastern Caribbean as a pristine, well-managed tropical environment.

Waste disposal is a difficult problem for most small island societies, and the CEP countries are no exception. Their urban areas lack adequate treatment facilities for domestic sewage and waste water. Ocean outfalls for effluents unsuitable as gray water are more often than not conspicuous by their absence. The waters of major harbors, and to a degree other smaller embayments and inshore coastal areas, are receiving effluents from a variety of land-based sources of pollution, including agrochemicals, sillage, processing residues, sediments, and other waste materials from upland areas delivered to coastal waters by rivers, streams, and underground seepage. Many package sewage treatment plants serving

shoreline hotels are badly maintained, inadequately supervised, and too often function improperly, which further adds to coastal nutrient loads.

At the same time, the management of solid waste remains a problem for most rural communities and all urban areas in CEP countries. An even more serious problem exists as a consequence of the increasing risks posed by various toxic materials such as many industrial wastes, biocides used in agriculture, cleaning solvents, and hospital wastes, and by the ever present threat of oil spills in the coastal zone. Management planning and spill contingency planning have not kept up with the potential threats to expanding communities and tourism facilities, particularly those in the coastal zone.

Finally, each CEP country must address the probability that near-site impacts on land of pollutants will be extended and amplified because most pollutants from residential, agricultural, and industrial sources are transported to the coast via streams and watercourses, by leaching and infiltration through the soil, by direct (piped) discharges into the sea, and from non-point sources along coastlines.

ENVIRONMENTAL ISSUE: SOLID WASTE MANAGEMENT

Solid waste disposal is a serious environmental issue in all CEP countries. Official and unofficial means of disposing of refuse continue to have undesirable impacts on the natural environment and the citizens of each island.

Present waste disposal sites, some formally operated and others informally tolerated by CEP governments, are of concern for several reasons. They are often a public nuisance and a health hazard because of fly, mosquito and rodent breeding, noxious odors, possible contamination of ground and surface waters, and exposure to toxic and hazardous

POLLUTION PROBLEMS IN THE EASTERN CARIBBEAN ADVERSELY AFFECT PUBLIC HEALTH, THE NATURAL ENVIRONMENT, AND THE MARKETING POTENTIAL OF TOURISM-BASED ECONOMIES

**INSUFFICIENT
BUDGETARY
SUPPORT
HAS BEEN
ALLOCATED
FOR
POLLUTION
CONTROL
EFFORTS
IN CEP
COUNTRIES**

wastes. Additionally, there are negative impacts on the tourism and investment sectors of the economy due to aesthetic concerns (e.g., litter, overflowing garbage collection containers, disagreeable odors, and unsightly dumps). Open burning is done regularly, with visibility decreased by wind-driven air pollution from smoke. Many disposal sites are located in wetlands close to coastlines, where they destroy productive plant communities, displace wildlife and reduce marine water quality via surface run-off and toxic leachates with a high biochemical oxygen demand (BOD).

Away from the urban population centers, the number of officially designated areas for solid waste disposal is inadequate to meet rural demands, with disposal taking place at *ad hoc* "unofficial" dumps or in watercourses, beaches and the sea.

The generally poor management of solid waste disposal sites is due in part to a lack of funds for proper equipment and maintenance. The lack of an adequate number of suitable vehicles for the collection and transportation of solid waste to disposal sites, fencing to contain refuse, and heavy equipment to bury it are severe limitations throughout all CEP nations.

Although studies have been done on solid waste management in several CEP countries, such reports for the most part have not addressed the problem in a comprehensive or financially realistic manner, seldom providing either implementation schedules or funding strategies. Most OECS states, including the CEP target countries, still lack environmental protection criteria for the siting and operation of disposal sites, an inventory of suitable alternative sites which meet these criteria, and a schedule for closing presently used sites which are overfilled or which constitute an environmental hazard.

Recommendation. National solid waste management plans, covering at least a ten and preferably a twenty year period, should be prepared for each CEP country. Plans need

to focus on the different waste flows and particular waste-handling needs of urban versus rural areas and of industrial and commercial operations. Enactment of up-dated solid waste management legislation is also needed, to define national and local government responsibilities, to establish standards for waste disposal, and to regulate waste collection. Legislation should include a prohibition against all refuse disposal in the sea or adjacent to streams and rivers. Assistance to local government units, now charged with solid waste collection responsibilities throughout the CEP countries, is needed to allow local governments to upgrade the services presently provided.

Recommendation. The identification of financing for upgraded solid waste management programs is critical. The development of innovative means of raising revenues is necessary to reduce the burden on public treasuries. Possible options include: imposition of a levy on hotels for waste collection and treatment services; sale of franchises to private waste collectors for designated collection areas; and charging industrial and commercial businesses for waste collection and disposal services.

Consideration should be given to turning garbage collection over to private companies which could charge a fee for services, something which is not presently done. Public health ministries could be given responsibility for licensing such companies and should have the power to rescind franchises if collectors do not perform satisfactorily.

**ENVIRONMENTAL ISSUE:
TREATMENT AND DISPOSAL
OF LIQUID WASTES**

The continued disposal of raw sewage into freshwater and marine environments threatens the public health of CEP countries, where water-borne diseases such as gastroenteritis are considered important environmental health problems.

Central sewer systems are found only in the urban areas; these are out-dated and overloaded, and discharge raw sewage without treatment via outfalls. Generally, septic tanks are the standard method of domestic and commercial sewage disposal in suburban areas, and septic tanks and pit privies are the common disposal methods used in rural areas. In some areas, hard volcanic soils limit percolation and therefore present problems for waste water disposal by septic tanks and soak-aways. At other locations, high groundwater tables limit the absorption capacity of the soil, creating the risk of pollution by sewage.

No comprehensive or recent inventory has been carried out in CEP countries to measure or estimate the quantities of industrial pollutants received by various watershed drainage systems. This lack of data is becoming a more important environmental issue as the volume of industrial activity increases in the Eastern Caribbean. In the 1960's, there were only a few simple industries engaged primarily in the processing of local raw materials in CEP countries. Today, as a result of conscious public policy initiatives to encourage industrial production, this sector includes an expanding range of small-scale industries producing both for the local market and export. While such manufacturing is still generally in an early stage of development, its potential for employment creation and export expansion is highly rated by Caribbean economic planners.

Therefore, industrial wastes will continue to contribute to the pollution load of harbors and other coastal waters in CEP countries. Although there is little evidence of significant levels of toxic effluents being discharged from industrial plants, localized discoloration and high turbidity levels have been observed in inshore waters receiving discharges from such industries as breweries, distilleries and food processing plants. While not necessarily toxic, these pollutants contribute to the reduction of dissolved oxygen in localized areas, stressing corals, fishes and other animals, and in extreme cases resulting in fish-kills, particularly when industrial discharges

are compounded by waste oil from power plants and household waste water run-off.

Only minimal levels of monitoring of coastal waters have been carried out on a routine basis in CEP countries. Nevertheless, despite the lack of consistent data, there is a growing concern that improved methods need to be identified to ensure that domestic and industrial effluents receive proper treatment and disposal. Systems currently in place to handle sewage, gray water, and liquid industrial wastes may be permitting large amounts of bacteria and viruses, nutrients, chemicals, and particulate organic matter to enter the coastal waters of CEP islands on a fairly consistent basis.

Recommendation. The most cost-effective and ecologically-sound sewage disposal and treatment method needs to be identified for the major population centers of CEP countries. Taking into consideration existing technological and financial constraints, the most feasible option is likely to be preliminary treatment combined with a long outfall which discharges into deep water in an area of strong currents. Disposal systems should be designed to be easily upgraded to a higher level of treatment should this prove to be necessary later.

Recommendation. Government policies should be directed toward attracting industries which are relatively non-polluting. Environmental impact assessments should be required of all proposed industrial projects before they are granted construction and operating permits. Existing industries already discharging toxic or high-BOD wastes into the environment should be required to treat such wastes and cleanup already polluted areas.

Recommendation. A long-term water quality and marine biological monitoring program should be implemented by CEP governments to gather base line data and identify areas requiring remedial action. Laboratory and personnel capabilities will have to be up-

POLLUTION CONTROL AND WASTE MANAGEMENT CAN BE TURNED INTO REVENUE-GENERATING ACTIVITIES, THUS REDUCING THE BURDEN ON THE PUBLIC TREASURY

graded, probably with CARICOM, UNEP and/or other donor assistance.

Recommendation. An appropriate government agency should undertake the development of improved regulations and operating standards for privately-owned and operated sewage treatment plants, which, because of generally poor maintenance and operating procedures, are adding to pollution loading in CEP countries.

**ENVIRONMENTAL ISSUE:
POLLUTION FROM OIL AND
OTHER HAZARDOUS MATERIALS
[see Section 5 for a discussion
of agrochemicals]**

Oil and other petroleum products are brought to the Eastern Caribbean by tankers to off-loading terminals. The companies engaged in the transshipment of such products to CEP islands have identified varying levels of pollution control capability and clean-up equipment availability for deployment in emergency situations. CEP governments have only limited in-house response capabilities in the event of oil spills or other toxic material accidents. In many cases, equipment and assistance would have to be sought from other countries in the Caribbean. Disaster/spill contingency planning is also inadequate, particularly given the Caribbean's central location in heavily-trafficked oil transshipment lanes.

At present, there is no system for the collection and proper disposal of waste oil in CEP countries. Waste oil and grease from garages is simply dumped into storm drains and on the ground and, together with oil from street surface run-off, is then washed into rivers and coastal waters during rains.

Recommendation. A contingency plan for oil and other toxic spills should be developed, exercised, and maintained in each CEP country. Planning and emergency response capabilities should be assigned to a single government agency. Contingency planning

at a national level needs to incorporate all toxic and hazardous materials and should include an impact reduction and mitigation plan (i.e., risk reduction action plan), along with a spill response plan.

Recommendation. Legislation is needed to require proper disposal of waste automotive oil and hazardous materials, and facilities to accomplish this must be provided.

**ENVIRONMENTAL ISSUE:
INSTITUTIONAL CONSIDERATIONS**

Recommendation. The quantitative and systemic dimensions of environmental pollution in the CEP countries are not sufficiently well documented to permit easy development of remedial or regulatory measures. It would therefore be appropriate to identify funding and/or assistance to carry out a national pollution assessment in each CEP country. Such an effort should establish the basic dimensions of waste streams, identifying and quantifying sources and causative agents, volumes, flow rates, destinations, impacts, and projections.

Recommendation. Pollution control and waste management are customarily seen as a drain on the public treasury. However, given the high costs of modern technology and the high volumes of waste generated in consumer-oriented economies, pollution control and waste management can be turned into revenue-generating activities by the simple procedure of establishing prices for many facets of waste disposal (for example, charging a fee for waste collection and water treatment services or billing polluters for clean-up and restoration costs). Once this is done, segments of the process could be privatized.

Recommendation. Throughout the OECS countries, public health legislation is seriously outdated and based on legal concepts which are inadequate to deal with modern pollution control problems. Such legislation needs to be updated and strengthened in all

CEP countries to include national standards and criteria for water quality, pollution control, and waste management. Consideration must be given to each country's existing institutional

capabilities and technical/fiscal resources in designating pollution control standards and oversight/regulatory responsibilities.

KEY ENVIRONMENTAL ISSUES RELATED TO POLLUTION CONTROL

- LOW LEVEL OF AWARENESS AMONG DECISION-MAKERS, BUSINESSES, AND THE GENERAL POPULATION ABOUT POLLUTION ISSUES AND THEIR COSTS TO THE COMMUNITY AND THE ECONOMY OVER TIME.
- LACK OF STRATEGIC PLANNING TO DEVELOP COMPREHENSIVE NATIONAL PLANS FOR LIMITING WASTE GENERATION AND FOR PUTTING IN PLACE POLICIES FOR WASTE MANAGEMENT, POLLUTION CONTROL AND RECYCLING.
- SEEMINGLY COSTLY SOLUTIONS TO ENVIRONMENTAL POLLUTION PROBLEMS WITHOUT PROPER ASSESSMENT OF INNOVATIVE MEANS FOR RAISING NEEDED REVENUES BY ESTABLISHING LICENSING AND DISCHARGE PERMIT FEES AND USER FEES FOR WASTE DISPOSAL SERVICES.
- FAILURE TO PROVIDE FOR CONTINGENCY PLANNING AT THE NATIONAL LEVEL FOR OIL AND OTHER HAZARDOUS MATERIAL SPILLS ON LAND, IN PORTS, HARBORS AND MARINAS, AND IN COASTAL WATERS.
- INSUFFICIENT DOCUMENTATION ON THE QUANTITATIVE AND SYSTEMIC ASPECTS OF ENVIRONMENTAL POLLUTION TO PERMIT EASY DEVELOPMENT OF REMEDIAL OR REGULATORY MEASURES.
- OUT-DATED PUBLIC HEALTH AND WATER LEGISLATION, LACKING REGULATIONS, NATIONAL STANDARDS AND MODERN CRITERIA FOR WATER QUALITY, POLLUTION CONTROL, AND WASTE MANAGEMENT.

8. PARKS and OTHER PROTECTED AREAS

RESOURCE CONSERVATION and HERITAGE PROTECTION

RESOURCE CONSERVATION PROGRAMS ADDRESS THE NATION'S LONG-TERM NEED TO PRESERVE RESOURCES FOR THE FUTURE

In the developing CEP countries -- still engaged in the difficult art of nation building and the day-to-day politics of transforming what was a dependent colonial society into viable nation-states -- the trade-offs between the long-term benefits of conservation and resource protection and the more immediate, short-term benefits of resource exploitation are not always easily understood. The role of conservation and preservation institutions (such as parks, reserves, sanctuaries, museums) is to help balance the equation between the need to preserve resources for the future and the need to use resources to meet today's demands. What should constitute appropriate resource conservation and heritage protection policies and programs has been defined in differing ways in each CEP country.

The Dominica Parks Service, headed by a Superintendent of Parks, is a separate unit within Government's Forestry and Wildlife Division; it is charged with responsibility for developing and managing the country's parks system. The Morne Trois Pitons National Park, Dominica's first, was established in 1975 and contains almost 17,000 acres of legally protected forest in the south central part of the island. A second national park, the Cabrits National Park, was established in 1986 in the north of the island near Portsmouth. The 260 acres of land comprising this park incorporate important historic ruins as well as a representative sample of dry forest lands. The adjacent marine area encompasses another 1,000 acres of underwater park surrounding the Cabrits Peninsula.

The institutional framework for a parks and protected areas system in Antigua-Barbuda emerged with passage of national parks legislation in 1984 that created the Antigua and Barbuda National Parks Authority. Only one park -- Nelson's Dockyard National Park -- has been established to date. That park comprises about eight percent of the

country's land mass, has both marine and terrestrial components, and incorporates whole villages, public roads and other major "inholdings" within its boundaries. In this regard, it is unusual in the region and more like the English "park" model than the American prototype. The Park's most celebrated attraction is Nelson's Dockyard at English Harbor, built in 1725 as regional headquarters for the English naval force in the Caribbean. Today the Dockyard remains one of the key historic landmarks in the Eastern Caribbean; it is also an important tourist attraction and a center of yachting -- all of which have been incorporated within the framework of the national park.

Although St. Lucia does not yet have a formal national parks system, it does have a well-established National Trust; enabling Trust legislation has provided the legal framework for the vesting of certain important areas in the Trust for protection and management, including the Pigeon Island National Park and the Maria Islands Nature Reserve. Other protected areas in the country fall under the jurisdiction of the Forestry Department (the parrot sanctuary and forest reserves) and the Fisheries Management Unit (marine reserves). The St. Lucia National Trust, under a grant from USAID, is working on the development of a national parks and protected areas plan to define and consolidate protected areas planning for the country.

In St. Kitts-Nevis, the National Conservation and Environment Protection Act of 1987 provides a new legal framework for the country, one which accepts both the principle behind and the idea of a system of national parks and protected areas. This important legislation includes provisions for the establishment and protection of both natural and cultural areas, sites and features. However, only one national park (the Brimstone Hill Fortress National Park) was designated when the law was enacted, and no new sites have been added. The Brimstone Hill Park has as its focus one of the region's most important historic sites; this fortification is managed for the Government (as it has been for over 20

A SENSE OF NATIONAL PRIDE HAS NOT YET LED TO WIDESPREAD RECOGNITION OF THE INHERENT QUALITIES OF INDIGENOUS NATURAL, HISTORICAL AND CULTURAL RESOURCES OR PRODUCED A UNIFIED PROGRAM FOR THEIR PRESERVATION AND MANAGEMENT

years) by a private sector NGO. Brimstone's restoration as a scenic and educational attraction for both residents and tourists began in the mid-1960's and stands today as an excellent example of how historic resources can contribute to the economic and cultural development of CEP countries.

In 1988, the Government of Grenada and the Organization of American States published a *Plan and Policy for A System of Parks and Protected Areas in Grenada*. The purpose of the plan was to identify and provide a course of action for the protection and wise use of the country's natural and cultural heritage. However, at present, there is no formal government policy on the establishment or management of a system of protected areas. No existing legislation provides adequate authority to both establish and manage such a system or to protect adequately the natural and historical resource base. The National Trust Ordinance legally establishes a basis for protecting areas with both natural and cultural features; however, this legislation has not been used for such purposes and is in need of revision and update.

There is some interest within the Government of St. Vincent and the Grenadines to create a system of national parks and protected areas. Accordingly, a national parks bill has been drafted with assistance from an OAS legal consultant, but no official action has been taken. The Tobago Cays are designated a national marine park, but management plans have not been put in place. The OAS has prepared a feasibility study for the area, including an economic analysis and management recommendations.

**ENVIRONMENTAL ISSUE:
PROTECTION AND DEVELOPMENT
OF HISTORICAL RESOURCES**

The growing population base and expanding economic development of CEP countries are placing increasing pressures on the region's surviving historic landmarks and in-

igenous architectural features. Identifiable problems include:

- accelerating loss of archaeological sites and artifacts particularly in the coastal zone, associated with the expansion of tourism, housing, industry and roads into formerly undeveloped areas without prior cultural resource assessments;
- deterioration and dismantling of plantation settlements, fortifications, and other rural historic sites in the absence of regulatory controls;
- intensifying destruction or modification of historic and vernacular buildings in urban areas, to the extent that some communities are losing their traditional architectural character and charm;
- lack of holistic national planning for the incorporation of cultural patrimony and living culture into the national development process;
- deficiencies in existing resource planning and management mechanisms to protect historical resources.

The economic and social benefits to be derived from the protection of historic sites, architectural features, cultural landmarks, or archaeological resources have not been fully appreciated in CEP countries. The result has generally been the pursuit of government policies which very often promote either benign neglect or in some cases deliberate destruction of these resources.

Lack of public concern is due in part to the fact that the original initiative for historic preservation in the region came from expatriates with much of the emphasis of early conservation efforts focused on the colonial past. In more recent years, tourism has had a

positive effect in awakening local appreciation of this piece of the national heritage because many historic sites can be developed as tourist attractions and are therefore of economic value to the country (e.g., Nelson's Dockyard in Antigua and Brimstone Hill in St. Kitts).

The lack of well-defined protection and management strategies for historical resources is a problem throughout the CEP countries. In countries with national trusts (Grenada, St. Lucia, St. Vincent), provisions in enabling legislation authorize these quasi-governmental bodies to exercise varying degrees of control over those sites and areas officially vested in the organization for management. Sites not so vested generally are not protected. In countries which did not pursue the national trust model (Antigua-Barbuda, Dominica, St. Kitts-Nevis), only historical resources located within the boundaries of an officially designated national park or protected area are fully protected; at present, this limits the most aggressive government-sponsored preservation/restoration efforts to Nelson's Dockyard National Park in Antigua, the Cabrits National Park in Dominica, and the Brimstone Hill Fortress National Park in St. Kitts. In the case of Antigua-Barbuda and St. Kitts-Nevis, historical resources have recently come under the official purview of newly established "environmental commissions," but the degree of protection remains undefined.

In general, CEP countries lack the following critical components for effective historical resource management:

- a comprehensive national policy to bring together issues related to heritage protection under one operational program;
- clear lines of authority or responsibility for the management of historical resources;
- adequate legislation to protect historical resources;

- effective procedures to control the use and development of historical resources.

Recommendation. In CEP countries with antiquities legislation, such laws need to be reviewed and in most cases updated and strengthened. In countries lacking such a legal framework, antiquities legislation is needed to provide for both protection and restoration of historical and cultural resources, including underwater archaeological sites. Legislation might include the establishment of a Registry of Historic Places, requiring a comprehensive inventory and evaluation of historical/cultural resources and affording some protection to national landmarks, historic sites, or architectural features not presently included under existing preservation laws. Criteria need to be set for the selection and certification of "Registry" sites, and standards for further development of such sites need to be established.

Recommendation. The responsibilities and authority of the various institutions and organizations now involved in some aspect of historical resource management in CEP countries need to be clarified, perhaps through adoption of a "national heritage protection policy and program plan".

Recommendation. Prior to any major development, particularly in the coastal zone, a cultural resource survey should be carried out by professional archaeologists, with developers required to pay for such surveys. Development control procedures should provide adequate time for the excavation of archaeological sites prior to commencement of construction activities.

Recommendation. The integrity of many of the architectural and historical features of most Caribbean towns has been diminished by a proliferation of ill-maintained and poorly designed buildings quite out of context within architecturally or historically important areas. Nevertheless, CEP governments should consider implementation of "historic district" policies for designated areas.

THE PRESENT GENERATION WOULD BE DERELICT IN ITS RESPONSIBILITIES TO FUTURE GENERATIONS IF IT DEPRIVED THEM OF THE OPPORTUNITY TO VIEW, TO LEARN, AND TO BENEFIT FROM A HEALTHY ENVIRONMENT AS REFLECTED IN ALL ITS PRESENT RICHNESS, DIVERSITY, BEAUTY AND SUBTLETY

Further consideration should be given to the development of government policies which encourage adaptive use and restoration strategies by the employment of economic and other incentives and to the adoption of design controls for new construction in urban areas.

**ENVIRONMENTAL ISSUE:
PARKS AND PROTECTED AREAS PLANNING
-- INSTITUTIONAL CONSIDERATIONS**

The development of national "systems" for park and protected area management in CEP countries has generally been fragmented, often single-site focused, and lacking in a strong visionary approach. Only Dominica of the CEP countries has a parks "system" in place. Within that system, however, park planning and site management issues are still not fully resolved. For example, competing demands for use of the resource base within the Morne Trois Pitons National Park have intensified in recent years, e.g., for hydropower development, geothermal power development, power transmission, road building, and, in some locations, cultivation. Such demands are often in conflict with the more traditional objectives of park land use, namely, conservation of wildlife, enhancement of biodiversity, and passive wilderness recreation.

In St. Kitts-Nevis, despite the fact that recent, well-conceived legislation is in place, the development of a comprehensive and well-managed parks and protected areas system is still at risk because the parallel requirement for appropriate institutional strengthening is not being addressed. The fact that the country can point to the presence of one national park does not diminish this risk because the national park at Brimstone Hill had been operational as an NGO-managed national monument for 20 years prior to its designation as the country's first (and only) national park.

Antigua-Barbuda, like St. Kitts-Nevis, has enacted national park legislation and has also created a National Parks Authority. Yet the authorizing legislation does not provide a

definition for what constitutes a "national park" and leaves many resources unprotected. Personnel at the Parks Authority are primarily involved with the management of business concessions, yachting operations, maintenance, and service activities at the Nelson's Dockyard National Park. None of the permanent staff have adequate training in resource management, and neither effective land use nor development control measures are practiced within the Park.

Each Environmental Profile describes in considerable detail areas which have been proposed for protected area status in CEP countries. However, the process of incorporating such sites and areas within truly national park systems has not been officially defined at the decision-making levels of government, even in a country like Grenada with a recent, well-documented and attractively published report on parks and protected areas planning.

Recommendation. In all CEP countries, a plan for a "parks and protected areas system" (or similar management framework) is needed to ensure that all critical natural and cultural resources receive adequate protection in an *integrated* fashion. The system should ensure coverage of the biological diversity within each country and should seek to optimize the use of outstanding natural and historical resources and scenic areas for recreation and tourism.

Protected areas program planning should be placed within an orderly and well-planned "resource assessment" framework which reflects overall national requirements for development priorities, recreational needs, environmental diversity, and the preservation of natural and cultural assets. Resource allocation choices should be predicated on a full appraisal of available site and resource management options.

Recommendation. Park planners in CEP countries, in cooperation with tourism planners, should also give attention to prepar-

ing national guidelines which accomplish the following:

- establish priorities for "protected area" designation;
- develop a process for selection and acquisition of protected area sites;
- determine a phasing-in schedule to bring new sites within the system;
- establish management controls for each protected area class or category, including identification of non-compatible uses which will not be permitted within designated protected areas;
- provide for enforcement procedures;
- designate a central management authority to oversee the system;

- allocate manpower resources for enforcement and management activities on the basis of priorities established for the system;
- determine mechanisms for inter-ministerial and inter-departmental cooperation and define the working relationships with and inputs to other development sectors -- especially tourism, water supply, recreation, education, and fisheries;
- define a role for national NGOs.

Recommendation. Individual management plans for each unit within the established system should be prepared.

Recommendation. The need for a recruitment, training and incentive program, aimed at eliminating the critical shortage of trained staff for park management in CEP countries, should be addressed.

KEY ENVIRONMENTAL ISSUES RELATED TO PARKS AND OTHER PROTECTED AREAS

- RELATIVE LACK OF UNDERSTANDING AND APPRECIATION FOR THE ECONOMIC AND SOCIAL BENEFITS TO BE DERIVED FROM THE PROTECTION OF INDIGENOUS NATURAL AND CULTURAL RESOURCES, OFTEN RESULTING IN GOVERNMENT POLICIES OF BENIGN NEGLECT.
- LACK OF EFFECTIVE PROTECTION FOR SCARCE OR THREATENED RESOURCES UNLESS THEY ARE PLACED UNDER THE MANAGEMENT CONTROL OF A SPECIFIC AUTHORITY OR HAPPEN TO FALL WITHIN THE BOUNDARIES OF A DESIGNATED PROTECTED AREA.
- FRAGMENTED INSTITUTIONAL RESPONSIBILITIES FOR THE PROTECTION, DEVELOPMENT, AND MANAGEMENT OF CRITICAL NATURAL AREAS AND HISTORICAL RESOURCES, INCLUDING SHIPWRECKS AND ARCHAEOLOGICAL SITES.
- THE ABSENCE OF ENVIRONMENTAL IMPACT ASSESSMENT PROCEDURES FOR MAJOR DEVELOPMENT PROJECTS, INCLUDING AN EVALUATION OF NATURAL AND CULTURAL RESOURCES PRIOR TO PROJECT APPROVAL OR COMMENCEMENT OF CONSTRUCTION.
- FAILURE TO PROVIDE AN INTEGRATED MANAGEMENT FRAMEWORK FOR THE DEVELOPMENT AND USE OF OUTSTANDING NATURAL AND HISTORICAL RESOURCES AND SCENIC AREAS.
- FAILURE TO PROVIDE A NATIONAL SYSTEM FOR ESTABLISHING PRIORITIES AND CRITERIA FOR PROTECTED AREA DESIGNATION, FOR PHASING DESIGNATED AREAS INTO THE SYSTEM, AND FOR MANAGING CLASSES OR CATEGORIES OF PROTECTED AREAS WITHIN THE SYSTEM.
- THE NEED FOR BETTER LINKAGES BETWEEN PARK PLANNING AND OTHER DEVELOPMENT SECTORS, ESPECIALLY TOURISM, WATER SUPPLY, RECREATION, EDUCATION, AND FISHERIES.

9. INSTITUTIONAL FRAMEWORK

WHO'S IN CHARGE? ... RESPONSIBILITY FOR ENVIRONMENTAL FUNCTIONS WITHIN CEP GOVERNMENTS IS GENERALLY FRAGMENTED AND POORLY COORDINATED

OVERVIEW

Responsibility for environmental management in CEP governments is dispersed among a number of departments and divisions within several ministries of the central government. Resource planning, management, development, and protection functions are therefore currently dependent on the coordinated action of many agencies with varying degrees of responsibility for key resource sectors. However, because CEP governments have a limited capacity for inter-agency coordination, accountability for the environment at the national level is generally fragmented. Thus, such key governmental functions as planning, development control, resource protection, regulatory oversight, quality control, and resource development, as these pertain to the environment, are too often implemented on an *ad hoc* basis (particularly in the absence of an approved framework for planning and development control) and focus primarily on short-term or interim rather than long-term policy objectives for the environment.

Diffusion of responsibility and lack of sufficient coordination have also meant that the various units of CEP governments with environmental functions are unable to significantly influence policies and programs or act collectively on critical environmental policy issues. It has also meant that resource management responsibilities are not always clear-cut, and several units of government, as well as several quasi-governmental bodies like public corporations, may have overlapping authority.

Although environmental responsibilities are not the exclusive concern of any single government agency, in each CEP country one or two entities can be identified as having the widest responsibilities and clearest mandate for management of the environment.

In St. Kitts-Nevis, it is the Ministry of Agriculture, Lands, Housing and Development. Although a Ministry of Natural Resources and the Environment was established in 1984, it remains non-functional due to the

lack of an administrative structure and implementation resources. Of necessity, therefore, the Ministry of Agriculture has the *de facto* primary responsibility for environmental management since it includes within its mandate agriculture (the largest user of land), housing (the second largest), physical planning and development, fisheries, forestry and wildlife. The Southeast Peninsula Land Development and Conservation Board was created in 1986 as a semi-autonomous government authority with power to monitor and regulate development activities and to maintain environmental quality for the 4,000 acre Peninsula, an area scheduled for major tourism development in the 1990's.

In St. Lucia, "the environment" was added to the portfolio of the Minister of Health in 1988, but it is still unclear what impact this action will have on the execution of environmental policy in the country. The Central Planning Unit, by virtue of its key role in coordinating project design and project review functions within the government, continues to exercise considerable influence over the direction of land use development in the country. Several units of the St. Lucia Government, in cooperation with NGOs like CANARI and resource-user groups like fishermen, farmers, and charcoal producers, have experimented with community-based resource management strategies which could serve as a model for the region. Historically, the Department of Forest and Lands (formerly the Forestry Division) has been the key government voice for resource protection and conservation programs in the country, while the quasi-governmental St. Lucia National Trust is the best organized and most effective of the national trusts in CEP countries.

An equally effective voice for environmental issues has yet to emerge within the Government of Antigua-Barbuda. Government has established an advisory body -- the Historical, Conservation and Environmental Commission -- to provide input and guidance in the management of the nation's natural and historical resources. However, the Commis-

sion's long-term potential for providing direction and influencing policy is diminished by the fact that it lacks officially-mandated terms of reference or statutory powers.

A similar situation prevails in Grenada, where such coordination that does exist within Government for resource management functions occurs through the physical planning process and Cabinet deliberations. In 1986, the Prime Minister specifically named the National Science and Technology Council, a statutory body, as the focal point for environmental concerns within Government but did not spell out specific responsibilities relative to that mandate. To date, this role has generally been an advisory one.

In Dominica, "the environment" was only recently added to the portfolio of the Minister of Agriculture, Fisheries, Lands, Forestry and Wildlife, and the Environment, following elections in 1990. Within that Ministry, the Forestry and Wildlife Division has historically been the lead government agency for carrying out resource development, management, and conservation responsibilities. Its central role in the environmental sector is perhaps best exemplified by the fact that all of the country's legally designated protected areas are under the management control of this one division.

In St. Vincent, no single agency has emerged as a leader for environmental issues within Government. Likewise, no single agency is charged with lead responsibility for the environment, although the newly created (1989) Ministry of Health and the Environment has begun to assume broader responsibilities. At present, however, the Ministry essentially comprises the public health services transferred from the former Ministry of Health; the environmental functions of the newly-constituted Ministry have not yet been defined. At the time the new Ministry was created, an Environmental Protection Task Force was also set up as an interdepartmental coordinating body, with some private sector representation, to advise and assist the Minister in

defining directions and programs for the environmental portfolio. Its non-statutory, temporary status and lack of focus remain a problem.

**ENVIRONMENTAL ISSUE:
THE ROLE OF GROWTH MANAGEMENT,
LAND USE PLANNING
AND DEVELOPMENT CONTROL**

Physical planning functions within CEP governments generally date to the period just after World War Two when many Eastern Caribbean islands first enacted Town and Country Planning Ordinances and were introduced to urban and land use planning concepts. A UNDP-sponsored Physical Planning Project in the 1970's further exposed Eastern Caribbean governments to physical planning. While many experimented with national land use planning and "draft" plans were subsequently prepared, such early attempts at comprehensive planning (and those that followed) were never formally accepted by CEP governments as a legally-mandated framework for development control and growth management. Accordingly, decisions about changes in land use and approval of new development activities tend to be based on short-term considerations and executed on a case-by-case basis, often at the Cabinet level.

Within this context, development planning and control functions are being undermined, a systemic weakness which represents one of the more pernicious institutional threats to the natural environments of CEP countries, for unsound land use decisions almost inevitably have adverse environmental consequences.

Furthermore, physical planning as an integrative process is not well established within CEP governments, and there is generally only limited opportunity for systematic coordination across ministerial or departmental lines in the physical planning and development control process. Too often, physical planning units have been vested with only limited, gen-

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CONTROL
PROCESS**

**ENVIRONMENTAL
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ASSESSMENTS
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DECISION-
MAKERS**

erally advisory control over the broader planning/regulatory aspects of major development projects. They customarily are relegated to reviewing subdivision plans or performing site-level planning functions, while decisions on major development strategies and projects are made with little or no input from the professional staffs of physical planning units. This is unfortunate, for most of these larger projects will have significant impacts on physical, natural and human environments.

Generally, weak inter-agency and inter-sectoral coordination is not limited to physical planning but is symptomatic of the larger resource management sector. Responsibility for each of several key functions -- including development control, land use allocations, water management, and utilization of marine resources -- is generally dispersed among several ministries and departments of government with limited formal mechanisms to improve coordination in dealing with these responsibilities across departmental lines.

In the near-term, land use planning and development control weaknesses are not easy to deal with because required legal, structural and institutional changes may take years to put in place. In the meantime, traditional environmental controls and accepted limits to growth are being increasingly overwhelmed by the pace and nature of contemporary change in the Eastern Caribbean. In fact, it could be argued that the importance of planning is inversely related to a country's size and GDP, i.e., in the smaller, less wealthy CEP countries, there is little margin for error as few funds are available to remedy the mistakes of ill-planned schemes and strategies. Like most small places, the CEP countries cannot afford the consequences and costs associated with poor planning decisions and the failure to assert sound development control.

Recommendation. The lack of a comprehensive land use planning framework in CEP countries will continue to reduce the effectiveness of the development control process. Land use planning provides a structure for as-

sessing the physical and natural features of an area and for suggesting its long-term sustainable uses. The preparation (or updating) of a comprehensive physical development plan, to guide and inform decision-making about future development activities in each CEP country, should be a priority for the decade of the nineties. Formal approval at the Cabinet level is important to lend the force of law to the zoning and land use allocations incorporated within each national plan.

Recommendation. Perhaps the most important condition for sustainable development is that environmental and economic concerns are merged in the decision-making process, as they are in the real world. To this end, the coordination linkages between the economic planning units and the physical planning units of CEP governments need to be improved.

In general, physical planning units in CEP countries need to be strengthened and their role in the planning process upgraded. The latter might include the assumption of more formalized development review and development control responsibilities, preparation of expanded and improved land use maps and natural resource data bases, and implementation of formal zoning restrictions and subdivision regulations.

Consideration should also be given to the establishment of environmental technical expertise within physical planning units. However, if these units are to be given more substantive planning responsibilities, including environmental control functions, the size and capabilities of planning staffs will need to be upgraded. Assistance from international agencies should be considered.

Recommendation. Legislation is needed in CEP countries to require the formal preparation of environmental impact assessments (EIAs) for all major development projects (public or private sector), especially for those within the coastal zone, within the boundaries of designated protected areas, or

affecting other critical areas. From an institutional perspective, EIAs are useful because they force a more holistic integration of technical data and environmental expertise across departmental lines while, at the same time, guaranteeing more systematic input of environmental and social considerations -- reflecting resource user perspectives -- at an early stage in the planning process. This can be particularly important in CEP countries where resource management functions are spread among many government departments and quasi-government institutions -- each of which tends to view "the environment" from its own perspective or area of interest.

Recommendation. Improved coordination is one of the most critical institutional issues confronting CEP countries in the resource management sector. Governments need to take steps to initiate procedures for more effective and regular coordination by government agencies with resource management responsibilities which cut across sector and ministerial lines, e.g., pollution control, land use planning, and development control. It is important that governments attempt to identify ways to harmonize environmental management functions, especially since these functions have not been isolated within a single agency in CEP countries.

**ENVIRONMENTAL ISSUE:
LEGISLATION AND
INSTITUTIONAL STRENGTHENING**

Critical to improving the resource management capabilities of CEP governments is the need to clarify institutional roles and authority, as these have been defined by statute or regulatory procedure. Several areas of institutional overlap or conflict have been identified in the resource management sector, including: development control and planning approval, allocation and use of public lands, conservation and protection of watersheds and the water supply, pollution control and the maintenance of water quality. The objective should not be to eliminate overlap or re-

dundancy *per se* but to eliminate jurisdictional gaps, identify common goals, capitalize on opportunities for shared monitoring, and pursue reinforcing strategies for improved oversight and enforcement.

Much of the legislation pertaining to environmental management in CEP countries is outdated, lacks regulations, is ignored, or is generally unenforceable. A key area requiring legislative review in all CEP states is that of public health; existing legislation is seriously outdated, lacks standards, and is based on colonial legal concepts which are inadequate to deal with modern pollution control problems.

CEP countries have received assistance from a variety of donor groups in the last decade to review, update and revise legislation related to environmental resources. In St. Vincent, for example, an ambitious body of proposed legislation is currently under consideration by Government, including legislation for forests, water resources, national parks, planning, public health, pesticide control, and litter control.

At the same time, each Environmental Profile identified extant environmental legislation or laws with environmental implications which have not been effectively enforced in CEP countries. The lack of adequate technical personnel for monitoring and enforcement is often cited for the inability of CEP governments to fully enforce existing legislation. These staffing problems will be exacerbated if proposed new environmental laws are enacted.

St. Kitts-Nevis is a case in point. The country's new National Conservation and Environment Protection Act (1987) is potentially one of the strongest and most comprehensive environmental laws in the Caribbean, with broad definitions, rules and penalties covering both the natural and built environment. However, if the resource management and conservation concerns articulated by the Act are to be reflected in new policies and regulations, considerable institutional strengthening of those departments and agencies responsible for re-

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source management and resource protection in the state will be required.

Recommendation. An update to the 1986 OECS-sponsored analysis of natural resource management legislation in the Eastern Caribbean should be carried out by a donor organization. What is required is a more tightly defined assessment which builds on the 1986 review by more specifically identifying those areas of (1) existing or potential conflict in institutional responsibilities and (2) shared or overlapping legislated or assumed authority. All CEP countries would benefit from such an analysis. Recommendations for modification of existing legislation would need to be included as well as guidelines for improved coordination procedures.

Recommendation. Probably with the assistance of donor agencies, CEP governments need to carefully examine the technical and regulatory implications of the full spectrum of extant and proposed environmental and resource management legislation in each country and take appropriate steps to improve the quantity and quality of staff required for implementation, particularly middle-level management and technical staff. Governmental institutional strengthening has been given high priority in the national development plans of several CEP countries.

Recommendation. The difficulty of enforcing the pollution control provisions of existing public health laws in the CEP countries has been noted by both in-country observers and external consultants. Not only are the provisions of public health laws seriously outdated, but the extremely low penalties prescribed trivialize the best of efforts aimed at pollution control and regulation. In some cases, regulations to support legislation were never enacted, further limiting the substantive authority of public health laws.

Revised and modernized public health legislation, with appropriately strengthened national standards for water quality, pollution control, and waste management, is needed in

all CEP countries. Standards should be developed which take into consideration institutional capacities and resources for monitoring and enforcement. Tactics to coordinate the pollution control response of accountable agencies and departments and to develop and set workable standards need to be explored.

ENVIRONMENTAL ISSUE: THE ROLE OF ENVIRONMENTAL EDUCATION

The people of the Caribbean need to participate meaningfully in the development process since they are ultimately the beneficiaries of that process. Since the majority of the citizens of the region earn their livelihood from agriculture and tourism, it is particularly important that educational/training activities related to these fields include an emphasis on expanding awareness about the environmental implications of these key economic sectors and reinforce an understanding of the inter-connectedness of human action and the impact on natural systems.

Recommendation. Public education about the environment must be linked to appropriate institutional initiatives at the national level, and CEP governments need to ensure that, as a matter of ongoing public policy, education about the environment will be incorporated into the formal educational system at all levels.

Recommendation. CEP governments need to recognize the consideration expertise and experience of NGOs in building community-focused programs of environmental awareness and to draw upon these initiatives to support and complement their own programs. NGO activities are often less formal, less traditional but more experimental and more experientially-based than environmental education programs in the public sector.

IN GENERAL, THE CONSIDERABLE RESOURCES AND EXPERTISE OF NGOs ARE OVERLOOKED BY GOVERNMENTS WHEN DESIGNING AND IMPLEMENTING NATURAL RESOURCE MANAGEMENT PROGRAMS

**ENVIRONMENTAL ISSUE:
THE ROLE OF NGOs**

A number of non-governmental organizations in CEP countries have played an important role in influencing the level of environmental awareness. However, environmental NGOs in the region do not generally function as "pressure groups" *per se*. Rather, through alternative education, research, training, and outreach programs, they seek to heighten public awareness about environmental issues and to provide private sector input for the achievement of environmental goals.

Nevertheless, Eastern Caribbean governments still appear somewhat skeptical, if not suspicious, about the role of NGOs in the definition of public policy. While efforts to facilitate or accommodate NGO participation can make the task of the government planner or resource manager more complex and time consuming, such efforts are important because they will also:

- facilitate government access to a larger information base;
- provide an opportunity for governments to build coalitions or support on behalf of their projects or decisions; and
- allow for discussion and possible conflict resolution prior to an extensive commitment of public resources to a potentially controversial activity or project.

As environmental NGOs in the Eastern Caribbean mature and expand their program agendas, they will have an increasingly important role to play as agents for sustainable development and planned growth strategies, as "quality control" vehicles for monitoring development impacts, and as institutional forums for consensus-building about national development goals.

Recommendation. CEP governments and environmental NGOs need to aggressively seek opportunities for promoting joint initiatives and partnerships in the pursuit of shared resource management objectives.

For example, a critical role in natural resource management is the monitoring, collecting and archiving of information about environmental impacts. Eastern Caribbean NGOs are well-positioned to help with this important task by linking their ongoing (and historically important) information collecting focus (e.g., most have libraries, many operate museums) with emerging citizen-based environmental monitoring capabilities. What needs to be explored is the degree to which these NGO facilities and services can be linked to identifiable needs in public sector programs.

**ENVIRONMENTAL ISSUE:
CEP FOLLOW-UP**

The notion that the "environment," broadly speaking, is government business is not new in the Eastern Caribbean. The people of these islands have generally welcomed government control of Crown Lands, public health, ports, harbors and some aspects of forestry and fishing, among other activities. But while the idea of government as guardian of selected environmental resources is not new, what is new and still in experimental stages is the idea of trying to choreograph various ministries, government units and even statutory bodies into a coordinated resource management system -- one designed to improve efficiencies, reduce risks, and minimize adverse impacts on the environment.

What is also new is the steady growth and acceptance of the citizen-based environmental movement in the region, where in country after country community groups, civic organizations, and NGOs are attempting to influence the public sector to take action when environmental abuses become obvious, to protect communities from environmental haz-

ards, and to guarantee the conservation and survival of certain environmental amenities.

The days of passive conservation for many natural resources in the CEP countries are fast disappearing. Any new national conservation program for these countries in the decade of the nineties will inevitably require expanding levels of more direct kinds of governmental intervention. In turn, this presumes an antecedent national strategy and plan for ecosystem restoration and management.

As the four-year Country Environmental Profile Project for the Eastern Caribbean draws to a close, it is apparent that environmental planners, resource managers, and the political leadership of the CEP countries are being pulled in seemingly conflicting directions as they confront the almost overwhelming number of recommendations and policy guidelines provided in each Environmental Profile.

On the one hand, some protagonists maintain CEP governments should move ahead quickly with direct action programs of remediation and intervention. The emphasis should be on defensive, "fire-fighting," protective kinds of action, given the environmental stress now observable in many sectors of island life.

For example, if the impact of pesticide use on public health is of critical concern, as articulated by government resource managers, health officials and community leaders, then what might be required is a program of improved data collection and analysis. Credible and reliable information is necessary to convince the political leadership of the urgency of the problem, thereby bringing it to the forefront as a priority policy question. The "environmental issue" is narrowly defined; the approach is a problem-solving one, i.e., to seek a technically-based solution; the strategy is to identify the necessary resources.

On the other hand, there are those who are anxious to approach the environmental issues identified in the Profiles strategically, i.e., to use the Profiles as a comprehensive planning tool and as a first step in the design and implementation of a broadly-based *national conservation strategy*. What is needed, according to this argument, is something almost like an structural readjustment for the environment in each CEP country. The strategic approach has a longer time frame, and because it is more visionary, it is more difficult. It builds on creating consensus and a mutuality of interests; hence, it is more political and less technical.

The problem is that sound environmental policy is a blend of politics and people's needs with technology and the natural system's needs -- in a sustainable equilibrium. In fact, follow-up to the CEP Project can be pursued on a variety of levels. The ratio of direct action to strategic planning solutions is really a function of where each CEP country is at present. Therefore, what is most needed now is the early development of a policy framework within which change can occur along with a schedule of implementation which reflects each country's assessment and prioritizing of the full spectrum of environmental issues identified in its own Environmental Profile.

Finally, it needs to be said that "solutions" are seldom as neat and orderly as their presentation in written form in the Environmental Profiles might make them appear. In most cases, they will require inter-disciplinary and cross-ministerial cooperation and coordination. Furthermore, a complex problem will appear, and in fact will prove to be, intractable until it is attacked creatively, aggressively, and simultaneously by both government and private sector entities working together. One of the purposes of the Country Environmental Profile Project in the Eastern Caribbean has been to open such channels for dialogue in the search for workable solutions.

KEY INSTITUTIONAL ISSUES RELATED TO ENVIRONMENTAL MANAGEMENT

- ENVIRONMENTAL DECISION-MAKING ON AN AD HOC BASIS, FOCUSING ON SHORT-TERM OR INTERIM RATHER THAN LONG-TERM POLICY OBJECTIVES FOR THE ENVIRONMENT.
- FRAGMENTATION OF ENVIRONMENTAL MANAGEMENT FUNCTIONS WITHIN CEP GOVERNMENTS DUE TO THE DIFFUSION OF THESE RESPONSIBILITIES AMONG A NUMBER OF DEPARTMENTS REPRESENTING SEVERAL MINISTRIES AND STATUTORY BODIES.
- ILL-DEFINED LINES OF INSTITUTIONAL AUTHORITY WITH REGARD TO THE MANAGEMENT OF LAND, WATER AND CULTURAL RESOURCES.
- GENERALLY WEAK COORDINATION AMONG GOVERNMENT AGENCIES AND STATUTORY BODIES WITH RELATED ENVIRONMENTAL MANAGEMENT RESPONSIBILITIES.
- LACK OF AN OFFICIALLY APPROVED, UP-TO-DATE LAND USE PLANNING FRAMEWORK IN ALL CEP COUNTRIES, THEREBY REDUCING THE OVERALL EFFECTIVENESS OF DEVELOPMENT CONTROL PROCEDURES.
- THE NEED TO STRENGTHEN THE PLANNING PROCESS AND TO UPGRADE THE RESPONSIBILITIES AND CAPABILITIES OF PHYSICAL PLANNING UNITS, INCLUDING THE ENVIRONMENTAL EXPERTISE OF PLANNING STAFFS.
- THE NEED FOR ENVIRONMENTAL IMPACT ASSESSMENTS, AS ONE MEANS OF FORCING A SYSTEMATIC EXAMINATION OF ENVIRONMENTAL AND SOCIAL ISSUES AT AN EARLY STAGE IN THE PLANNING PROCESS.
- SHORTAGE OF TRAINED AND EXPERIENCED TECHNICAL PERSONNEL FOR ENVIRONMENTAL PLANNING, MONITORING AND ENFORCEMENT ACTIVITIES.
- OUTDATED ENVIRONMENTAL LEGISLATION OR LACK OF SUPPORTING REGULATIONS TO MUCH OF THE EXTANT BODY OF ENVIRONMENTAL LAW, THUS DIMINISHING THE OVERALL EFFECTIVENESS OF THE LEGAL BASE FOR RESOURCE PROTECTION.
- FAILURE OF CEP GOVERNMENTS TO TAKE FULL ADVANTAGE OF THE CREATIVE ENERGIES, RESOURCES AND EXPERTISE OF NGOs WITH ENVIRONMENTAL INTERESTS AND AGENDAS.

FORESTS

- *To defend designated water catchment areas against encroachment and to phase out land clearing activities on very steep upland slopes, in critical water catchments, and in designated forest reserves,*

CEP governments should promulgate and implement more effective upland watershed land use regulations, monitoring programs, and protection procedures, including enforcement.

- *To increase the practice of private forestry and to present positive alternatives to illegal squatting or land clearing activities in critical water catchments,*

CEP governments should, in a deliberately-designed strategy, identify and establish appropriate incentives, including economic incentives, which promote these objectives.

- *To fund protective land and water conservation measures, including upland watershed land acquisition or easement control,*

CEP governments, perhaps in cooperation with donor agencies, should review metering systems, water rate schedules and user fee charges, and should thereafter establish financing schemes sufficient to earmark such monies for land and water conservation programs.

- *To improve the economic viability of small farmers while conserving the natural resource base,*

donor agencies, in cooperation with CEP governments and NGOs, should provide financial and technical assistance in support of agroforestry programs.

- *To ensure the availability of an adequate data base on the composition, condition, area and resources of forested regions and to provide for the long-term development of forests,*

CEP governments, with donor assistance, should prepare or update (1) forest resource inventories and assessments and (2) comprehensive forest resource management plans.

- *To confirm the extent of environmental risk associated with fuelwood production and harvesting,*

CEP governments should establish more effective methods for systematically evaluating fuelwood extraction rates, particularly for areas where continued harvesting for this purpose poses a substantial environmental risk.

WILDLIFE, HABITATS, AND BIODIVERSITY

- *To provide for a more systematic and formal integration of biodiversity issues into improved land use planning procedures,*

CEP governments should develop guidelines to (1) restrict the clearing of native forests in designated areas and habitat types and (2) provide for a recurring quantitative review of land use practices and trends and their effects on wildlife and biodiversity, viewed as a national resource.

- *To ensure access to data required for biological diversity assessment and decision-making,*

CEP governments, perhaps initially with the assistance of donor agency funding and NGO technical support, should upgrade natural resource mapping and data collection systems, moving toward development of a workable geographic information system (GIS).

- *To implement cooperative research, data collection, education and monitoring initiatives related to wildlife protection and the preservation of biodiversity,*

CEP governments and NGOs should establish working partnerships for the promotion of wildlife conservation, research, and educational programs and, to this end, should consider joint applications for funding support to appropriate donor agencies.

- *To improve access to information needed by decision-makers on the impacts of pollutants on wildlife and on marine and terrestrial ecosystems,*

CEP governments, assisted by NGOs, should develop long-term record-keeping procedures regarding pollution events and habitat damage or loss, such information to be centrally housed within one appropriate government agency.

- *To more effectively carry out wildlife management programs,*

CEP governments, with donor assistance, should identify resources for upgrading those units of government responsible for wildlife management, including resources for staff training, technical support, and equipment acquisition.

- *To improve global efforts to regulate wildlife trade and to gain access to materials, training, and expertise on species conservation and wildlife trade regulations,*

the Governments of Antigua-Barbuda, Dominica, Grenada, and St. Kitts-Nevis should approve the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

FRESHWATER RESOURCES and WATERSHED MANAGEMENT

- *To protect key water catchments and maintain adequate water supplies for domestic consumption and other uses,*

CEP governments should develop comprehensive national water policies and development plans for water resources and watershed management, including a phase-in program for land acquisition for watershed protection and a careful analysis of the optimal ratio of surface water to groundwater exploitation.

- *To more effectively exercise authority in limiting development in critical water catchment areas,*

CEP governments should adopt a more aggressive program of identifying and protecting the most productive water resource areas and incorporating this information into national planning, land use zoning, and development permitting policies.

- *To maintain public control over water catchment areas which are needed for the longer-term maintenance of water systems but which do not fall within the boundaries of legally-designated "protected areas,"*

CEP governments should establish use-limiting restrictions and incentives and should negotiate easements to limit the development of such private lands; alternatively, CEP governments, perhaps with donor assistance, should take steps to acquire critical lands for incorporation into a "protected areas" system under the control of appropriate authorities.

- *To minimize leakage and waste in the water distribution system, a recurring phenomenon in CEP countries,*

CEP governments, with donor assistance, should accelerate programs of leak detection and repair as an ongoing maintenance requirement.

COASTAL AND MARINE ENVIRONMENTS

- *To better regulate local fisheries and balance tendencies toward over-exploitation and excessive fishing,*

CEP fisheries management plans should be oriented toward conserving the resource and attempting to enhance its long-term returns, including efforts to stabilize declining landings and to optimize the harvest of species important to local nutrition and tourism.

- *To improve fisheries management programs,*

CEP fisheries managers should give priority attention to expansion of existing data collection systems and to improved implementation and monitoring of extant fisheries control measures and restrictions.

- *To more effectively manage development activities in the coastal zone and to provide more comprehensive development guidelines and policies committed to maintaining the quality of coastal resources in the face of accelerating "piecemeal" development,*

CEP governments, in cooperation with donor agencies, should take immediate steps to begin development of comprehensive Coastal Zone Management programs, including environmental impact assessments for coastal projects, permitting procedures, community education, techni-

cal assistance services, and resource user involvement in planning and monitoring.

- *To improve enforcement of regulations controlling the removal of beach sand, with its associated risks of coastal erosion and storm damage,*

CEP governments should establish formal programs to monitor marine sand resources and to regulate commercial exploitation of these resources, including the designation of (1) areas where controlled sand removal will have the least detrimental impact and is most compatible with current site utilization and (2) priority, erosion-prone areas where sand removal will be absolutely prohibited.

- *To address the increasing environmental problems affecting the coastal zone,*

CEP governments, with funding from donor agencies, should develop marine resource assessment, development, and management plans, in much the same way that such plans have been prepared for the forestry and agriculture sectors; marine resource plans should include an evaluation of coastal and marine resources (coral reefs, seagrass beds, beaches, mangroves), current extractive uses, and needed conservation programs.

AGRICULTURE

- *To address some of the environmental problems associated with banana cultivation, particularly in hillside areas,*

CEP governments should develop appropriate input pricing, extension services, soil conservation investment subsidies, and marketing assistance programs which encourage a diversification of the agricultural base, including an emphasis on tree crops capable of providing more permanent cover of land areas on steep, erosion-prone slopes.

- *To reduce soil erosion and general land degradation associated with overgrazing of livestock by small farmers,*

CEP governments, in cooperation with regional organizations and local NGOs, should pursue research programs to identify agroforestry methods and erosion-control techniques best suited to each country and to local soil types and terrain.

- *To address the problem of insecure land tenure, which serves as a barrier to expanded commitment to land conservation practices by small farmers,*

CEP governments should expand agricultural extension services to small farmers (emphasizing education and training programs in soil and water conservation techniques), and should identify more innovative and near-

term rewards, incentives, and subsidies to encourage the practice of environmentally-sound land management by small farmers.

- *To improve in-country capabilities for sampling and analyzing pesticide residues,*

CEP governments, with donor assistance, should establish procedures for the regular testing of potable water and food stuffs for pesticide residues, and should upgrade laboratory and personnel capabilities for water quality monitoring.

- *To improve implementation of extant pesticide control legislation,*

CEP governments should provide up-to-date regulations, reactivate and energize Pesticide Control Boards, and provide such boards with sufficient authority and personnel to actively monitor and regulate agrochemical importation, storage, distribution and use.

- *To improve safety procedures in the use and application of agrochemicals,*

agricultural extension agents and representatives of farmers' organization should be trained to certify farmers and other users in the safe use and application of agrochemicals.

TOURISM

- *To more clearly link tourism development to carrying capacity considerations, to enhancement of the natural environment, and to an appropriate and achievable level of infrastructure development,*

CEP governments should give more serious attention to an integration of economic planning and physical/land use planning.

- *To limit the tendency to increase the purchase of imported goods and services to support an expanding tourism industry,*

resource managers from both the private and public sectors should identify those specific goods and services to be "abandoned" to imports and those where better planning can actually increase the local content of the tourism product.

- *To limit the environmental and social impacts of large tourism projects, particularly those sited in the coastal zone,*

CEP governments should more carefully review large-scale tourism projects, using formal environmental impact assessment procedures, and should require such developments to be energy and potable water self-sufficient and have self-contained sew-

age treatment plants; additionally, tippage fees should be charged for solid waste generated by tourism facilities, and yardage extraction fees charged for construction sand.

- *To increase the marketability of CEP countries as tourist destinations,*

CEP governments, working with the private sector and NGOs, should design a comprehensive tourism amenities program for the development, use, and management of natural and historical landmarks as important features in tourism marketing plans.

- *To expand the tourism base in CEP countries,*

CEP governments, in cooperation with the private sector, should (1) more fully address nature or ecotourism in marketing plans and promotional literature, (2) develop site management plans for those amenities which support nature tourism, and (3) identify sufficient resources to implement such management plans, including training programs which address the special staffing requirements of ecotourism activities.

POLLUTION

- *To address the need for more comprehensive and financially realistic solid waste management planning, including implementation schedules and funding strategies,*

CEP governments, with donor assistance, should prepare national solid waste management plans, covering at least a ten and preferably a twenty year period, and should consider enactment of up-dated solid waste management legislation to define local and national government responsibilities, to establish standards for waste disposal, and to regulate waste collection; identification of financing for upgraded solid waste management programs should be a part of the planning process and should include identification of means for raising needed revenues by establishment of user fees for waste disposal services.

- *To reduce the pollution load in freshwater and marine environments from the continued disposal of raw sewage,*

CEP governments, with donor assistance, should upgrade present disposal methods by using preliminary treatment procedures combined with a long outfall for discharges into deep water in areas of strong currents; disposal systems should be designed to be easily upgraded to a higher level of treatment should this prove to be necessary later.

- *To reduce the pollution load of industrial wastes in harbors and other coastal waters,*

CEP governments should adopt public policies designed to attract relatively non-polluting industries; environmental impact assessments should be required of all proposed industrial projects, and existing industries already discharging toxic or high-BOD wastes into the environment should be required to treat such wastes and clean-up already polluted areas.

- *To have access to base line data and to identify marine/coastal areas requiring remedial action from environmental pollution impacts,*

CEP governments, with donor assistance, should establish long-term water quality and marine biological monitoring programs, including upgrading of laboratory facilities and personnel capabilities.

- *To reduce the risk from oil and other hazardous material spills,*

CEP governments, in cooperation with donor agencies and regional organizations, should develop contingency plans and emergency response capabilities.

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- *As an antecedent to the development of remedial or regulatory pollution control measures,*

CEP governments, in cooperation with donor agencies and regional organizations, should carry out national pollution assessments that identify the basic dimensions of waste streams and quantify sources and causative agents, flow rates, destinations, impacts, and projections.

- *To reduce the burden on the public treasury for pollution control and waste management programs,*

CEP governments, with donor assistance, should examine the feasibility of turning such programs into revenue-generating activities by the simple procedure of establishing prices for many facets of waste disposal and privatizing some services.

- *To address the need for updated environmental health legislation, based on modern pollution control problems and concepts,*

CEP governments, with donor assistance, should update and strengthen all such legislation and should provide national standards and criteria for water quality, pollution control, and waste management, keeping in mind each country's institutional capabilities and resources for carrying out oversight, monitoring, and regulatory responsibilities.

PARKS and OTHER PROTECTED AREAS

- *To improve efforts to protect and manage historical resources,*

CEP governments should (1) review, update, and strengthen antiquities legislation; (2) provide for the establishment of a "registry of historic places" with protection provided for national landmarks, historic sites, or architectural features included on the registry; and (3) consider the designation of "historic districts," including the development of policies which encourage adaptive use and restoration in such districts and the adoption of design controls for new construction.

- *To improve the existing, generally fragmented institutional framework for protecting, developing and managing critical natural areas and historical resources, with responsibilities spread among several authorities and institutions,*

CEP governments, in consultation with NGOs, should adopt a national policy and program plan for "heritage protection" which, among other issues, addresses the question of divided institutional responsibilities for protected areas management.

- *To ensure that all critical natural and cultural resources receive adequate protection in an integrated fashion,*

each CEP government, with assistance from donor agencies and in cooperation with NGOs, should prepare and formally adopt a plan for a "parks and protected areas system," which includes national guidelines for (1) designating protected areas, (2) selecting and acquiring sites, (3) establishing site management plans, (4) providing enforcement procedures, (5) designating a central management authority, and (6) defining public/private sector cooperation and inter-governmental coordination; a funding strategy for land acquisition also needs to be approved and put in place.

- *To address the critical shortage of trained staff for park management,*

CEP governments and NGOs, with donor assistance, should identify appropriate training programs for personnel in natural resource management and in park and protected areas management.

INSTITUTIONAL FRAMEWORK

- *To improve the effectiveness of land use planning, growth management policies, and the development control process,*

each CEP government should prepare (or update) a comprehensive physical development plan to guide and inform decision-making about future growth; the process should include development of island-wide zoning which classifies and protects certain categories of land for specific uses, e.g., agriculture, recreation, water catchment, forestry, and wildlife.

- *To improve generally weak development planning and control functions, identified as a systemic institutional problem in all CEP countries,*

CEP governments should strengthen the role of their physical planning units, including allocation of responsibility for (1) more formalized development review and development control functions, (2) preparation of land use maps and natural resource data bases, and (3) implementation of formal zoning restrictions and subdivision regulations; with assistance from donor agencies, the size and capabilities of planning staffs should be upgraded, perhaps to include environmental technical expertise.

- *To force a more holistic integration of technical data and environmental expertise across departmental lines and to guarantee more systematic input of environmental and social considerations at an early stage in the planning process,*

legislation is needed to mandate the formal preparation of environmental impact assessments for all major development projects, especially for those within the coastal zone, within the boundaries of designated protected areas, or affecting other critical areas.

- *To improve generally inadequate inter-agency and inter-sectoral coordination among the various units of government with environmental protection and resource management responsibilities,*

CEP governments should take steps to initiate procedures for more formal, regular, and effective coordination of government units with resource management functions, in particular those government departments and quasi-governmental statutory bodies with responsibilities for pollution control, land use planning, development control, allocation and use of public lands, and protection of watersheds and the water supply.

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- *To address jurisdictional gaps or redundancy in extant environmental legislation and institutional overlap or conflict in resource management responsibilities,*

CEP governments, with the assistance of donor agencies, should implement an up-dated assessment of environmental legislation, specifically identifying areas of conflict in institutional responsibilities and areas of shared or overlapping legislated or assumed authority; recommendations for modification of existing legislation should be provided as well as guidelines for improved coordination procedures.

- *To address the need for adequate technical personnel for monitoring and enforcement functions as identified in extant environmental legislation,*

CEP governments, probably with the assistance of donor agencies, should review the technical and regulatory implications of the full spectrum of existing and proposed environmental and resource management legislation and should take steps to improve the quantity and quality of staff required for implementation, particularly middle-level management and technical staff.

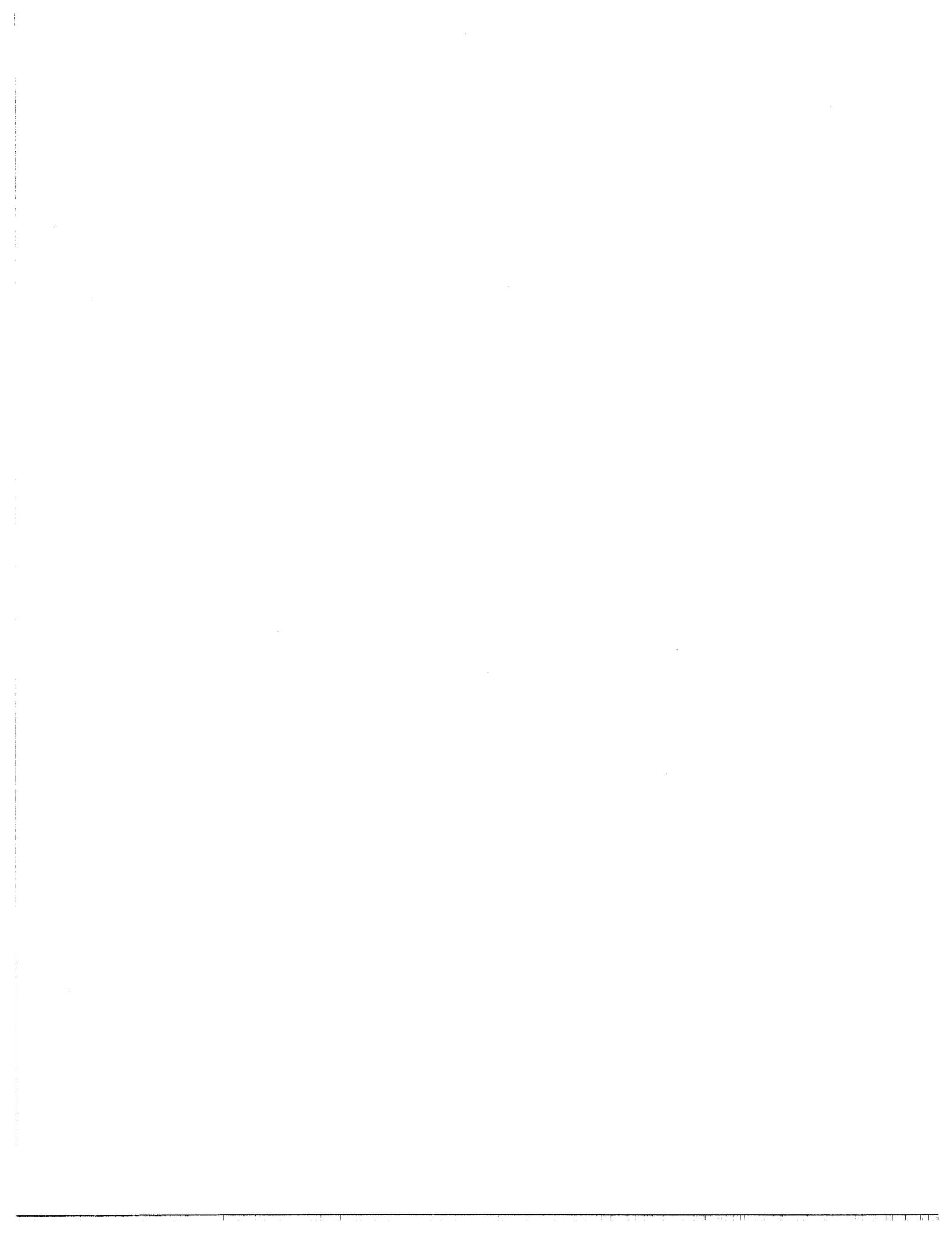
- *To strengthen the ability of citizens to participate over the long-term in the ongoing public policy debate about environment/development issues,*

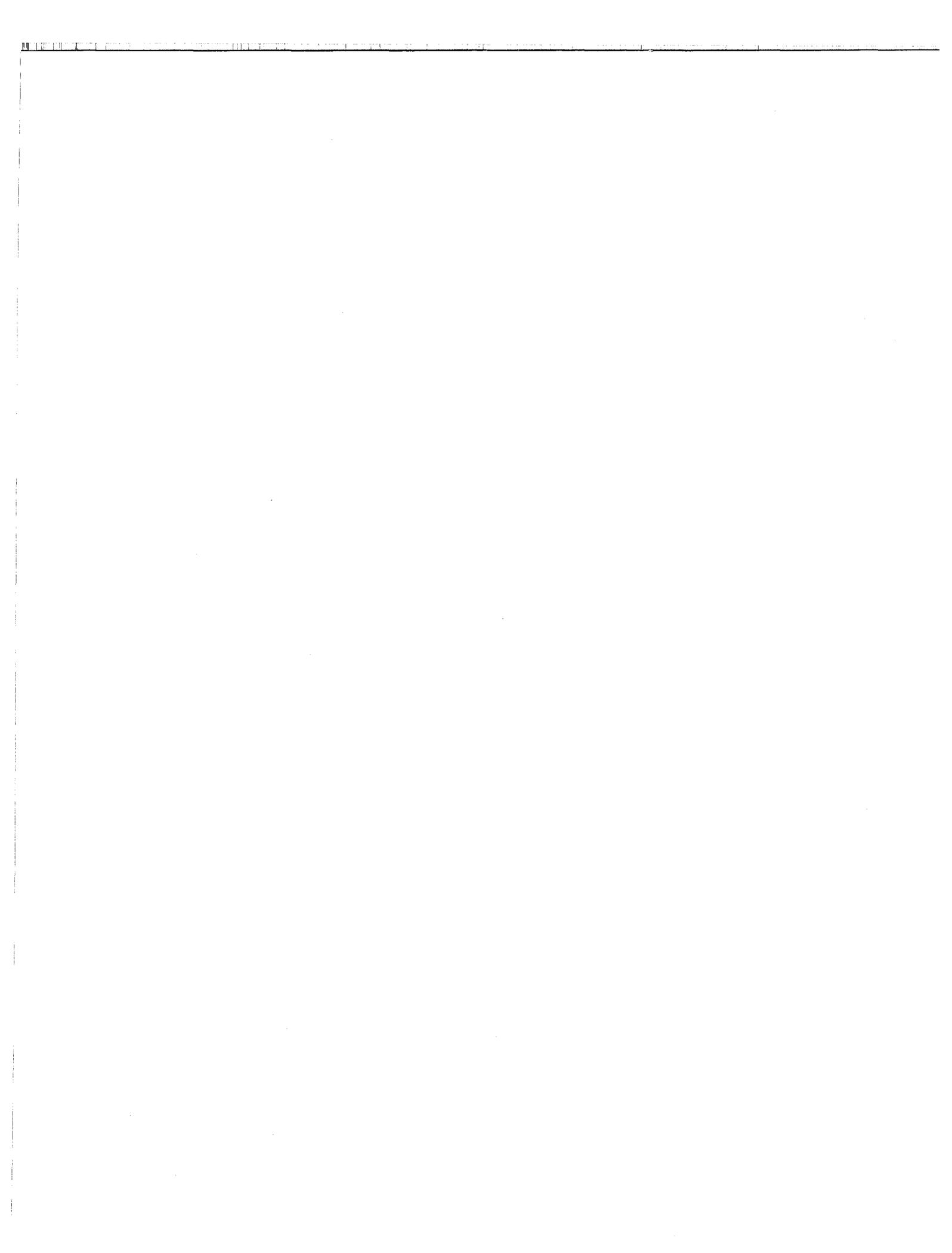
CEP governments should ensure that, as a matter of continuing public policy, education about the environment is incorporated into the formal educational system at all levels.

- *To facilitate government access to a broader base of information, expertise, public opinion and potential support,*

CEP governments and environmental NGOs should aggressively seek opportunities for promoting joint initiatives and partnerships in the pursuit of shared resource management objectives.







COUNTRY ENVIRONMENTAL PROFILE (CEP) SERIES FOR THE EASTERN CARIBBEAN

A collaborative effort (1987-1991) of the U.S. Agency for International Development; the Caribbean Conservation Association; the Island Resources Foundation; the Governments of Antigua-Barbuda, Grenada, Dominica, St. Kitts-Nevis, St. Lucia, and St. Vincent and the Grenadines; and the non-governmental organizations listed below.

The following Environmental Profiles were published by the Caribbean Conservation Association and the Island Resources Foundation in 1991:

ANTIGUA-BARBUDA COUNTRY ENVIRONMENTAL PROFILE

DOMINICA COUNTRY ENVIRONMENTAL PROFILE

GRENADA COUNTRY ENVIRONMENTAL PROFILE

ST. KITTS-NEVIS COUNTRY ENVIRONMENTAL PROFILE

ST. LUCIA COUNTRY ENVIRONMENTAL PROFILE

ST. VINCENT and THE GRENADINES COUNTRY ENVIRONMENTAL PROFILE

Requests for Profiles may be sent either to CCA or IRF as follows:

Executive Director
Caribbean Conservation Association
Savannah Lodge, The Garrison
St. Michael, Barbados

Publications Office
Island Resources Foundation
1718 P Street Northwest, #T4
Washington, D.C. 20036

In-country copies of individual Profiles may be requested from the following non-governmental organizations, each of which served as a local CEP partner/coordinator:

Antigua Environmental Awareness Group
P.O. Box 103
St. John's, Antigua

St. Christopher Heritage Society
P.O. Box 338
Basseterre, St. Kitts

Grenada National Trust and Historical Society
c/o National Museum
St. George's, Grenada

Nevis Historical and Conservation Society
Alexander Hamilton House
Charlestown, Nevis

YES Committee
c/o The Forestry Division
Botanical Gardens
Roseau, Dominica

National Research and Development Foundation
P.O. Box 1097
Castries, St. Lucia

St. Vincent National Trust
P.O. Box 1538
Kingstown, St. Vincent

