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ENVIRONMENTAL STRATEGY OPTIONS
FOR LATIN AMERICA AND THE CARIBBEAN



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TABLE OF CONTENTS

Table of Contents	
List of Boxes and Figures	
List of Acronyms	
Preface	
Acknowledgements	
<u>Executive Summary</u>	3
<u>I. Background Framework: The Sustainable Development Challenge in LAC: Linking Economy, Ecology, and Society</u>	10
<u>II. Constraints to Remedial Action</u>	15
<u>III. Strategic Principles</u>	20
1) Confrontation of Causes	
2) Economic and Environmental Strategies	
3) Institution-Strengthening	
4) Public Participation	
5) Role of Private Sector	
6) Research, Information and Technology Transfer	
7) Education and Training	
8) Environmental Impact Assessments	
9) Donor coordination	
<u>IV. Priority Areas for Strategic Actions</u>	23
A. Economic Policies, Trade, and Investment	23
B. Health, Population, and the Environment	27
C. Urban and Industrial Environmental Conditions	32
D. Agriculture	35
E. Natural Resource Systems: Forests, Watersheds, Biodiversity & Wildlands	41
F. Coastal Resources	49
G. Energy	51
H. Human Resources, Institutions, and Democratic Initiatives	54
<u>V. Conclusions</u>	58
<u>VI. Appendices</u>	
1. List of People Consulted	
2. A.I.D. Funding for Environment-Related Activities	
3. Environmental Indicators (Overview and Tables)	
4. List of References	

LIST OF BOXES

BOX 1 - ECOTOURISM	25
BOX 2 - SWAPPING DEBT FOR NATURE	26
BOX 3 - BOLIVIA'S CHILD SURVIVAL AND RURAL SANITATION PROJECT	30
BOX 4 - POLLUTION CONTROL PROGRAM BREATHE LIFE INTO CUBATAO	34
BOX 5 - HAITI AGROFORESTRY PROJECT BEARS FRUIT	39
BOX 6 - FOREST MANAGEMENT AND SOIL CONSERVATION IN GUATEMALA	47
BOX 7 - NATIONAL PARK PROTECTION SUPPORTS BIODIVERSITY	48
BOX 8 - PARTICIPATORY COASTAL RESOURCE MANAGEMENT IN ECUADOR	50
BOX 9 - ALTERNATIVE ENERGY PROJECTS GAINING STEAM	53
BOX 10 - FUNDACION NATURA'S ENVIRONMENTAL EDUCATION CAMPAIGN	56

LIST OF FIGURES

FIGURE 1 - INTEGRATED SUSTAINABLE DEVELOPMENT FRAMEWORK	4
FIGURE 2 - CAUSES OF NATURAL AND HUMAN RESOURCE DEGRADATION	12
FIGURE 3 - INTEGRATED SUSTAINABLE DEVELOPMENT FRAMEWORK	14
FIGURE 4 - RURAL AND URBAN POPULATIONS IN THE LAC REGION	27
FIGURE 5 - ACCESS TO SAFE DRINKING WATER	28
FIGURE 6 - ACCESS TO SANITATION SERVICES	28
FIGURE 7 - ENVIRONMENTAL HEALTH DIAGRAM	29
FIGURE 8 - LAND USE	36
FIGURE 9 - AGRICULTURAL LAND DISTRIBUTION	36
FIGURE 10 - SOCIAL ACTORS IN THE DEFORESTATION OF LATIN AMERICA	44
FIGURE 11 - DEFORESTATION, LAND-USE, & REPERCUSSIONS	45

LIST OF ACRONYMS

AID, A.I.D.	United States Agency for International Development
AID/LAC	Latin America and Caribbean Bureau
AID/LAC/RD	Rural Development
AID/LAC/DP	Development Planning
AID/W	Washington
AID/LAC/DR/E	Development Resources/Environment
AFR	Africa
ANE	Asia and Near East
APRE	Asia Private Enterprise
BIFAD	USAID Board for International Food and Agricultural Development
BOSCOSA	Forest Conservation and Management Project - Costa Rica
CARE	CARE International
CCREE	Canadian Environmental Assessment Research Council
CETESB	Sao Paulo (Brazil) State Environmental Agency
CF	Conservation Foundation
CI	Conservation International
DAI-DESFIL	Development Associates, Inc. - Development Strategies for Fragile Lands
EAI	Enterprise for the Americas Initiative
EDUNAT	Environmental Education Project - Ecuador
EIA	Environmental Impact Assessment
EPM	Environmental Planning and Management Program
FAO	United Nations Food and Agriculture Organization
FORESTA	Forest Resources for a Stable Environment Project - Costa Rica
GEMS	Global Environmental Monitoring System
GNP	Gross National Product
HUD	Housing and Urban Development
IBRD	International Bank for Reconstruction and Development (World Bank)
ICCP	INAFOR/CARE/Cuerpo de Paz soil conservation and forest management program
IDB	Interamerican Development Bank
ILO	United Nations International Labor Office
INAFOR	Guatemalan National Forestry Institute
IPM	Integrated Pest Management
LAC TECH	Agriculture and Rural Development Technical Services Project
NGO	Non governmental organization
NTE	Non traditional export
OAS/ILPES	Organization of American States/Latin American Institute for Economic and Social Planning
PADF	Pan American Development Foundation
PAHO	Pan American Health Organization
PL480	U.S. Government Public Law 480 - Food for Peace Program
PVO	Private Voluntary Organization
R&D	Research and Development
ROCAP	A.I.D. Regional Office for Central America and Panama
S&T/FENR	A.I.D. Bureau of Science and Technology/Forestry, Environment and Natural Resources
TNC	The Nature Conservancy
UNEP	United Nations Environment Programme
USAID	United States Agency for International Development
WRI	World Resources Institute
WWF	World Wildlife Fund

PREFACE

The Center for International Development and Environment of the World Resources Institute (WRI) has been cooperating with the Latin America and Caribbean (LAC) Bureau of the U.S. Agency for International Development in developing this regional environmental strategy for the 1990s. The main goals of this report are to provide a comprehensive analysis of the main environmental problems in the LAC region, to clarify the link between environment and development, and to identify strategic priorities and actions for A.I.D in the 1990s. The final report will provide a valuable resource for use in formulating and implementing actions in this important field. It is intended for a wide audience from many sectors in A.I.D. and in the region, other donors, governments of the region, NGOs, the U.S. Congress, and interested citizens and private enterprises. WRI's Center has carried out the work under funding of the Environmental Planning and Management Project in A.I.D.'s Bureau for Science and Technology, Office of Forestry, Environment and Natural Resources.

This draft of the "Environmental Strategy for Latin America and the Caribbean" consists of an overview of the general conditions, the main environmental problems, their impacts and causes, constraints to remedial action, and strategic options. The paper is based on a review of extensive literature and reports, analysis of A.I.D. projects, and interviews with numerous people, both inside and outside of A.I.D. In order to clarify how the environment is linked to all sectors, the team incorporated the views of experts in many sectors, including many people outside of the field of natural resources. The "Issues and Background Paper" for this project was completed in December, 1990, and was reviewed and discussed by A.I.D personnel at a workshop held on December 13-14. The comments and feedback generated at that fruitful workshop have been analyzed and incorporated into this draft.

This paper should be treated as a draft. Hopefully, it will stimulate interest, discussion, debate, and feedback. Reviewers' comments, suggestions, and ideas are welcome: they will be fully considered in the preparation of the final strategy document. The formulation of this strategy will continue as a participatory process, involving many people in the determination of priorities. Further interviews of individuals in LAC countries will be undertaken. This participation will increase the legitimacy and strength of the strategy and also increase the effectiveness of the actions. The final choice of strategic approaches will obviously vary in different countries, depending on conditions and constraints in each country.

Copies of this draft have been distributed to people whose comments will be valued in the review and revision process. Opinions and ideas will be aired in a workshop, which will benefit the preparation of the final strategy report.

ACKNOWLEDGEMENTS

This draft report was prepared by the Center for International Development and Environment of the World Resources Institute. Lori Ann Thrupp served as project leader and primary author of the report. She and Michael Colby conducted the research, analysis, consultation process, and writing for the "Issues and Options" paper. Roberto Martin contributed in every capacity, as the project research assistant. Walter Arensberg was an important advisor and provided invaluable comments on drafts. Dan Tunstall was responsible for managing the preparation of the environmental indicators section, and was assisted by Norbert Henninger, Dirk Bryant, Mieke van der Wansem, and Arum Gilbert, who prepared the data tables. Kara Page collected a comprehensive set of very useful references. Faye Kepner was the project secretary.

The project team would like to thank members of the project advisory committee: Mohamed El-Ashry, Tom Fox, Janet Brown, Walter Arensberg, Bruce Cabarle, Paul Faeth, Kenton Miller, Bob Repetto, Robert Winterbottom, Dan Tunstall, and Aaron Zazueta. The ideas and suggestions of the committee members have been useful in preparing the environmental strategy. The contributions of Aaron Zazueta, Dan Tunstall, and Walter Arensberg were particularly helpful during the workshop held in Washington in December.

We would also like to express our appreciation to the A.I.D. project team leader, John Wilson (LAC/DR/E), and James Hester (LAC/DR/E), and environmental advisers Jeff Brokaw and Tom Hourigan (LAC/DR/E) who provided assistance and information. The advice and guidance of Elena Brineman (LAC/DR) and Peter Bloom (LAC/DR) were also appreciated. Anne Langhaug (LAC/DP) was very helpful for bibliographic searches and acquisition of key documents. We are also indebted to Ray Waldron (LAC/DR/RD), Mike Korin (LAC/RD), and Dave Gibson (LAC/DR/RD) and the LAC/TECH program, especially Jim Carney, Jim Stewart, and Candace Conrad, for excellent organization and support of the workshop and the collaborative efforts between the agriculture and environment strategies. The support of the Environmental Planning and Management project within the Bureau of Science and Technology, in the Forestry, Environment, and Natural Resources Office made it possible to carry out the project. Finally, we owe thanks to all of the people we interviewed (listed at the end of the paper), whose insights and information were crucial in the preparation of this draft paper.

ENVIRONMENTAL STRATEGY OPTIONS FOR LATIN AMERICA AND THE CARIBBEAN:

EXECUTIVE SUMMARY

Introduction

The Latin America and Caribbean region has a great abundance and diversity of natural and human resources. Over the past several decades, however, the resource and environmental conditions have become increasingly degraded, undermining economic growth and threatening human health in the region. These environmental problems have reached a level of urgency in the 1990s. The nations are challenged to adequately manage and develop natural and human resources to bring about sustainable economic development; and many of them have undertaken attempts to meet this challenge. Unfortunately, the regional economic crisis has compounded forces of degradation and have limited the financial resources available to solve these pressing problems.

The Latin American and Caribbean (LAC) Bureau of the U.S. Agency for International Development (A.I.D.) is formulating this regional environmental strategy in order to: clarify the link between environment and development, identify approaches and activities which will be most effective in resolving the problems, and integrate environmental considerations into all programs. This draft Environmental Strategy sets out options intended to address these urgent issues. The report presents a framework clarifying the environment-development nexus, the main environmental conditions and problems in LAC, their impacts and causes, constraints to remedial action, and suggested strategic principles and actions for AID/LAC in the 1990s.

A basic assumption behind the strategy is that the environment is not a threat to development, nor is it another sector for development, to be assigned to a "new" division to handle. Rather, environmental quality and natural resources are fundamental to economic growth and development. Thus, programs, policies, and projects to ensure environmental and natural resource sustainability must be integrated into traditional development programs, and into all activities of A.I.D., governments, private enterprises, and citizens.

The report will stress the importance of understanding and addressing the human dimensions of environmental problems -- ie, the social and economic roots and repercussions of these predicaments. Overcoming all forms of environmental problems is thus critical for improving human welfare, economic development and political security in the 1990s.

The good news is that there are plenty of ways to harmonize ecological, economic, and social needs in the process of development. Experience shows that private sector enterprises profit from environmentally-sound investments; and similarly, governments, NGO's, and community groups can benefit greatly, environmentally, economically, and socially, from sustainable activities. The actual implementation of these initiatives often requires different ways of thinking and innovative strategies, methods, policies, and projects --throughout the range of activities associated with development assistance. Such changes sometimes are constrained by institutional, political, and economic barriers, but these problems can often be resolved through dialogue, negotiation, and comprehensive accounting of resource values.

The strategic principles, objectives, and options presented here are at a general level, and logically not all of them will apply to all countries of the region. The cross-cutting

principles serve as particularly important guidelines aimed to link economic, social, and ecological interests. The options may be seen as an "idealized" array, based on the analysis of the key issues and needs of the Latin American and Caribbean countries. They have not yet been narrowed to the point of a Final Strategy for the AID/LAC Bureau's activities. Each country will need to select priorities adapted to local conditions.

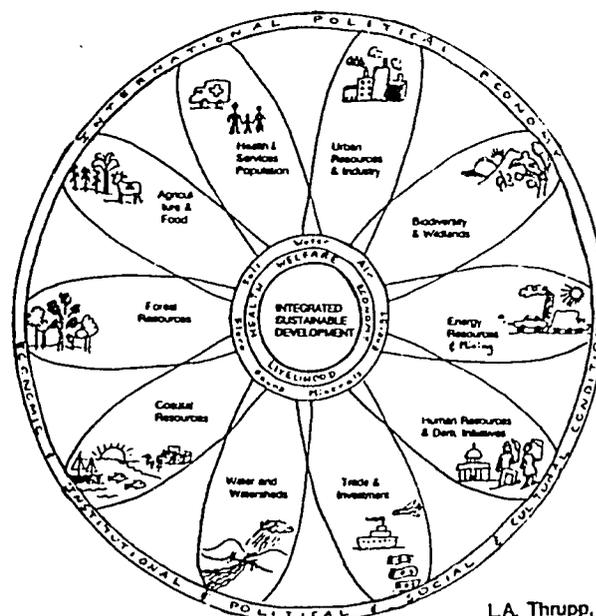
The report consists of the following sections:

I. Background/Framework: The Sustainable Development Challenge -- Linking Economics, Ecology, and Society

The environment, economic development, and human health are inextricably linked. "Environmental" issues are not only "green" concerns, such as loss of habitat, wildlands, vegetation, flora, fauna, and soil. They also include "brown" issues such as sewage contamination, pollution, lack of potable water, and waste hazards – which often reflect poverty and inequities. All of these are social and economic issues which directly impact peoples' health and welfare. The roots of these predicaments must be confronted to achieve integrated sustainable development, which means that the political economic and social structural causes must be addressed. The LAC nations face the vital need to integrate environmental management into all activities, while overcoming severe economic crisis which has emerged in the past two decades. Environmental management initiatives constitute opportunities for effective change. Private companies, governments, and NGOs can make important contributions in these efforts.

II. Constraints to Remedial Action

A.I.D., other donors, LAC governments, NGOs, and other groups have responded to many of these problems, by developing programs and activities aimed toward alleviating degradation and supporting sustainable development. Nevertheless, environmental problems are worsening in many areas, and the efforts for change are thwarted by the following main constraints: a) policy and political influences; b) socioeconomic inequities, which often prevent people from adopting changes; c) institutional weaknesses; d) economic factors, including poverty, uncontrolled or directed economic growth, indebtedness, and pressures to "mine" resources; e) gaps in education and information; and f) lack of attention to public participation.



L.A. Thrupp, 1990

III. Strategic Principles

Preventing and alleviating natural resource degradation and poverty requires integration of environmental management into all arenas of development, as depicted in the Integrated Sustainable Development Framework diagram above. Changes are needed to merge ecological, economic, and social aims. This calls for effective strategic principles:

- 1) Address the root causes underlying environmental/human degradation, stressing prevention of problems.**
- 2) Develop economic and environmental policies for sustainable development and eliminate conflicting policies that cause degradation.**
- 3) Strengthen institutions involved in natural resources and environmental management, including NGOs and government agencies, which includes improving management, legal systems, and technical capacities.**
- 4) Support public participation and empowerment of local people in environmental initiatives.**
- 5) Strengthen the role of the private sector in environmental management.**
- 6) Promote research, information exchange, and technology transfer for sustainable development and environmental management.**
- 7) Strengthen education and training of environmental management, in all areas and at many levels.**
- 8) Integrate environmental impact studies into development processes and in a wide range of projects and activities.**
- 9) Promote donor coordination and interagency collaboration for undertaking natural resource and environmental management.**

These principles apply to all of the sector-specific areas and actions identified below.

IV. Priority Areas for Strategic Actions

All major sectors of LAC affect and are affected by environmental degradation and resource depletion, ranging from pollution to soil erosion to loss of genetic resources. All of the problems have adverse cross-sectoral impacts, particularly economic losses and harm to human health, which can undermine development. In addition, the predicaments have a wide range of specific causes; but the main causes are often rooted in economic forces, inappropriate policies, short-term time horizons, and inequities in resource distribution. Overcoming these problems requires effective actions in the priority areas identified below, and application of the cross-cutting principles in each of these sectors.

Areas of strategic actions:

A. ECONOMIC POLICIES, TRADE, AND INVESTMENT

Objective: **Support environmentally-sustainable economic policies, trade, and investment, and prevent social/ecological degradation from investment & trade.**

Actions: 1) Establish environmental accounting to reflect actual values of resources

2) Implement policies to mitigate potential negative environmental impacts from trade and structural adjustment policies

3) Develop incentives to promote private sector investments in environmentally-sound services, industries, and products

4) Expand ecotourism and environmentally-sound tourism which benefit local people

5) Promote innovative financing mechanisms, such as debt-for-nature and debt-for-development swaps in environmental management

6) Support local management and incentives for small private businesses involved in environmental enterprises

7) Improve flow of technology and information from North to South and South to South and within the countries, partly through increases in commerce

B. POPULATION, HEALTH, AND THE ENVIRONMENT

Objective: **Reduce population pressures and environment-related health problems, emphasizing family planning, preventive health measures, and community actions.**

Actions: 1) Develop family planning programs

2) Implement comprehensive population policies

3) Improve supply services and quality of water

4) Improve hygiene and sanitation

5) Develop occupational health and safety programs

C. URBAN & INDUSTRIAL ENVIRONMENTAL CONDITIONS

Objective: **Prevent and minimize pollution in urban/industrial areas and provide urban residents safe and affordable water, sewage and waste disposal services.**

Actions: 1) Improve water treatment and delivery systems in urban areas

2) Develop waste management and disposal services

- 3) Reduce and prevent pollution through changes in policies, technologies, and industrial processes, and promote efficient clean production systems
- 4) Promote recycling and conservation of reusable materials
- 5) Improve planning to avoid and mitigate natural disasters in urban areas

D. AGRICULTURE

Objective: Support goals of sustainability (including environmental soundness, productivity, and equity) in the development of agriculture, emphasizing resource management, participatory approaches, and security of rural livelihoods.

- Actions:
- 1) Develop sustainable agriculture, emphasizing soil conservation, agroforestry, and water/irrigation management, and using systems and participatory approaches
 - 2) Improve land tenure systems and security of land ownership
 - 3) Reform agricultural pricing to support productivity, sustainability, and equity
 - 4) Harmonize actual agricultural land use with soil capability, involving local people in decision-making and analysis of capacities and uses
 - 5) Develop sustainable crop protection, including pesticide regulations, Integrated Pest Management, and improved phytosanitary laws
 - 6) Promote diversity of species and systems, and crop diversification
 - 7) Provide balanced support of agricultural exports and food crops for local markets
 - 8) Improve market opportunities and rural financial/credit systems
 - 9) Improve infrastructure maintenance and development
 - 10) Ensure narcotics interventions are environmentally sound

E. NATURAL RESOURCE SYSTEMS: FORESTS, WATERSHEDS, BIODIVERSITY & WILDLANDS

Objective: To reduce deforestation, develop sustainable, productive, & equitable management of forest resources, improve watershed/water management, and promote conservation of biodiversity and wildlands, stressing participatory actions.

- Actions:
- 1) Slow deforestation and promote reforestation through improved programs, policies, and incentives
 - 2) Improve land tenure and property rights systems to promote sustained resource use
 - 3) Develop comprehensive watershed management

- 4) Develop multi-purpose natural forest management
- 5) Develop agroforestry and social forestry activities
- 6) Support conservation of biodiversity, wildlands, and forest areas (such as parks, reserves), ensuring that local people participate in and benefit from the initiatives
- 7) Promote innovative approaches to link biological and cultural diversity, such as extractive reserves, ecotourism, and seed banks
- 8) Promote efficiency and equity in water distribution
- 9) Develop comprehensive planning and siting of dam construction
- 10) Reform colonization policies and settlement incentives in forest lands

F. COASTAL RESOURCES

Objective: Improve coastal zone management and planning and prevent coastal pollution, giving attention to sustainable development of tourism and fisheries.

- Actions:
- 1) Control overfishing and induce sustainable fisheries management
 - 2) Implement laws and/or incentives for controlling effluents, waste disposal, sand mining, petrochemicals, and other sources of pollution along shores
 - 3) Improve environmental analyses, planning, and management for tourism and infrastructure construction in coastal areas
 - 4) Integrate coastal management with watershed management/planning
 - 5) Improve regulations over reef, mangroves and endangered marine species

G. ENERGY

Objective: Increase energy efficiency and conservation, develop renewable energy sources, and eliminate barriers to appropriate energy production technologies.

- Actions:
- 1) Improve energy efficiency and conservation in all sectors
 - 2) Develop comprehensive sector-wide energy planning and energy policy reforms
 - 3) Increase use of renewable energy sources, including biomass, small hydropower, wind, solar energy, and geothermal
 - 4) Support the development of co-generation plants by independent producers
 - 5) Improve access to and efficiency of fuelwood use

H. HUMAN RESOURCES, INSTITUTIONS, AND DEMOCRATIC INITIATIVES

Objective: Strengthen human resource development through education & training, and support democratic initiatives for sustainable and equitable development.

Actions: 1) Develop environmental education programs at all levels (schools & universities)

2) Strengthen laws, regulatory systems, and enforcement mechanisms to support environmentally and economically sustainable use of resources

3) Support public-awareness-raising efforts for environment-related issues

4) Develop environmental training for policy-makers, technicians, and managers

5) Develop innovative institutional linkages, networks, and improved communication

6) Support locally-based expertise, taking advantage of local experiences & knowledge

7) Support democratic initiatives and local grassroots environment-related movements

V. Discussion of Strategic Options

The final section consists of a brief overview of the main problems, causes, principles, and options, summarized in the form of a simple matrix. The wide range of options represent opportunities which can be undertaken by donors, private enterprises, government agencies, NGOs and community groups. The AID/LAC Bureau Missions and the countries of the region will need to select priorities, depending on their natural and human resource capacities, and development agenda. Programs need to be adapted to particular constraints, and must allow for dynamic flexibility. Implementing the strategy will require major policy changes and solid actions that go beyond rhetoric.

I. BACKGROUND/Framework:

THE SUSTAINABLE-DEVELOPMENT CHALLENGE IN LAC

Linking Economics, Ecology, and Society

a. Introduction

The **environment** of the Latin American and Caribbean region consists of a great abundance and a wide diversity of natural and human resources. Despite this rich innate endowment, however, the nations of this region confront a wide range of environmental problems harming natural resources and societies in the late 20th century. These problems range from health hazards from pollution to deteriorating land and water resources. The repercussions of these predicaments include rising economic and social costs and threats to human welfare -- undermining economic development and social stability.

The nations of Latin America and the Caribbean face the challenge of adequately managing and developing the natural and human resources for sustainable economic development. The existing problems demand innovative solutions and concerted actions. They must include a diversity of technical, social, economic, institutional, and political initiatives and reforms. The great cultural and natural capacities of the region need to be used with creativity and imagination to resolve difficult dilemmas. Environmental management must become an integral part of the development process.

b. Clarifying The Environmental Agenda: Resource-Economy-Society Linkages

The character of environmental problems in Latin America and the Caribbean can be summarized in six general themes or points which will be illustrated throughout this report.

First, environmental problems are defined broadly. They include not only "green" resource dilemmas -- eg, loss of habitat, wildlands, forests, vegetation, flora and fauna, soil erosion and watershed conditions; they also include what are called "brown" issues, such as sewage contamination, scarcity of potable water, and inadequate disposal of solid and hazardous wastes. Thus, environmental predicaments are far more than aesthetic and "future" concerns; they are social and economic costs which directly harm social welfare and can provoke political instability. (Brundtland, 1987, IDB/UNEP, 1990)

Second, many environmental problems have widespread repercussions, affecting all levels and groups of society; but, poor people -- ie, low income groups in rural and urban areas -- usually are the main victims of these problems. That is, the poor suffer a disproportionate burden of these harmful effects in the region (IDB/UNEP, 1990). This distribution of impacts needs to be given attention when attempting to form solutions.

Third, poverty is both a cause and effect of many forms of environmental degradation. However, "blaming" the poor for the problems is a common misperception which needs to be eliminated. Poverty is derived from deeply-rooted historical development patterns and inequities -- which sometimes "force" poor people to unintentionally harm or overuse natural resources and/or to live in deteriorated physical conditions. Paradoxically, paths to affluence that emphasize short-term economic interests also are both causes and outcomes of resource degradation. In other words, there are worsening environmental problems associated with both economic development and very low levels of development.

Fourth, Latin America and the Caribbean is characterized by both crises and opportunities. These tensions are manifested by the fact that the region has extensive natural resources and biological diversity, offering great unrealized potential; yet the resources are being increasingly degraded and depleted. In addition, there is wealth concentrated in some areas and great cultural richness, but the majority of people in the region live in poverty, constrained by inequities and low incomes, and many suffer from cultural, political, and social oppression. Environmental conditions illustrate these paradoxes. Although attention to the environment is growing, the problems have worsened. For example, the lack of sewage disposal and potable water affect growing numbers of people, provoking high incidence of infectious disease and high rates of child mortality. Industrial and urban pollution of air and water have reached alarming levels, causing illness and reducing life expectancy. Deforestation rates have increased, usually in areas unsuitable for sustained production, contributing to soil erosion, declines in agricultural productivity, and loss of biodiversity. High rates of population growth and urbanization exacerbate the economic and environmental dilemmas in many areas. Resources, economic opportunities, and services are inequitably distributed and are insufficient to accommodate expanding populations.

Fifth, environmental problems must be seen in relation to the economic and political context. Over the past two decades, the LAC nations have been shackled by severe economic crises, characterized by growing external debt (reaching approximately \$500 billion for the region in 1988), accelerating inflation, recession, high unemployment, and growing inequities in income distribution -- which exacerbate poverty. Many governments and international agencies have attempted to resolve these problems through structural adjustment and austerity measures, and promotion of short-term growth and exports. Although some countries have overcome the serious stages of crises, most still face economic hardships. These economic situations both affects and are affected by natural resource conditions. That is, economic problems are partly caused by resource degradation, such as the declining agricultural productivity from soil erosion. At the same time, economic factors, including poverty, inequities, and the economic policies and forces which induce short-term unsound approaches of resource extraction, contribute to resource and human degradation.

Sixth and finally, it is clear that environmental degradation, economic decline, deterioration of health, and social-political instability are closely interlinked. These conditions have trapped many people in the region in a vicious circle. In turn, addressing environmental issues means addressing factors that impinge upon peoples' welfare and human rights, as well as the physical resources on which societies' livelihoods depend. Environmental management dilemmas cannot be divorced from economic and social development in the region.

c. Importance of Understanding Root Causes

The causes of environmental degradation are multifaceted and complex; and they need to be well-understood and addressed in order to solve the problems. In general, the causes include technical constraints, economic and financial constraints, institutional and political weaknesses and biases, and demographic factors, as well as natural physical factors. Any given problem usually has several contributing factors; no single factor can be blamed. Specific causes of degradation will be explained in this report.

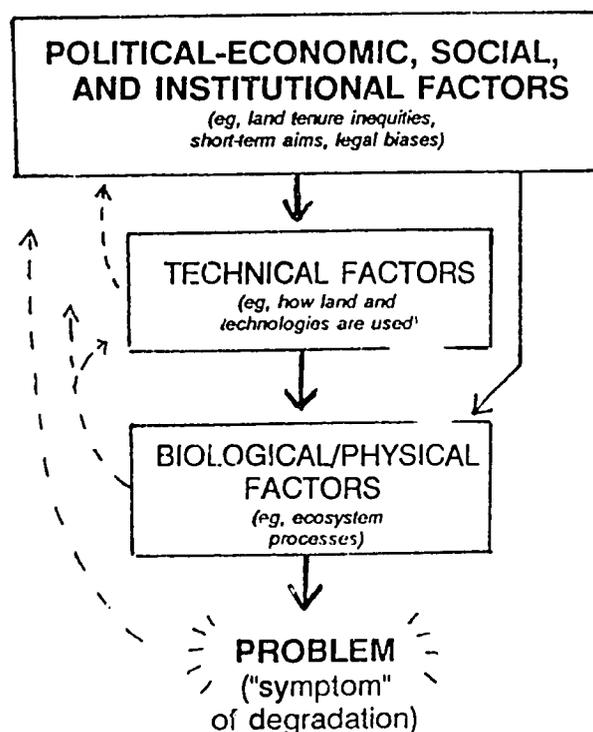
In general, however, the underlying root causes are often economic and political forces which drive the patterns of development in unsustainable directions. More specifically, these factors include: particular patterns of development which are aimed for short-term interests and

which give inadequate attention to future and social impacts, such as over-exploitative use of resources; economic pressures to repay growing debts; limited time horizons; and, in many cases, inequity in the distribution of resources (Brundtland, 1987, Leonard, 1987). Land tenure inequities are proven to be particularly important underlying causes of deforestation, soil erosion, land degradation, and the concomitant hardships for rural poor people (Leonard, 1987, IDB/UNEP, 1990). Conventional economic policies and incentives often support these kinds of forces and patterns, since they tend to neglect or contradict concerns for environmental, and socioeconomic sustainability. Moreover, policy-making processes rarely involve local people and farmers in most countries, which aggravates the neglect of peoples' resource needs.

Other socioeconomic factors which contribute to these problems are weak institutional and educational capacities and absence of political will to address environmental issues. These weaknesses are partly due to the fact that many decision-makers still have the false perception that environmental management and development conflict, instead of understanding that these can actually coincide.

These crucial underlying social, economic and political forces are simply depicted below:

CAUSES OF NATURAL AND HUMAN RESOURCE DEGRADATION



Source: Thrupp, 1989

d. Responses and Challenges: Integrating Environment and Development

In the LAC region, initiatives have been taken in attempts to resolve the multifaceted environmental problems. A.I.D. and other donors, LAC government agencies, multilateral banks, NGOs (both local and international), and community groups have become involved in these efforts. They include a wide diversity of projects and measures for resource conservation and environmental management.

A.I.D.'s current activities in the area of environment and natural resource management are a necessary outgrowth of its responsibilities defined in the Foreign Assistance Act of 1961. In 1976, these environmental responsibilities were formally set out in Federal Regulation 16 (22 CFR Part 216), which provided detailed guidance on evaluating the environmental effects of projects, programs and activities proposed for A.I.D. funding. Between 1977 and 1986, the Foreign Assistance Act was amended to reflect increased government commitment to these issues. Section 118 was amended to require environmental assessments for any A.I.D. project significantly affecting the environment, and was later expanded to place a high priority on conservation and sustainable management of tropical forests. An amendment to Section 119 encouraged the participation of local people in all stages of project design and development relating to biological diversity.

A.I.D.'s 1988 Policy Paper on the Environment and Natural Resources was the first attempt to place the above regulations into a coherent policy framework. The recognition that sustainable use of natural resources is essential to the Agency's central goal of promoting economic expansion in developing countries has brought environmental issues into the mainstream of project planning. The policy paper was followed in May of 1990 by the "Initiative on the Environment", a proposal by the Working Group on the Environment to guide A.I.D.'s natural resource and environmental interventions in the most urgent areas.

The LAC Bureau and country missions have made progress in developing such efforts (summarized in Appendix 2), which conform to the previous policy guidelines, priorities and proposals. The Central America Strategy (November 1990) was an important step in specifying strategies priorities for resolving pressing problems in the region. A.I.D. has recently established additional innovative means of supporting environmental management and sustainable development in the Enterprise for the Americas Program (June 1990).

Through these experiences, it has become clear that the amelioration and prevention of environmental problems contribute to economic development. That is, environmental aims and development aims can be mutually-reinforcing and linked. Conservation and pollution prevention pay, in terms of preventing losses, increasing productivity, and sustaining profitability, as well as improving social conditions. The "health" of the environment and its resources is vital to the "health" of the economy and society. Millions of people are calling attention to the economic hardships from resource degradation and to the need to link environment, development, and equity aims.

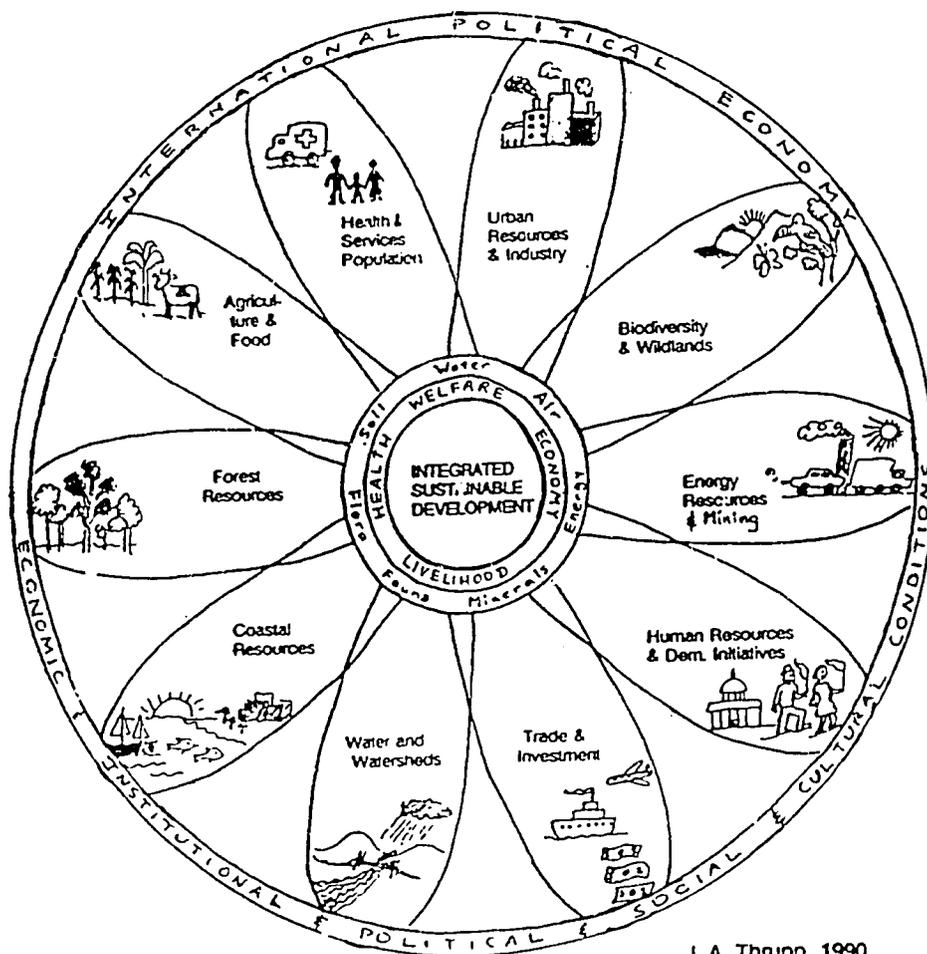
Undeniably, conflicts sometimes arise between "environmental" and profit-making interests, usually involving trade-offs between long-term vs. short-term aims, or social vs. individual/private interests in resource use. However, these conflicts can be resolved in many cases, sometimes through negotiations and balancing trade-offs, in order to find sustainable and just solutions.

Finding effective solutions is by no means easy, however. Many environmental initiatives have serious constraints and weaknesses. Some of the main constraints are institutional weaknesses, lack of policy and political support, economic limitations and conflicts,

socioeconomic inequities, and lack of environmental education -- which were mentioned above (as causes). Other constraints are due to weaknesses in planning, implementation and monitoring of policies, programs, and projects. In particular, many environmental efforts have not adequately accounted for social and cultural factors, and have not enabled full participation and involvement of local people. This neglect of the "human dimension" is being increasingly recognized by A.I.D. and other agencies, and attempts have been made to redress this problem. It has become clear that success in environmental management depends partly on full participation of the local people. That is, success is more likely when people themselves are interested and are fully engaged and empowered in the process of defining and resolving the problems and building alternatives.

Despite the disarray and despair which is often depicted about degraded resource conditions in Latin America and the Caribbean, hope for the future can be seen in these emerging activities. Environmental deterioration is not an inevitable outcome of human activity; it has emerged from particular patterns of development. These patterns do not have to be maintained. Lessons have been learned and major changes are being made to bond economy, ecology and society. Sustainable development depends largely on prudent management of the natural resource base. LAC faces a challenge of overcoming the spiral of degradation, while effectively realizing the great potential of the rich human and natural resources in the region. (See Figure below)

This Environmental Strategy Paper for LAC is designed to provide a long-term and comprehensive perspective on the environment and natural resource conditions of the region. It will also present strategy options which fit, complement, and supplement previous guidelines and efforts supported by A.I.D.'s and the LAC Bureau for sustainable economic development.



II. CONSTRAINTS TO REMEDIAL ACTION

Although many efforts have been taken to overcome the environmental problems in the region, there are still major constraints and barriers to effective action and change. Unfortunately, environmental degradation and natural resource depletion are continuing in most of the Latin American and Caribbean countries, in spite of these initiatives. Although some have been successful in introducing new environmental management practices, the measures are still inadequate in quantity and quality to bring about the required changes. Achieving sustainable and equitable forms of development poses difficult challenges, and it requires transformations of conventional development patterns.

The main constraints to effective action for resolving environment-development dilemmas are common to nearly all issues. Experiences have shown that the main barriers are not technological; that is, many management technologies exist. However, they have not been widely disseminated or adopted for a variety of reasons. One of the main problems is that the causes of the problems are not being directly addressed, attacked, and changed. That is, the measures address the "symptoms" and apply remedial measures, rather than confronting the roots of problems. The main constraints to effective action are grouped in six general interrelated types: Policy/political influences; inequities; economic forces; institutional weaknesses; lack of education; lack of attention to public participation; lack of diffusion of appropriate technologies.

A. POLICY/POLITICAL INFLUENCES:

There are numerous political and policy constraints affecting natural resource agencies and programs in Latin America and the Caribbean. Political forces and prevalent economic and legal policies often counteract objectives for sustainable equitable development.

Political support is often the critical ingredient which determines the breadth and depth of sustainable development activities. Yet, in LAC, this vital factor is often missing. Lack of strong and consistent political support results in inadequate financial, political and social incentives for developing effective environmental initiatives. This severely limits the potential contribution of such measures.

In some cases, political support is lacking because environmental protection and resource management can be controversial and politically sensitive for decision-makers. Moreover, environmental interests are often perceived as conflicting with development interests, even though this is not necessarily true. In these situations, decision-makers tend to give political support to conventional economic interests, to the neglect of environmental issues. Strong political support for resource management has come from leaders who recognize that environmental and economic interests can coincide to achieve sustainable development aims.

Important related constraints are government policies which conflict with rational environmental management. Many LAC policies intended to promote economic development have negative social and environmental consequences. Policies which contribute to resource degradation and which counteract sound management include:

- i) government subsidies for agrochemicals, beef cattle production, and timber;
- ii) colonization policies (which require deforestation for acquiring land titles);
- iii) incentives for agricultural exports requiring heavy agrochemical inputs;
- iv) price controls which discriminate against the disadvantaged;

- v) deregulation of polluting industries and of toxic products;
 - vi) policies which permit and encourage land speculation and deforestation;
 - vii) tax policies which lead to inefficient and environmentally harmful land/forest use
 - viii) leasing and colonization policies which induce settlement in fragile areas;
 - ix) pricing policies which undervalue resources (eg, water and oil) and hinder conservation.
- Usually the negative effects of these policies are unintended; but changing these policies can be difficult, because they are often backed by deeply-entrenched economic interests.

Weaknesses and biases in the legal policies which govern economic and environmental policies are also significant constraints. Typically, in many LAC nations, environmental laws exist "on paper;" but, in practice, they are inadequately implemented and enforced. Mechanisms for enforcement often are absent because of lack of finances and staff for this purpose, and inadequate political commitment. Natural resource projects, strategic planning, and institutional innovations can not proceed effectively without supportive and compatible national policies and laws (USAID/ROCAP, 1989).

B. INEQUITIES:

Inequity in the distribution of land, resources, and income is a crucial constraint to carrying out effective environmental management. Socioeconomic inequities are deeply-rooted in the historical patterns of economic development in LAC. The pervasive disparities between rich and poor throughout LAC deter people from changing their resource practices and use. For example, it is difficult for farmers on very small plots of land to adopt tree-planting, because trees occupy land they need for growing basic foods. Likewise, building soil conservation terraces requires a great deal of time which farmers often need to devote to producing immediate necessities for their families. Inequitable land-tenure systems and land-tilling policies are particularly strong barriers to the sustainable use of land and resources. They lead to concentration of land ownership and "squeeze" or displace small poor farmers, forcing them to farm on unsuitable unproductive lands. When people do not have security of land tenure, they are unlikely to invest in conservation practices such as tree-planting which have longer-term payoffs. In general, the majority of people -- ie, the poor -- lack alternative sources of income or resources which could enable them to change to environmentally sound activities. (IDB/UNEP, 1990, Leonard, 1987, Brundtland, 1986)

Moreover, efforts to develop environmentally-sound technologies are limited because they seldom reach poor people living in isolated marginal areas. Development of infrastructure and services often do not benefit the rural poor, but instead are biased towards urban populations (Lipton, 1983). This happens partly because of difficulties and high costs of gaining access to these regions, and because of political influences of powerful urban interests. On the other hand, strong vested economic interests defending status quo structures sometimes block efforts to introduce resource management and land-tenure changes which could help the majority.

Urban pollution control and sanitation programs are also constrained by inequities in the distribution of income. For example, poor urban people and poor municipal governments cannot afford to install sanitation systems or treat water. Since they lack access to waste disposal services, it is difficult to dispose of wastes and sewage in sanitary ways. On the other hand, large industries are often favored by policies and exemption from laws, which may encourage them to pollute or to over-exploit resources. The prevalence of these inequities limit the prospects for truly successful environmental management initiatives. (IDB/UNEP, 1990, Leonard, 1987)

C. INSTITUTIONAL WEAKNESSES:

Many efforts for environmental management are thwarted by institutional weaknesses. Many government institutions involved in resource and environmental issues lack funding, trained staff, technical expertise, vehicles, information, and other resources required to implement comprehensive projects and policies. They also tend to lack regulations and law enforcement mechanisms. In addition, many are constrained by poor organization, weak leadership, unclear mandates, and conflicts with other organizations. Decisions and actions may become bogged down in bureaucratic "red-tape." When several agencies are involved in the management attempts, they often lack coordination; and instead, they tend to compete unproductively or duplicate efforts (Leonard, 1987, AID, 1989).

Government institutions in the region also have difficulty attracting highly qualified and motivated individuals, mainly due to inadequate wages and lack of training opportunities. Many individuals are unwilling to endure governmental bureaucracies while receiving very low wages. Together, these weaknesses interfere with the institutions' abilities to effectively plan and carry out environmental actions and hinders efforts for policy and law enforcement as well.

These institutional constraints are often derived from macro-economic pressures outside the control of the institutions themselves. General economic recession and lack of public funds, compounded by the governments' indebtedness, contribute to the problems. The agencies are sometimes subject to pressures from powerful economic constituencies, or to political interests of donor organizations, which can undermine their aims.

LAC organizations also tend to lack access to urgently-needed information. There are often gaps in communication and in information flow between institutions, both North-to-South and South-to-South. Donors and development agencies often fail to ensure that information available to the institutions they are trying to assist. Effective policy formulation is difficult without access to adequate scientific information. Incomplete or outdated information significantly hampers the abilities to analyze past trends and to plan effectively for the future.

NGOs and grassroots groups offer strong potential in carrying out environmentally and socially beneficial changes and some have fewer weaknesses than the government organizations. However, NGOs tend to have a weak financial base, relatively little political power, and sometimes inexperienced management capacities. These weaknesses, combined with lack of collaboration and "turf struggles" can defeat NGO efforts to carry out measures for sustainable development. This institutional framework in LAC requires major changes in order to create and implement effective actions.

D. ECONOMIC FORCES AND POLICIES:

Economic pressures – particularly the pressure to maximize short-term yields and growth, to the neglect of the environment – also pose constraints to carrying out effective environmental actions. Although economic development and prosperity can be enhanced through sound resource management, the conventional patterns of growth in LAC have often neglected environmental factors and have thwarted efforts to overcome degradation. Recently, economic forces include recession, deep indebtedness, high rates of inflation, uneven growth patterns, unfavorable terms of trade, over-dependency on unpredictable export markets, austerity measures aimed for structural adjustment, and over-exploitation of resources, with the neglect of social "externalities" and long-term economic problems. Such factors are derived partly from international market forces.

Analysts have pointed out that poverty and the struggle for economic survival represent barriers for developing sound environmental programs (USAID/ROCAP, 1989, p. 13). However, it is important to recognize that the poor (with their logical "short-term" visions) can not be "blamed," largely because poverty is determined by broader societal inequities and skewed economic growth. Equally important barriers are inappropriate paths to "affluence," ie, patterns of over-exploitation for short-term interests, which have generated unnecessary social and environmental costs.

Furthermore, market prices and economic accounting methods undervalue or misrepresent environmental impacts, goods and services. They do not reflect the real values of forests, watersheds, biodiversity, and other services of ecosystems, nor account for the real costs of environmental degradation. Market signals cannot ensure that resources are used wisely. Likewise, economic decision-making processes rarely address equity issues in the distribution or use of resources.

The imperative to pay back debts and to pursue structural adjustments compound pressures to maximize short-term returns, which may conflict with aims for sustainability. For example, heavy pressure to grow non-traditional export crops with heavy agrochemical inputs (in the efforts to earn foreign exchange rapidly) can counteract efforts to rationalize and minimize use of hazardous pesticides. Or, for example, measures intended to attract foreign manufacturing investments, such tax exemptions may contradict efforts to curtail pollution.

Another major constraint is the lack of economic incentives for private sector involvement in environmental management. There is great potential for private enterprise activities, as illustrated by increasing successful "green" investments by companies in the U.S. and Europe. Yet, LAC governments have not yet created the economic climate to encourage these changes. Many private companies, like decision-makers, tend to erroneously perceive natural resource management conflicts with their interests.

These fundamental economic distortions have not yet been adequately confronted. Changing these patterns is imperative for ensuring sustainability of resource use.

E. LACK OF EDUCATION AND INFORMATION:

Lack of education and information at all levels is another key barrier to effective environmental action. Throughout LAC, there are insufficient technical training, primary and secondary school courses, and educational programs for scientists and policy-makers in the fields of environmental management. There are gaps in peoples' access to environment-related information at all levels. Similarly, the general public tends to have low levels of awareness of environmental problems, which reflects the public's lack of access to information and education. In some cases, there is incomplete or uncertain knowledge on impacts and seriousness of the problems. Even if environmental initiatives are well-planned and designed, they cannot be carried out effectively if projects personnel do not have adequate training and information. These weaknesses inhibit the abilities of people in LAC to analyze the significance of environmental problems and to implement effective solutions.

Lack of funding and weak political support are factors which contribute to these barriers in environmental education. Given economic hardships, educational and information services in general have suffered budget cuts. Although schools and universities have begun to develop programs in some countries, many have not realized the need to include environmental science in their curriculum. Furthermore, poverty constrains peoples' attendance of schools and courses, just as it hinders the abilities of governments to develop educational programs.

Another constraint is a lack of attention to indigenous skills and knowledge which could be used more effectively in designing environmental education and management. Educational programs rarely make use of this valuable source of information, which should be fully incorporated. Use of "top-down" approaches to education and training, rather than "bottom-up" interactive approaches, have also hindered the effectiveness of environmental education.

F. LACK OF ATTENTION TO PUBLIC PARTICIPATION:

The fate of the resource base will be determined partly by individuals' everyday actions. Yet, local communities and citizens have not been given opportunities to participate in decision-making regarding resource use and management. The lack of attention to participation can limit the potential for empowerment of populations. This, in turn, limits the effectiveness of environment-related activities and policies. Yet, experiences show that when local people are enabled to have full power and involvement in these efforts, successes are more likely to occur.

Although grassroots groups and NGOs have been active in democratic environmental movements, they are not sufficiently encouraged and instead are sometimes thwarted by governments. They usually do not have sufficient tools, incentives, and funding to carry out their efforts; and they tend to lack open lines of communication with decision-makers. The voices of citizens are often not heard in political arenas. Community groups and farmers are rarely treated as partners in developing environmental actions; rather, they are often viewed mistakenly as passive "targets." These limitations are present in a range of environmental fields. Frequently, women are neglected in such programs, which hinders effectiveness; yet women are often key actors in resource management.

In recent years, donors have often talked about improving participation of people in such activities, and some efforts have been made, with encouraging results. However, much of this talk is rhetoric, and has not been seriously taken into account. Merely undertaking interviews with local people is not enough to constitute fruitful public participation. When project directors attempt to incorporate participatory concepts, they still may perpetuate top-down management by foreign or high-level "experts," rather than supporting more effective bottom-up activities.

G. LACK OF DIFFUSION OF APPROPRIATE TECHNOLOGIES:

Certain kinds of technologies are well-adapted and appropriate to mitigate and prevent resource degradation. Examples of existing environmentally-appropriate technologies include terraces to reduce runoff, contour ditches, tree-planting (eg, in agroforestry systems), mulching, gully plugs, integrated pest management methods, pollution control devices, and renewable energy technologies. Also available are industrial technologies and processes which allow for greater efficiency of inputs, or can help reduce waste, or which capture industrial by-products and use them in sister industries. Even though they exist, however, these technologies have not had wide diffusion and adoption in many of the countries. Financial incentives and institutional support for adoption of the technologies tend to be lacking. In some cases, as exemplified in efforts for developing "improved" stoves, the cultural and social preferences of users, especially women, are not taken into account. Private enterprises have had limited involvement in marketing and distributing such technologies, even though such investments can be lucrative. Support of applied research and dissemination for such technologies is also lacking, although it is needed, especially in areas such as natural forest management and economical pollution control methods.

III. STRATEGIC PRINCIPLES

The over-arching strategic goal is:

To assist the citizens of Latin America and the Caribbean in preventing and minimizing environmental degradation, and to support new opportunities and effective approaches for sustainable and equitable economic development.

In order to achieve this goal, changes are urgently needed throughout the region. The LAC Bureau of A.I.D. can help reach this goal by pursuing: a) critical cross-cutting *strategic principles*; and b) remedial and preventive *actions* in diverse sectors and areas. This chapter identifies these priority principles and chapter IV identifies actions which bear upon the central problems shared by the countries. Together, these principles and actions are aimed to meet the challenge of managing and conserving the environment while supporting development. The principles are general approaches which should cross over into each of the priority areas or sectors, thus constituting necessary broad-based steps to solve a problems. Logically, each country's particular resources and constraints must be considered in developing environmental actions which fit local conditions.

The essential cross-cutting strategic principles are the following:

1) Address the root causes underlying environmental/human resource degradation, stressing prevention of problems.

Developing effective environmental measures requires attacking the problems at their roots. Therefore, strong efforts must be made to confront the causes of environmental degradation. Obviously the specific causes are complex and vary for different issues and regions. Yet, in general, the roots requiring attention are economic forces, such as inappropriate macro-economic and sector policies, short-term economic pressures, and social structures, such as inequities in resource ownership. Similarly, prevention of problems is usually more effective and economical than developing remedial efforts after the severe effects have already occurred. Evidence shows that preventing pollution and degradation pays off, because it avoids future clean-up expenses and improves efficiency and social benefits, both in the present and future. Examples of preventive measures which address the causes of problems include: changes in production technology; economic incentive policies; reforms of tax, pricing, and tenure systems; and changes in resource-related laws to strengthen efficacy of regulations.

2) Develop economic and environmental policies for sustainable development and eliminate conflicting policies that induce degradation.

Attempts to achieve sustainable development and environmental management will not succeed unless they are supported by appropriate economic and environmental policies. First and foremost, it is essential to remove policies which lead to degradation, waste, and pollution. Eliminating or reforming land-titling laws which encourage cultivation on unsuitable land, and subsidies for various depleting and polluting activities is vital to the establishment of environmentally-sound and economically-sustainable practices. Consistency is needed between environmental policies and development policies of other sectors.

At the same time, it is essential to develop strong policies and policy-enforcement mechanisms, which support the aims of sustainable development. Policy changes are needed in all areas, including credit, financing, investment, taxes, subsidies, marketing, land use, tenure policies, and all kinds of laws and regulations which affect resources. Laws must be

implemented and enforced through effective mechanisms. Nothing is achieved if they are unenforced "paper laws." Social and economic incentive policies for private producers and industries are particularly helpful for stimulating conservation and rational resource use. Policy incentives are also needed to encourage local-level community groups to take actions for improvement of natural resource conditions.

3) Strengthen institutions, including non-government organizations and government agencies in resource-related initiatives.

Both government and non-government organizations need improved institutional capacities for environmental management and sustainable development activities. This requires improvements of organization, management, human skills and expertise, and funding of institutions, and strengthening legislative mandates, laws and enforcement mechanisms which pertain to environmental regulations. Other necessary measures include interinstitutional coordination, improved organization and use of information/data bases, and avoiding unfruitful competition (ie, prevention of "turf" struggles). Support is also needed for community groups and NGOs in sustainable development efforts.

4) Build participation & empowerment of the public in environmental initiatives.

Participation of citizens is fundamental for effective development and conservation. When local people are fully involved, actions and institutional efforts are more likely to be productive, sustainable, and equitable. Numerous experiences show that participation of local people needs to occur at all stages of projects, and should include women as well as men. That is, people must participate fully in defining research priorities, directing and carrying out research, planning, policy advising, project implementation, enforcement, and monitoring. For example, in R & D projects for sustainable agriculture and rural resource management, farmers should be involved as partners in the entire R & D process. In general, this "bottom-up" approach is more successful than a "top-down" approach in bringing about change. This participatory approach also helps build empowerment, democratic initiatives, and pluralism, which are needed for institutional strength and sustained socioeconomic development.

5) Strengthen the role of the private sector in environmental and natural resource management and in prevention of resource degradation.

Private enterprises can profit from investing in urgently-needed environmental management activities. There are possibilities for fruitful collaboration between A.I.D. and other donors and private companies in order to develop such activities. Experience shows that private companies can develop lucrative businesses in this field. Examples are: production and sales of pollution prevention technologies and services, agroforestry, integrated pest management services, family planning, waste disposal, recycling, energy conservation, ecotourism, safety equipment, and a variety of resource-maximizing technologies. Such investments not only benefit individual firms, but also have society-wide economic and environmental benefits.

6) Promote research, information exchange, and appropriate technology transfer for sustainable development and environmental management.

Although research has been conducted in some areas of resource management, much still needs to be learned. Areas which require further research include: effective methods of soil conservation, natural forest management techniques, and technologies for pollution control and recycling; and social and economic factors related to environmental issues. It is essential that research is established according to needs of local people, and that findings are shared and applied effectively. A related urgent need is improving the flow and exchange of information (including research reports) and appropriate technology. The pervasive information

and technology "gaps" must be overcome. Information gathered in resource-related research projects must be used more effectively in environmental and economic decision-making. Developing innovative information networks between NGOs, universities, and research institutions can help in sharing and disseminating information. Improving technology transfer requires expansion of marketing opportunities, extension institutions, and taking steps to ensure that local people assimilate and effectively benefit from foreign techniques.

7) Strengthen education and training (ie, human resources) in all areas of environmental management and at many levels.

Building education and training is vital in all areas of environmental management and sustainable development. The role of education is crucial in empowering citizens to plan and carry out their agenda. Education in environmental studies and resource issues needs to include not only formal schooling, but also practical training courses, and informal programs. Such educational opportunities are needed at all levels: for government decision-makers, scientists and researchers, private sector managers, graduate and undergraduate students, secondary and primary pupils, and the general public. Public environmental awareness can be raised through both education and the media. Both public institutions and private bodies can contribute to expansion of education and training. Improvements in environmental education, training, and building human resource capacities represent investments with immediate pay-offs, because they can increase productivity of labor and scientific capabilities. They also will have considerable significant future benefits for societies in the region.

8) Integrate Environmental impact studies into development processes and in a wide range of projects.

It is necessary to assess environmental impacts of a wide range of projects in sectors to ensure that they are environmentally sustainable, economical, and socially sound. An Environmental Impact Assessment (EIA) is a comprehensive process of identifying, quantifying, predicting, and evaluating the impacts (including costs and benefits) of projects, policies, and development activities on natural resource, environment, human health and well-being (CCREE, 1988, Dixon, 1986). It is used as a practical aid to evaluate development alternatives and communicates information about the impacts and means for their management. EIA needs to become a standard part of government and private activities in LAC. Careful EIAs can help to identify sound projects and effective measures to mitigate negative social and environmental effects. In addition, evaluation of environmental repercussions must be fully integrated into the planning, construction, and economic development activities.

9) Promote donor collaboration and coordination for aims of sustainable development and environmental management.

Donor collaboration is important in many areas of development and conservation, and is often promoted rhetorically. However, it is difficult to achieve in practice, and lack of donor coordination remains a barrier in many field activities. Improving collaboration can avoid duplication of efforts and conflicts and instead can encourage more effective solutions in specific areas. In particular, collaborative activities and pooling of resources are needed in developing projects that require very large capital investments, such as sewage treatment plants, water systems, and hydroelectric dams. Coordinated workshops are also useful in planning regional forest and watershed management projects and biodiversity conservation. Such approaches can improve communication and facilitate exchange of information among donors for aims of sustainable economic development.

In sum, the above strategic principles are fundamental to the Environmental Strategy of Latin America and the Caribbean. They are required in the areas of action described next.

IV. PRIORITY AREAS FOR STRATEGIC ACTIONS

Overcoming the critical environmental and economic problems requires identification of priority measures needed in each sector or area of the region. In each area, the LAC Bureau of the U.S. Agency for Development will need to apply the strategic principles and also to undertake more concerted actions identified below. These priority actions confront both "green" and "brown" issues, and they were determined by analyzing the key problems, constraints, and effective approaches. This summary of actions also highlights the importance of addressing socioeconomic and institutional dimensions of the problems in each area.

A. ECONOMIC POLICIES, TRADE, AND INVESTMENT

Objective: Support environmentally-sustainable economic policies, trade, and investment, and prevent social/ecological degradation from trade & investment.

Rationale:

Trade and investment in natural resource products has a long history in Latin America and the Caribbean, starting with the early long-distance trade of valuable resources such as salt, minerals, and spices among early native peoples. The exploitation and commerce of resources and minerals were the driving motives behind the colonization of the region by European explorers. These activities generated wealth, but at the same time, they sometimes harmed native cultures and over-exploited resources.

Investments, trade, and commerce in agricultural, forest, and mineral resources have increased rapidly over time in the region, especially in the latter half of the 20th century, and they have benefited foreign and local enterprises. These economic activities have been supported by international financial agencies, donors, foreign and local governments and are promulgated through a range of economic policies. Latin America contributed almost 9% of world trade in natural resources, and absorbed 5% of that trade in 1983 (IDB, 1983). In the past two decades, the strongest growth in exports has been in fuels, followed by forest and agricultural products. Major agricultural exports are coffee, beef, sugar, cotton, soybeans, and bananas. The region also depends on foreign imports for many resources, and has increased imports of foreign inputs such as chemicals and fertilizers for agriculture.

In the last several years, export expansion and trade liberalization have been promoted in attempts to alleviate economic problems, encourage investments and increase flow of capital into the region. "Free-trade" zones have been established in several areas, such as northern Mexico and the Caribbean. Here, large foreign industries are given special incentives, tax exemptions, and favorable terms of investment, and they create manufacturing plants and jobs for many people. Investment in tourism (particularly beach resorts) has also increased in LAC in the last two decades, which is important for earning foreign exchange; and "Ecotourism" also has become popular and lucrative in recent years. The development of "non-traditional exports" has also increased since the late 1980s, due largely to the promotion campaigns by international agencies and foreign investors. This trend can promote diversification and alleviate reliance on single export crops. The new exports include specialty agricultural crops, such as flowers, macadamia nuts, strawberries, tropical fruits, vegetables, and tubers, and manufactured items. Another recent area of investment is biotechnology, ie, techniques of breeding, manipulating and using genetic resources, aimed mainly for improving agriculture and medicines.

Investment, trade, and commerce have contributed to foreign exchange earnings and development, have generated benefits to foreign investors and consumers, and have generated new employment opportunities. But they have also involved social, economic, and environmental problems throughout this region. The main general problems are:

- i) Unsustainable practices of extractive industries, and pollution, resource degradation and depletion from some industries, such as mining, forest extraction, and tourism;
- ii) Uneven trade relationships, including unfavorable terms of trade for the LAC countries;
- iii) Over-dependency on undiversified export commodities and foreign markets, leading to vulnerability to fluctuating international prices;
- iv) Lack of access to markets, sometimes due to trade barriers by the U.S. and other markets;
- v) Lack of competitiveness in international markets, exacerbating vulnerability and instability;
- vi) Uncontrolled import of toxic chemicals, which can lead to hazards and harm to health;
- vii) Inequities in distribution of benefits; ie benefits do not always "trickle down" to the poor;
- viii) Lack of technology transfer and information suited to natural resource conditions in LAC;

Free-trade zones have particularly severe problems of pollution and occupational health hazards, since they are largely unregulated. The maquiladora industry in the Free-Trade Zone of northern Mexico provides an example of serious hazards to workers from exposure to harmful chemicals and oppressive working conditions, which have provoked irreversible health problems, especially to women, who make up the large majority of the labor force. The expansion of non-traditional agricultural exports also illustrates problems, because this has increased use of pesticides, which can have negative health and environmental impacts.

New initiatives for trade liberalization offer opportunities, but sometimes can potentially undercut environmental management goals. In particular, if this means increasing leniency of environmental regulations, they may reduce countries' freedom to establish environmental management regulations adjusted to their local conditions. For example, countries may not be able to regulate pesticide imports and to select safe chemicals. These changes can encourage the siting of polluting industries and overly-exploitative resource extraction in the region.

The main causes of these problems are:

- i) lack of consideration of environmental impacts in investment and trade activities;
 - ii) economic policies and planning which encourage investments that are unsustainable;
 - iii) focus on a short-term horizon rather than stressing long-term profitability;
 - iv) lack of environmental regulations in some cases;
 - v) lack of information on environmentally-sound investment opportunities;
 - vi) neglect of environmental degradation in economic analyses and accounting, whereby degradation is wrongly accounted as a "positive" attribute rather than a loss;
 - vii) lack of realization that resource management and economic growth can converge;
- Addressing these causes is thus important to alleviate the resource degradation in LAC.

In sum, natural resources offer great opportunities for investment and trade in the LAC region. Agricultural, forest, and mineral resources and products constitute profitable endowments, if they are used in sustainable, efficient, and equitable ways. There are ways to change the conventional paths of resource exploitation which have provoked degradation and depletion. The private sector can seize opportunities to invest in industries, services, and products which are environmentally sound or prevent pollution. Expansion of trade in agricultural and resource products, both South-South and South-North, can help expand the range of options. Such changes can also enable countries to take advantage of resources which are best suited to their particular conditions. Ensuring environmental soundness and long-term economic viability of investment and trade activities is essential.

Strategic actions:

In order to develop sustainable economic policies, trade, and investment, it is necessary to develop the cross-cutting strategic principles (noted previously) and the following actions:

1) Environmental accounting to reflect actual values of resources and degradation

Reforms in conventional national accounting methods are urgently needed to overcome the serious problems of present accounting methods. Resource depletion and degradation must be accounted accurately as losses in GNP. Conventional tools of valuation and discounting also need to be changed to help guide economic growth strategies to support sustainable as well as productive activities.

2) Environmental regulations for sound trade and structural adjustment policies

Incentives and regulations are needed to ensure that trade policies and structural adjustment do not exacerbate environmental problems. Any "free trade" and commerce agreements should be accompanied by requirements for improving environmental conditions and restrictions on pollution. The economic policies need to be accompanied by environmental guidelines and laws, such as controls on raw timber exports, pesticide regulations, incentives for energy conservation, and fish catch regulations for sustainable yields. In "free-trade zones," establishing laws and pollution control is particularly important, since these areas are subject to severe pollution and human degradation. Failure to include these measures could result in significant social costs and could undermine the benefits of expanded trade and investment.

3) Environmentally-sound investments in services and products

Private businesses can have important roles in addressing environmental problems and developing sustainable activities and industries. Examples of profitable and environmentally-sound enterprises include: development of recycling operations; industrial waste minimization systems; water treatment and testing industries; production and sales of pollution control technology; production and sales of biological pest control methods; reforestation and agroforestry plantations. Fiscal incentives may be needed to induce private sector involvement and to promote widespread development of such activities.

ECOTOURISM

Ecotourism, the practice of travelling to relatively isolated or undisturbed places for the purpose of enjoying or studying the natural or cultural elements located there, is currently an underdeveloped activity with substantial growth opportunities. Over the last two decades, tourism has grown consistently, with revenues currently ranking third among all export industries worldwide. The rationale for ecotourism is derived from two sustainable development objectives: the desire to protect areas of biological, aesthetic and cultural significance, and the need to expand economic opportunities to benefit rural people and enterprising local businesses.

Carefully planned ecotourism activities offers benefits at the national, local and protected area level. Nature tourism provides an economic justification for establishing protected areas and diversifies the existing tourism industry. Well-conceived and operated areas bring substantial revenues to local populations through tourist expenditures. The protected area itself gains from investments in better management and protection activities. Costa Rica is a successful example of an ecotourism destination which has benefited from the combination of natural beauty, a large number of protected areas, and skilled and motivated local tour operators.

Improperly planned, executed, or monitored, tourism can have large economic and ecological costs, and can contribute to the destruction of the attraction itself. Excessive numbers of tourists have sometimes spoiled the pristine nature and health of the area, directly through crowding, or indirectly by increased litter, changes in animal behavior, or abuse of resources. Mexican and Guatemalan archeology sites have suffered from damage to ruins and looting of artifacts for illegal sale. Other factors affecting the potential development of an ecotourism industry, are access and availability of infrastructure. Many nature tourists may be willing to accept rudimentary accommodations and services; however, ecotourism can be sustained more effectively when minimal investments are made to facilitate access. More research needs to be conducted on how to maintain a critical balance between protecting significant areas and making them available to the public.

4) Innovative financing measures

Several countries have recently used several innovative financing and debt-servicing measures which can help relieve pressures on natural resources. These measures have the dual advantages of contributing towards conservation/environmental aims and alleviating debt. "Debt-for-nature" and "debt-for-development" mechanisms, "Green funds," and carbon taxes, have been useful successfully for this purpose. Further mechanisms of this kind are envisioned in the Enterprise for the Americas Program. When developing these measures, it is vital to give full attention to economic and social interests of the local people. (See Box)

5) Ecotourism and Environmentally-sound tourism

There are many opportunities to expand nature-related tourism. Ecotourism has proven to be profitable to businesses, earns foreign exchange, and can conserve biodiversity. Careful planning is needed to ensure that these activities are environmentally and socially sound and to sustain the attracting qualities. Necessary measures include sanitation infrastructure, sewage treatment, effluent controls, traffic control, and protection of fragile resources. It is necessary to ensure that local people and economies benefit from ecotourism investments. (See Box)

6) Local management of private enterprises in environmental businesses

Strengthening local management skills in private businesses is economically and socially beneficial, and is important in environmental/resource measures and investments. If people have full responsibilities in management positions, the effectiveness of projects increase while local people benefit. For example, this could be done by establishing independent foundations for the management of Enterprise for the America Environment and Development Trust Funds.

7) Transfer of technology and information

The gaps in the flow of technology and information need to be overcome. Increasing commerce and investments is necessary to improve the transfer of technology and information which is appropriate for environmental management. The private sector can play a key role in improving supplies of information and technology, but support from governments is also necessary. Concerted efforts are needed to improve exchange between the countries of the region -- ie, "South-South" flows of information and technology, as well as North-South transfer. These trade activities can contribute to lucrative investments and sustainable resource use.

SWAPPING DEBT FOR NATURE

The developing countries have contracted debts in foreign exchange with commercial banks, international financing organizations, and foreign governments. Instead of discounted debt settlements in dollars, some of the debtor countries have opted for paying their creditors in local currency for investment in the country.

Latin Americans devised an innovative way of using the resources of international organizations willing to provide nonreimbursable funding for social or environmental programs. Developing countries are now able to secure reduced rates and develop a formula for swapping some of their outstanding debt into local currency for specific programs. This imaginative idea led the "debt for nature" exchanges which have been welcomed by Costa Rica, Ecuador and Bolivia. As of September 1989, the following exchanges had been concluded:

Country	Nominal Value	% Converted
Bolivia	\$ 650,000	38%
Costa Rica	\$ 68,500,000	48% (ave.)
Ecuador	\$ 10,000,000	100%

It is most important to emphasize that debt swaps can only realistically absorb a moderate percentage of the large total debt. Marked differences in the countries' ability to pay, such as the differences in the structure of the debt and internal and external economic factors, also limit their applicability. The most important advantages of debt swaps for nature is that in addition to the small contribution to reducing the amount owed, it produces a national environmentalist conscience and gives rise to programs designed to protect biological diversity, secure reforestation, and provide environmental education.

B. POPULATION, HEALTH, AND THE ENVIRONMENT

Objective: Reduce population pressures and environment-related health problems, emphasizing family planning, preventive health measures, and community actions.

Rationale:

Peoples' health and well-being are closely linked to demographic and environmental conditions. The total population in Latin America and the Caribbean has reached 448.1 million in 1990, and the annual growth rate was 2.2% between 1980 and 1987 (IBRD, 1989). At projected growth rates, the population of the region will reach 753.5 million by the year 2025 (WRI, 1990). Population growth can have economic and social benefits: People contribute labor needed for productive activities; and for very poor rural families, having many children has traditionally been a way to secure and improve their livelihoods. However, in recent decades, population growth has accelerated, and people have become concentrated and over-crowded into areas with insufficient resources and infrastructure, and services. Under these conditions, population pressure has aggravated environmental degradation (See Figure below).

Overcrowding is especially severe in many major cities of LAC which lack capacities to accommodate the growing numbers. Population pressures are also critical in densely-populated rural areas, such as steeply-sloped lands in El Salvador, Mexico, Haiti, Guatemala. Hundreds of thousands of people who do not have access to fertile flatlands often are forced onto small plots of fragile land. Here, their farming practices contribute to soil erosion and declining fertility, often trapping them in a vicious cycle of poverty and aggravating poor health. Such conditions strain the LAC economies, aggravate malnutrition, and provoke the spread of diseases. Although the overall rate of child survival has improved in much of the region, some countries still have high child mortality rates, and malnutrition still affects between 10 and 60% of children under 5 years of age (PAHO, 1989).

- The root causes of population pressures are multifaceted and complex. They include:
- i) Inequities in the distribution of land, resources, and people which create pressure zones;
 - High birth rates, along with declining rates of child mortality and increase in life expectancy;
 - ii) Lack of access to family planning and cultural barriers to the use of birth control;
 - iii) Poor peoples' perceived advantages of having large families as a form of economic security;
 - iv) Rural-urban migration, which contributes to overcrowding in cities;
 - v) Inappropriate colonization schemes which lack services, and lack of development of cities and towns which can accommodate rising numbers of people who seek livelihoods in non-rural areas.

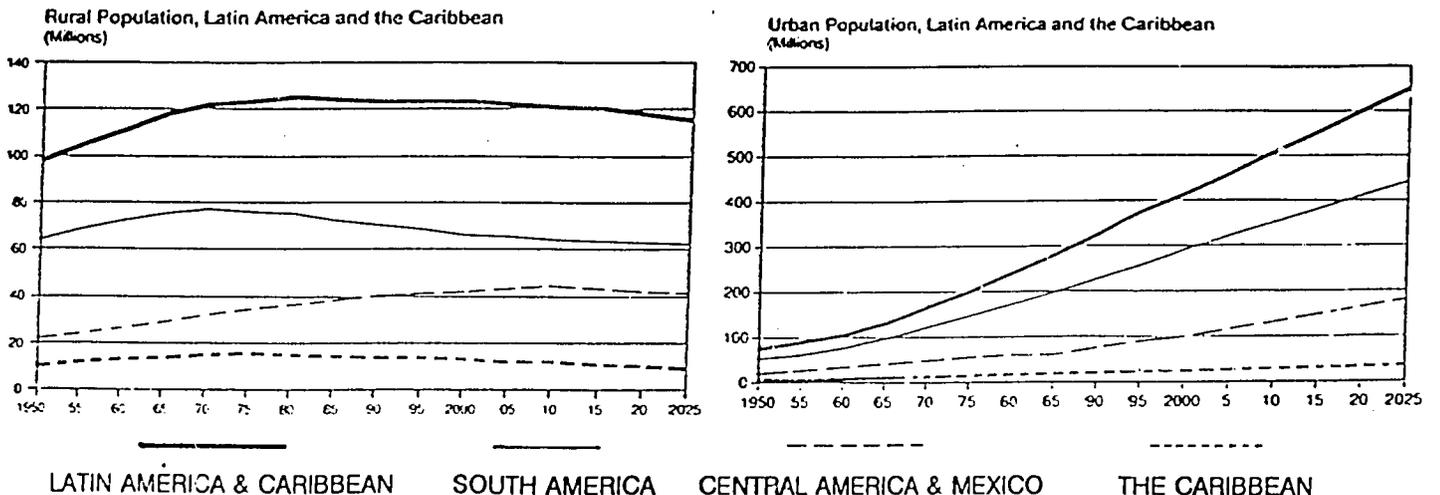
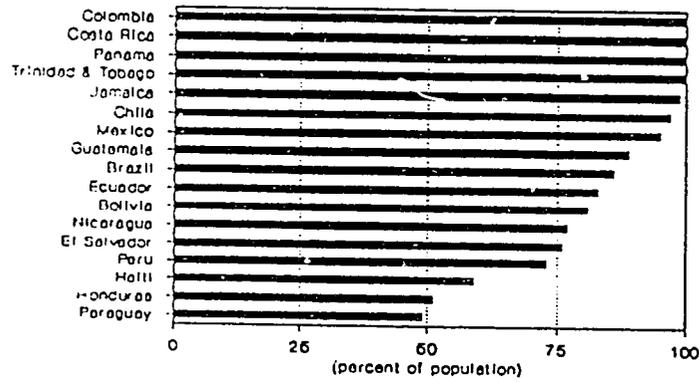


Figure 5: Access to Safe Drinking Water, 1985

Urban



Rural

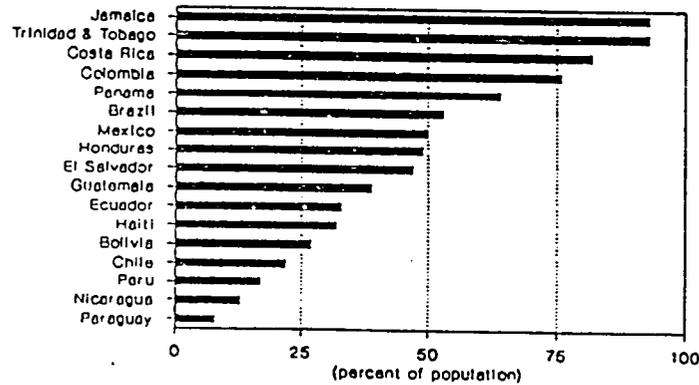
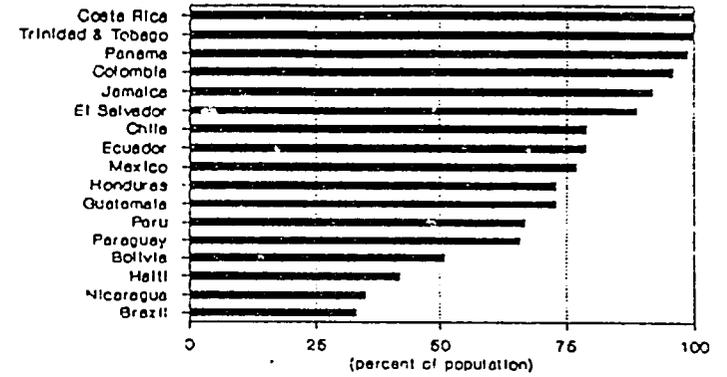
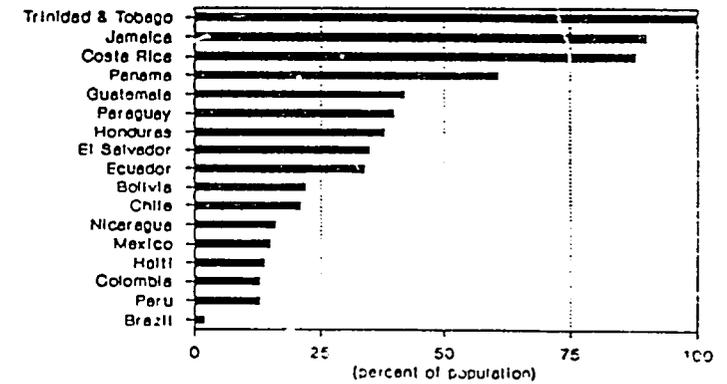


Figure 6: Access to Sanitation Services, 1985

Urban



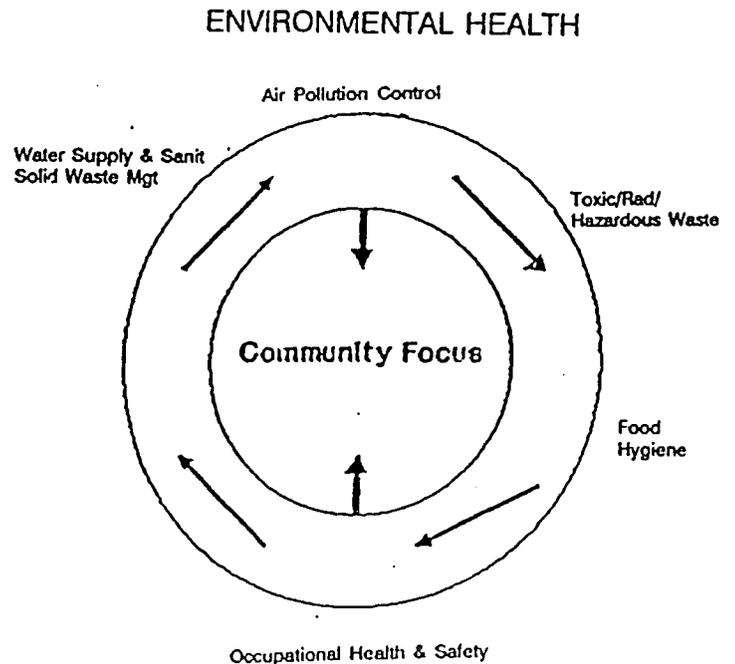
Rural



"Environmental Health [problems] encompass disease and health problems that are environmentally determined and are increased through environmental degradation." (Long/A.I.D., 1990) Several forms of environmental degradation harm human health. Infectious diseases are the main illnesses and killers of people in the region, and most are linked to environmental contamination. A principal symptom of many of the diseases is diarrhea, which is the leading cause of death of children under five in the Latin American and Caribbean region. An estimated 25,000 people die each day in developing countries from water and hygiene-related diseases (IDB/UNEP, 1990). Occupational safety and health problems, including injuries, accidents, and illnesses from hazardous job environments, are also important causes of deaths and ill health in many countries. Pesticide poisoning of farm workers is a growing problem. For example, an estimated 300 poisonings per 100,000 people occur each year in Central America in the late 1980s (Leonard, 1987). Workplace hazards and damages have increased with the rising use of chemicals. Finally, damages to health occur from air pollution and from toxic and hazardous wastes in urban areas, and these problems are increasing with growing industrialization and urbanization. All of these problems not only degrade the quality of life and cause premature deaths; they decrease productivity of people affected, hinder economic growth, and increase the costs of medicines and health care (IDB/UNEP, 1990).

The main causes of environment-related health problems are inadequate preventive measures, including lack of safe potable water, poor sanitation and waste disposal, and lack of controls over pollution emissions, toxins, and hazards in the workplace. An estimated 90% of sewage in Latin America is untreated (WRI, 1990). Many people do not have access to safe water and sanitation services (See Figures 5 & 6). These problems reflect poor planning, uncontrolled economic growth, lack of funding, socioeconomic inequities, and inadequate public and private investments in such necessities, and absence of political will.

Improving the health of the environment and of populations is thus central to sustainable development. Population pressures and environmental health problems in LAC warrant immediate attention. Environmental health needs to be seen within an integrated framework which encompasses a range of components, particularly air pollution and waste control, water supply and sanitation, and occupational health, as illustrated in the Figure below. Peoples' health and well-being can also be improved by alleviating over-crowding, providing family planning options to slow birth rates, and developing comprehensive population policies. Such measures are more effective if accompanied by reforms to reduce poverty and income inequities, and to increase education and economic opportunities for the poor, especially for women. In addition, high social and economic costs can be avoided with adequate measures to prevent environmental health problems (Long, 1990). Developing effective programs and actions in environmental health can have important economic benefits, raising productivity of labor and generating employment opportunities.



Source: D. Long et al, USAID, 1990

Strategic actions:

In order to reduce population pressures and improve environmental health, it is necessary to develop the strategic approaches (described in Chapter 3) and the following actions:

1) Family Planning Programs

Family planning and population programs should continue to be an important part of A.I.D.'s portfolio in this region, based on lessons and positive experiences of existing activities. Providing people access to birth control methods, education, and family planning advice, is helpful in reducing birth rates, relieving population pressures, and in improving peoples' health and quality of life. Community-based participatory approaches and involvement of community health workers are generally successful in population and health projects.

2) Comprehensive Population Policies

Reducing population pressures requires comprehensive approaches, including policies to control urbanization, which must be sensitive to peoples' economic needs and to cultural and social traditions. They also must be part of wider economic development policies. For example, towns and secondary cities need to be developed more effectively, to ensure that they have adequate services, jobs, and infrastructure. Poorly planned colonization schemes must be avoided. Zoning and development planning can be used to establish appropriate locations of settlements. Moreover, incentives are needed to induce people to locate in areas which can sustain development. Improving economic opportunities, especially for women, and overcoming socioeconomic inequities are also important to reduce population pressures.

BOLIVIA'S CHILD SURVIVAL AND RURAL SANITATION PROJECT

In 1986, the A.I.D. provided a \$5 million grant to CARE to administer a 4-year project addressing the principal causes of illness and death of children in the altiplano region of Bolivia. The project aimed to ameliorate the problems of serious health conditions, marked by severe lack of health, water, and sanitation services and a high mortality rate of children under 5 (ie, 330 per 1000), due mainly to diarrheal and parasitic diseases. With cooperation and counterpart funding from the Bolivian Regional Development Corporation, and the Regional Ministry of Health Units, the project operated in 200 rural communities in 5 departments, reaching approximately 59,000 people. The Project's major components were: provision of health services, including health education, provision of potable water and sanitation facilities, and promotion of community organization and participation. Water committees were formed to operate and maintain the water systems. They also collected fees from the community to pay for system maintenance and the salary of the operator. Mothers clubs were organized, and health promoters trained to provide health and sanitation education to community members.

The project has substantially increased the coverage of health, sanitation, and water services in the area. A large percentage of the households have been connected to the community water system and the coverage for immunization (90%), oral rehydration therapy (50%), and growth monitoring (85%) is significantly above the national averages of 28, 31, and 18%, respectively. Health of children is improving. An innovative element of the project is the creation of community leader councils to help integrate these changes in community activities. The sanitation education component generated an unexpectedly high demand for latrines, while household water connections allowed communities to begin or improve family gardens.

Although there have been some problems with the follow-up and support activities, mostly due to institutional constraints, CARE and A.I.D. are trying to remedy these weaknesses and hope to replicate this project in other communities of Bolivia.

Source: CARE, 1990

3) Access to Safe Water

Many illnesses and deaths could be prevented by ensuring that people have access to drinking water and that the water is free of pollution and sewage contamination. Services and infrastructure must be developed to provide water to populations and to reduce water-borne diseases in both rural and urban areas, addressing the sources of problems. Collaboration between donors and private enterprises is often needed for developing water systems for provision of clean water, because of the high expenses required. Ensuring that people have access to unpolluted water can greatly improve the quality of life and increase the productivity of labor as well.

4) Hygiene and Sanitation Improvements

Reducing the incidence of disease requires improvements of hygiene practices and sanitation. Hygiene conditions can be addressed effectively through popular health education, media attention, workshops, and "clean-up" campaigns. Such activities are most effective when they involve community participation. Waste and sewage disposal systems are also needed, particularly in urban areas, as discussed in the next section.

5) Occupational Health and Public Safety

Ensuring safe and healthy workplace conditions is another priority need. A.I.D. can develop and support programs to improve technologies, law enforcement, precaution measures, and safety training programs for workers who are exposed to serious hazards. Damages from workers' exposure to pesticides have been particularly serious and need to be prevented. For this purpose, it is important to work with local communities, labor unions, farmers and workers associations, as well as managers, employers and owners of factories and businesses. Improvements in occupational health and safety pay off in terms of improving the health, morale, and productivity of workers.

B. URBAN AND INDUSTRIAL ENVIRONMENTAL CONDITIONS

Objective: Minimize waste and pollution in urban/industrial areas and provide urban residents with safe and affordable water, sewage & waste disposal services.

Rationale:

Urbanization and industrialization are "double-edged" -- bringing both promises and problems in the Latin America and Caribbean region. Urban areas have grown at an accelerated pace over the last two decades. The percentage of population in urban areas reached 67% in 1987, and is projected to reach 76% by the year 2000. Urban and industrial growth have important benefits, such as job creation, higher income levels, and increases in productivity. However, these benefits are often offset by environmental problems which harm health and have high social costs. The urban poor bear the main burden of these problems. Poor populations in slums, shantytowns, and squatter settlements are growing about twice as fast as the cities themselves (IDB/UNEP, 1990); and sometimes the heavy demands of urban areas aggravate pressures on natural resources. The main predicaments are the following:

Water pollution is common in the rivers, streams, and water-supply systems in many cities. Untreated sewage is the primary contaminant. City waterways carry heavy loads of human wastes, harmful bacteria, garbage, other domestic residuals, and wastes from manufacturing facilities, including oils, grease, organic chemicals, plastics, acids, and heavy metals. The resulting lack of potable water poses hazards to health. Water-borne infectious disease is one of the main causes of diarrhea, which kills 4 million children under five each year in developing countries (Long, 1990). Water pollution can damage or eliminate fish populations, and harm marine life in coastal cities. Accumulation of wastes and sediments in water from urban areas often results in sedimentation downstream, which in turn, may require high clean-up costs. In some areas, as in Mexico and Bogota, untreated waste water is used downstream to irrigate vegetables supplied to urban areas, damaging peoples' health (WRI, 1990).

Air pollution chokes many of LAC's cities. Urban air is filled with organic and inorganic chemicals, particulates, dust from uncollected solid wastes and dried fecal material, and smoke from charcoal and firewood. These emissions create thick layers of smog and pose health hazards to urban residents. "The result is an estimated 2.3 million cases of chronic respiratory illness among children, 105 cases of chronic bronchitis among the elderly, and nearly 65 million days of work lost" (IDB/UNEP, 1990). One of the greatest health threats from automobiles, buses and trucks is the amount of lead in gasoline. For example, in Ecuador, gasoline contains more than 20 times as much lead as allowed in the U.S. Lead has sometimes damaged the mental and psychomotor activities in children (IDB/UNEP, 1990). Residential, industrial, and commercial activities also discharge gaseous residuals, such as sulfur dioxides and metals, into the atmosphere. For Latin America countries on which data are available, sulfur dioxide levels rose between 5 and 10% a year between 1973 and 1984 (WRI, 1990).

Solid and hazardous wastes are also polluting many LAC urban areas, which again constitute health hazards. Often scavengers or the "informal sector" collect and recycle discarded materials that are useful. But comprehensive waste disposal services are lacking. Wastes such as toxic chemicals and used medical materials, are increasingly troublesome as industries locate in and near cities. This problem is of particular concern for the advanced developing countries. Waste problems in coastal cities contributes to water pollution, which repels tourists and degrades fisheries.

The main causes of the urban/industrial environmental problems are: lack of planning, jobs, funding, and infrastructure in many LAC cities to accommodate growing numbers; lack of facilities and services for water, sanitation, sewage, housing, and plumbing; rapid growth of urban population, due partly to rising rural-to-urban migration (stimulated by the pull of city attractions and hopes of jobs, and the push from resource degradation in rural areas.); and lack of regulations controlling industrial and urban growth and automobile emissions. Both foreign and local industries and parastatal companies have failed to control their emissions. All of these factors stem from deep economic and structural roots, such as uncontrolled economic growth/"boom" (without considering the social costs), inequities in wealth, unemployment, short-term pressures from the economic crisis, and poverty itself. While cities and industries continue to provide hopes and attractions to people, the hopes can become shattered with the continual lack of attention to environmental conditions.

Management and planning of urban and industrial development are essential in the LAC environmental strategy. In particular, priority needs for improving urban residents' well-being are planning patterns of growth and developing safe and reliable water supply and adequate sanitation in urban areas are priority needs for improving peoples' well-being. Experiences have shown that improvements in urban environmental conditions generate social and economic benefits, including job opportunities. Cost-benefit assessments argue strongly in favor of investments in water, sanitation, and pollution-control projects in urban areas, if all benefits are taken into account.

Strategic Actions:

To overcome and prevent the urban/industrial environmental problems, it is essential to develop the cross-cutting strategic approaches (noted in Chapter 3), and the following actions:

1) Water treatment and delivery systems in urban areas

As mentioned in the health section, a key priority is ensuring people have access to clean water. This need is particularly urgent in urban areas, where water is typically severely polluted. It is necessary to support the development of infrastructure, technologies, and services for supplying potable water. Although these kinds of water systems and services are too expensive for A.I.D. to finance alone, A.I.D. can effectively contribute to and promote the development of these vital services. One of the most useful approaches is to collaborate with other institutions, to combine resources in order to provide technical and financial support to improve water supply systems and quality. Other institutions which can join forces with A.I.D. include: private investors, other donors, multilateral banks, municipal and central governments, NGOs, and universities. In developing water projects, attention must be given to: technical issues (eg, site selection, reliability of supply); social and cultural factors (eg, user education and community water needs); and management and administration.

2) Waste management and disposal services

Cleaning up waste pollution, especially sewage and solid waste, is essential for improving the urban environment and for providing people with adequate basic living conditions. Emphasis should be placed on developing waste disposal services and infrastructure in the poorest sections of urban areas which are commonly plagued by hazardous conditions from waste contamination. Experiences show that involvement of communities and municipalities is often an effective approach for carrying out these programs.

3) Pollution prevention/reduction policies and technical changes

Pollution prevention pays. It has been shown through past experience that it is usually addressing pollution problems at their sources is more economical and effective than to clean up messes from pollution. This means it is necessary to strengthen policies, institutional

capacities, and technologies to prevent water and air pollution. Private industries can profit from such changes. A.I.D. can play a strong role in improving assessments, regulations and planning for the siting, production, and emissions of industries. Scrubbers, filters, and "end-of-the-pipe" pollution control devices are often helpful investments; but it is often more economical to avoid the use of polluting technologies in the first place. Energy conservation and use of renewable energy sources can help reduce pollution at the source. (See Box)

POLLUTION CONTROL PROGRAM BREATHES LIFE INTO CUBATAO

The city Cubatao, Brazil had become known by the early 1980s as "the most polluted place on Earth". Its location in the industrial heartland of the country, between the financial capital of Sao Paulo and the major port of Santos, served to attract a number of petrochemical, chemical, steel and fertilizer industries. Massive and unregulated dumping of effluents into the rivers, combined with frequent oil and chemical spills and accidents, brought about severe water pollution, affecting aquatic populations and human health. Uncontrolled air pollution led to recurrent emergency alerts, chronic human respiratory problems and a severe degradation of vegetation in town and on surrounding hillsides.

With unprecedented cooperation, the state government and the industries invested almost \$320 million, supported by a \$100 million World Bank loan, to install pollution control equipment. By 1989, CETESB, the State Environmental Agency implementing the program, had brought 249 of 320 industries under control. As a result, particulate pollution was reduced by 92%, ammonia by 97%, hydrocarbons by 78%, sulfur dioxide by 84%, and nitrogen by 22%. Industrial effluents pumped into the rivers were reduced from 72 to 6 metric tons/day. In addition, there were no major air pollution emergencies reported in 1987.

The changes in Cubatao are heartening but not yet complete. Pollution by the government-owned steel plant has yet to be regulated, nor has there been any attempt to control non-point sources of pollution. While there has been a significant reduction in levels of pollution entering the environment, programs to clean existing water and air pollutants are not operating.

Source: World Bank, 1990

4) Recycling

Recapturing and reusing materials adds to economic output at the same time as it minimizes waste. Recycling is particularly promising in the region and needs to be developed widely. It is logical to take advantage of, expand, and upgrade the operations of millions of people of the informal sector who conserve, reuse and recycle waste materials. Labor-intensive technologies that use and extend present recycling systems are more economical than developing large-scale capital-intensive plants and they help generate jobs. Materials which are economical to recycle include glass, metals, plastics, rubber, paper, and organic wastes which can be used as a compost. Recycling has the added advantage of conserving energy, thereby easing pressure on the environment. The EPA has estimated that using scrap iron instead of iron ore to make new steel means a 74% energy savings, an 86% reduction in air pollution, and a 76% reduction in water pollution (EPA, 1990). In addition, the countries could benefit by expanding recycling at the level of industrial production, i.e., using the by-products of industrial processes as inputs into other industries or for energy production.

5) Avoiding and mitigating natural disasters in urban areas

Measures and policies to address potential disasters from earthquakes, hurricanes, floods, and mudslides are also important parts of urban environmental planning and improvements. Building codes, emergency water systems, and other municipal services and measures can be established to avoid the socio-economic damage of these hazards to cities.

D. AGRICULTURE

Objective: Support goals of sustainability (including environmental-soundness, productivity, and equity) in the development of agriculture, emphasizing resource management, participatory approaches, and security of rural livelihoods.

Rationale:

Agriculture is an important basis of the region's economies, employs about a third of the working-age population (ILO, 1986) and has been fundamental to the historical development of the region. The total area of land cultivated and the total volume of food production have increased substantially over time. Forested areas have been increasingly converted into farms and pastures. Export beef-cattle ranches grew rapidly in the 1970s and 1980s; but this trend has slowed, due partly to low prices of beef in international markets. Of the total land area of Latin America, approximately 8.9% is cropland, 28.1% is permanent pastures or meadows, 48% is forests and woodlands, and 14.8% is in "other" uses. (WRI, 1990) (See Figure 8)

Agriculture is characterized by a diversity of soils, scales, and systems; but there are basically two main types: i) Large-scale monocultural plantations and ranches, which are generally for export products, such as coffee, bananas, cotton, sugar cane, and beef, and which occupy the major proportion of arable land and provide a major source of foreign exchange; and ii) Small-scale heterogeneous farms, which are usually for subsistence and/or locally-marketed crops and are farmed by millions of people, but on a small percentage of the total area. The increase in agroexport production has been strongly supported by government policies, research institutions, and by the introduction of "Green Revolution" technologies, such as high-yielding varieties, fertilizers, and pesticides.

Although agricultural expansion has generated many benefits, it has frequently involved inequities in the distribution of land and resources, ie, concentration of land-ownership (See Figure 9), marginalization of indigenous people and small farmers, high levels of unemployment, rural poverty, and high social costs. In some cases, export products have replaced the production of basic grains. This has contributed to disparities in the rural sector (deJanvry, 1983). These problems are aggravated by the lack of health care and education and roads in many areas, and by unfavorable terms of trade for farmers. The agriculture sector is characterized by significant environmental costs and natural resource degradation as well:

Soil erosion is the most serious resource-related problem affecting agricultural land in LAC. According to UNEP, the total land area affected by serious or moderate erosion totalled more than 2 million square kilometers in the early 1980s. Soil erosion has caused losses of an estimated 30% of potentially cultivable land in Central America and 10% of land in South America. Erosion leads to decline in fertility, decreasing agricultural productivity and economic returns. Farmers usually use fertilizers trying to compensate for the losses and replenish soils. Fertilizers can help maintain or boost production in the short term, but sometimes the returns have diminished and the cost of fertilizers have increased over time. Many producers, especially poor farmers who cannot afford these inputs, are forced to abandon or sell their land. Soil erosion often results in flooding and landslides, damaging roads, watersheds, infrastructure, and buildings. It also leads to high levels of sedimentation in streams, rivers, and canals, decreases water quality, disrupts fisheries, with resulting down-stream costs. Eroded soil often has high levels of agrochemicals, presenting health hazards. The cost of rehabilitating eroded land and cleaning-up the down-stream impacts is often prohibitive.

Figure 8: Land Use, 1985-87

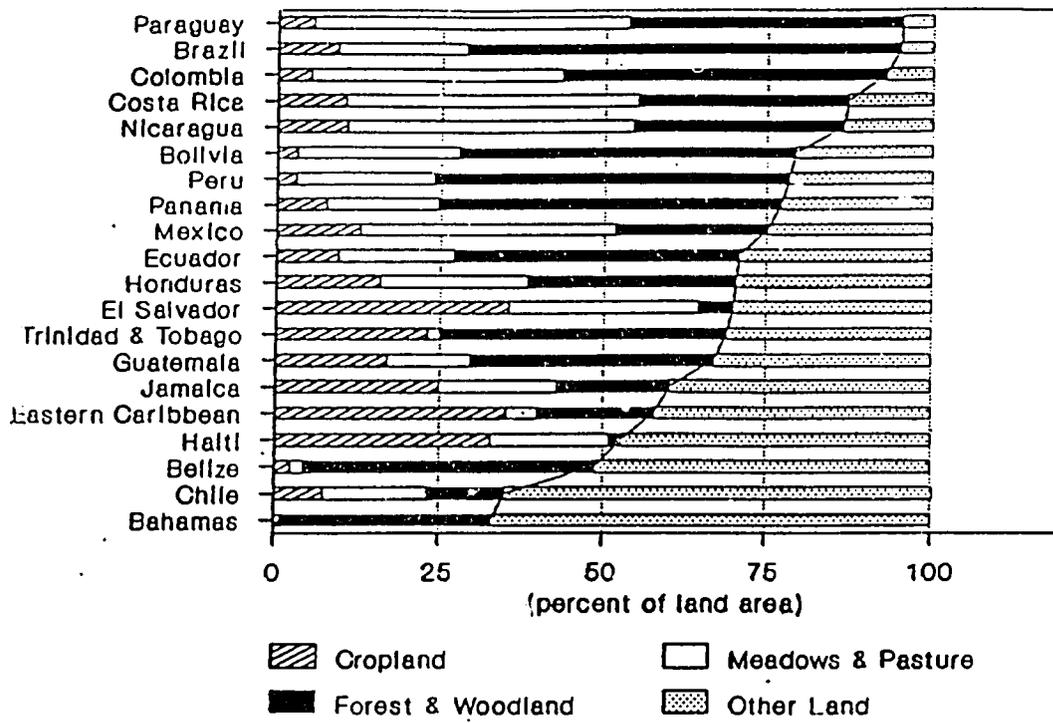
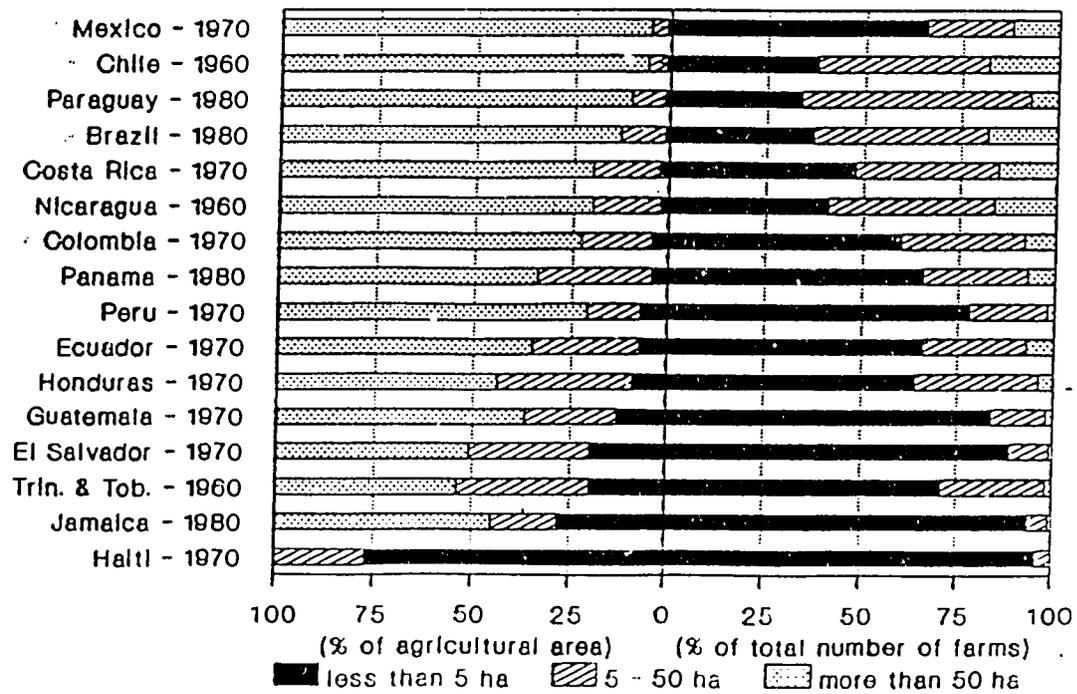


Figure 9: Agricultural Land Distribution



Grazing lands are particularly degraded in LAC, largely due to over-grazing. Their productivity is declining throughout the region. Although cattle-ranching can be lucrative in the first years of production, many kinds of tropical soils are unsuited for grazing. They become easily leached, compacted and degraded, contributing to low productivity and inefficiency. In the Amazon region, for example, 33% of the pastures established prior to 1978 were considered "unfit" or deteriorated (IDB/UNEP, 1990). These land-use patterns also involve declining access of fertile land to small farmers, contributing to landlessness and migration to cities or to new frontier areas which are often inappropriate for farming.

Paradoxically, while much land is being over-exploited, other parts are being underutilized and inefficiently used (IDB, 1983, 1990). For example, only 20% of the total area of terraced land (ie, 1 million hectares) is presently cultivated. These areas present opportunities for development, if the land is used in environmentally-sound ways.

Furthermore, the increasing use of pesticides, although having benefits, has had many negative effects, which include: 1) pesticide resistance, which leads to a vicious cycle of increasing costs and losses with declining effectiveness of chemical control; 2) killing of natural pest enemies and resurgence of secondary pests; 3) accumulation of residues in the environment and in foods, which create economic losses and insidious health hazards; and 4) poisoning and chronic health disorders, especially among farmworkers, from pesticide exposure and from residues in food. These impacts have high economic and social costs, such as rising medical treatment costs of poisonings. All of these pesticide problems are particularly severe in large-scale monocultures, such as cotton and bananas, which use very high chemical inputs and are more susceptible to resistance.

Another significant problem affecting agriculture is that traditional indigenous diversified farming systems with a variety of species have been increasingly replaced by homogeneous (monocultural) agroecosystems, which tend to be less stable. Although many of the diverse locally-based practices, insights, and species constitute important resources, they are sometimes eliminated by economic and technical changes. The loss of species diversity, cropping systems, seeds, and knowledge creates vulnerability. In other cases, practices which were formerly well-adapted for sustaining production (such as "shifting" cultivation) are often unsustainable under present dense populations and concentrated land-holding.

Narcotics production is a final complex issue in several LAC countries with environmental repercussions. Cultivation and processing coca, for example, provoke erosion and pollution. However, eradication through herbicide use also damages the environment and health.

Causes of soil erosion and land degradation in LAC are: deforestation followed by cultivation and cattle-grazing on steeply-sloped land or in humid lowlands which are unsuited for agriculture and grazing; lack of soil conservation methods; over-grazing and poor pasture management; and use of soils which do not sustain production. However, beyond these general reasons, the underlying root causes of erosion and land degradation are economic forces and unsustainable patterns of agricultural development, which include:

- i) government policies and pricing structures which create low terms of trade for farmers;
- ii) inequitable land distribution and lack of security in land tenure;
- iii) short-term time-horizons for yield maximization, to the neglect of longer-term impacts
- iv) small farmers' lack of resources, information, and technology for sustainable agriculture
- v) inappropriate incentives and subsidies which inadvertently lead to degradation.
- vi) lack of alternative income generation for rural populations.

Common reasons for pesticide poisonings, contamination, and resistance include: inadequate and inefficient application of the pesticides (especially over-use of pesticides); lack of safety measures; use of inappropriate and/or highly toxic products; lack of regulations over pesticides and over pesticide marketing practices. However, underlying these factors, the root causes of pesticide problems are:

- i) strong economic interests in promoting heavy use of agrochemicals;
- ii) incentives from government policies, without adequate guidance on proper use;
- iii) lack of pesticide information (such as mislabeling, lack of extension)
- iv) lack of appropriate application technology available to pesticide users;
- v) lack of information and advice on alternatives to pesticides (eg, cultural method)
- vi) inequitable or limited access to credit, which constrains farmers;

Additional causes of inefficiencies in land use are: lack of markets for agricultural products and inputs; lack of alternative sources of income; and lack of services and infrastructure, such as roads, in rural areas.

In response to these problems, it is essential to improve resource management and alleviate poverty in rural areas for sustainable and equitable agricultural development. Increasing equity in land tenure and security of property rights for small farmers are fundamental to induce sound agricultural practices. Developing sustainable forms of agriculture has substantial economic, ecological, and social benefits.

Strategic Actions:

To sustainable agriculture and to alleviate degradation in rural areas, it is necessary to develop cross-cutting strategic approaches (explained in Chapter 3) and the following actions:

1) Development of sustainable agriculture, stressing natural resource factors (eg, soil conservation, agroforestry, & water management) and farmer participation

Sustainable agriculture has numerous definitions; but in general, it is "effective management of resources for agriculture to satisfy changing human needs while maintaining or enhancing the resource base and avoiding environmental degradation, ensuring long-term productive and equitable development." Characteristics supported in the concept of sustainable agriculture are food security, dynamic adaptability, productivity, equity, diversity, and long-term time horizon. (BIFAD, 1988). Developing sustainable methods of agriculture also can generate employment opportunities and therefore contributes to urgent socio-economic needs in the region. Full integration of environmental and natural resource management into agriculture is essential for economic and ecological reasons. One of the most important components of this is soil conservation to reduce erosion and improve fertility. A variety of soil conservation methods, such as terraces, contouring, tree-planting, hedgerows, intercropping, covercrops, pasture rotation, and improved tillage, have been successful and economical. Agroforestry also provides important benefits. It is usually based on local peoples' knowledge and is well-suited in many agroecosystems, even in marginal and fragile areas. Policies and incentives are needed to support such practices, stressing use of local species and methods. (See Box) Communities' involvement in such efforts is likely to improve the productivity and provide local social benefits, including generation of jobs. Systems approaches (as opposed to reductionist approaches), and full participation of small and large farmers are also needed in both research and development of sustainable practices.

2) Improvements of land tenure systems and security of property

Experiences have shown that security of land tenure is important to induce farmers to use sustainable and productive land-use methods. Land use tenure systems and laws need to be reformed to ensure that farmers have secure tenure and property rights, especially for

poor small farmers. In addition, changes should be made in land entitlement/policies to avoid inequities which contribute to land degradation. Land surveys, updated registries, and legal system reforms can be used for issuing and enforcing land titles.

HAITI AGROFORESTRY PROJECT BEARS FRUIT

The Haiti Agroforestry Outreach Project is among the largest and most successful USAID-funded agroforestry efforts in LAC, aimed to address serious deforestation, land degradation, and erosion which thwart production and livelihoods in the island. (Forests covered more than 80 percent of Haiti in 1950, and only 2% by 1985.) This program, begun in 1981 as a four-year \$8 million investment, has motivated farmers to plant and maintain fast growing tree species on their farms, and it has helped to reduce the degradation of resources. By 1989, A.I.D. added \$27 million to the effort, through grants to the Pan American Development Foundation (PADF) and CARE. These groups worked with local PVOs and farmers to establish 50 containerized seedling nurseries, and to train over 1,000 full- and part-time extension workers. In the same period, 50 million hardwood and fruit tree seedlings were planted by 130,000 farmers. A seed and germplasm improvement component, and an applied research program to examine social, economic and agroforestry aspects of the project has also been added, improving the potential sustainability of the program.

High local demand for charcoal, fuelwood, and fruit, the availability of low-cost extension services, including advice on planting and maintenance of seedlings, participatory approaches, and the introduction of soil conservation methods have made the farmers aware of the potential for agroforestry, and has helped insure the project's success.

Source: A.I.D., 1989

3) Agricultural pricing changes

In some cases, productivity, efficiency, and sustainability of farming and stock-raising may be increased through changing farm product pricing policies and exchange rate policies to favor producers and rural people. It is important to reverse the existing pricing biases which are disadvantageous for farming families, particularly for small farmers. Often these kinds of economic policy changes need to be made in conjunction with appropriate trade policy changes and fiscal and tax reforms in the wider economy.

4) Harmonization of land use with soil capability

Ensuring compatibility between agroecosystems and land use capability is very important in the tropics. Land use capability analysis should be applied in all areas where possible. Particular attention should be given to planning and zoning for use of marginal or fragile areas which are susceptible to degradation. Establishing zones for specified agricultural activities can sometimes help promote suitable cropping. Agroecological zoning should be undertaken when possible; but zoning should be somewhat flexible, allowing for changes in crops over time and should be suited for market opportunities, ecological conditions, and peoples' needs. It is important that a diversity of people and agencies participate in land capability analyses and in the establishment of zoning, to avoid biases and to fulfill different socio-economic benefits.

5) Sustainable crop protection, including pesticide controls, Integrated Pest Management, and improved phytosanitary laws

Crop protection needs to be developed in an integrated and comprehensive way. First is the need for improved efforts and appropriate technologies to reduce pre- and post-harvest losses. Regulations and law enforcement need to be strengthened to control the import, marketing, and use of pesticides. Pesticides that harm health and the environment need to be eliminated or restricted. Information about safe, effective pesticide use must be made

accessible to users. Monitoring residues and workers' health is also recommended. Equally important is strong support of alternative pest control methods and Integrated Pest Management. IPM has been researched and tried; effective profitable non-chemical methods exist, often based on local knowledge. The challenge is to market and diffuse these methods. Changes in phytosanitary regulations are also needed to ensure the production of safe products. These crop protection measures reduce costs and have economic, ecological, and social benefits. IPM tends to be labor-intensive, and thus can generate jobs as well.

6) Diversification and diversity of agriculture

Policies and programs to support diversification of agriculture (both local and export crops) are generally beneficial, and help to promote economic stability of economies. Similarly, it is desirable to support and revive biodiverse agroecosystems, seeds, and species, strengthening the knowledge and methods used by local people. Diversity usually helps to improve flexibility and adaptability, expands future options, increases productivity, and reduces vulnerability to constraints. Along with promotion of diversity, it is also necessary to counteract the homogenization of agriculture with exclusively monocultures which are more susceptible to pests and environmental hazards and use high levels amounts of chemical inputs.

7) Balanced support of agricultural exports and food crops for local markets

Support for agriculture needs to be balanced between export and local market sectors. The promotion of non-traditional exports must not exclude or displace the development and support of other kinds of agriculture. There is a need for balance between the import and export food sectors. Moreover, the development of non-traditional export crops (like other kinds of crops) needs to incorporate environmental and equity concerns. Measures to ensure sustainability of NTEs include minimizing the use of highly toxic pesticides, promoting soil conservation methods, and improving efficiency of water use.

8) Improving market opportunities and rural credit systems

Actions are needed to overcome marketing bottlenecks which limit farmers' abilities to buy and sell goods. Improving producers' access and linkages to new markets can help increase their incomes. Developing marketing information services can help to provide farmers with reliable information on market opportunities and timing as well as information on markets for purchasing inputs. In addition, rural credit systems need to be reformed and strengthened in order to overcome biases and to increase productivity, equity, and sustainability, especially to improve credit availability for small rural businesses and farmers in sustainable agriculture.

9) Infrastructure maintenance and development

The limitations and decay of rural infrastructure need to be overcome. Maintenance of roads is crucial to enable people to sell their goods, buy inputs, take advantage of markets, and to improve their income and welfare. Emphasis should be placed on repairing and maintaining existing infrastructure rather than building new projects. Such maintenance projects may be needed in isolated farmland areas, to service the needs of the poor, as well as in more productive areas.

10) Environmentally-sound narcotics interventions

Narcotics eradication measures need to be broadened and improved so that they entail natural resource management, socioeconomic aspects, and the development of sustainable alternatives and job options. The eradication techniques should be carefully managed and monitored, to ensure that they are environmentally sound and do not harm people. Developing alternative profitable crops and cooperative community/participatory reforms should be encouraged, rather than imposing only "policing" approaches which provoke conflict.

E. NATURAL RESOURCES: FORESTS, WATERSHEDS, BIODIVERSITY & WILDLANDS

Objective: To reduce deforestation, develop sustainable productive, and equitable management of forest resources, improve watershed/water management, and promote conservation of biodiversity and wildlands, stressing participatory actions.

Rationale:

Forest resources are very important to development in Latin America and the Caribbean. Forests cover about one-third of the total area of the region. Although forest products provide only a small share of GNP in most nations of the region, forests contribute large unmeasured economic benefits to people. They provide a wide range of products, including fuelwood (which over 50% of the population depends on for cooking), lumber, paper, medicines, and building materials, fruits, nuts, and important services, such as watershed protection and soil erosion control. Forests also maintain plant and wildlife habitats and a diversity of species, and help stabilize climate conditions. The export of forest products has become increasingly important for earning foreign exchange, especially for Brazil, Chile, Honduras, and Paraguay. The forest industry creates jobs and diversifies economies. When integrated in farms and pastures, trees benefit agriculture, ie, in agroforestry, which has been practiced for centuries. Forested wildland areas are also important for ecotourism, recreation, and reserves or parks, which generate revenues. In sum, forest resources offer untapped potential. (WRI, 1990)

The region is also very rich in terms of biological diversity. It includes several of the world's most biologically diverse countries (eg, Brazil, Mexico, Peru, Colombia, Bolivia) (WRI, 1990). The region has a tremendous range and number of ecosystems which are fundamental for supporting life. It contains about 40% of the plant and animal species of the world's tropical forests. Biodiversity is particularly rich in rainforests but is also rich in coral reefs. Mangroves and wetlands provide unique habitat for migratory species and for spawning and rearing grounds for fish and crustaceans. Species diversity provides unmeasurable biophysical values, enhancing stability and productivity of ecosystems, and high economic values. Wild plants and animals are important as food sources, particularly for indigenous people. Active ingredients in about half of the world's pharmaceuticals come from wild species in ecosystems such as rainforests and coral reefs. Tropical species are also sources of rubber, oils, cosmetic products, spices, herbal medicines, and other products. Moreover, genetic diversity is crucial to the sustainability of agriculture. As much as 36% of the production of world foods have their genetic origin in Latin America (FAO, 1988; IDB/UNEP, 1990). Many of the related wild species to the major food crops of the world come from Latin American forests (eg, potatoes, corn, tomatoes, plantains, cacao). Diversity in agriculture has provided insurance against variations in weather and pests, increasing stability of production, variety in nutrition, and multiple kinds of food and/or income. Potentially valuable crop species are often discovered in the tropics.

Water is the most fundamental of natural resources for human survival. On the whole, LAC has more abundant water resources than the other major regions of the world. An extensive network of rivers extends through the region, providing a wide range of benefits. The watersheds protect surrounding areas from erosion and flooding. In addition, LAC has an average rainfall of 1500 mm, which is 50% higher than the world average. Rainfall is seasonal in much of the region, characterized by an annual dual wet-dry cycle, and agriculture is largely rain-fed. Relatively few areas are serviced by irrigation. Nevertheless, in some arid agricultural regions, as in Mexico and Chile, irrigation systems have been developed. Approximately 8.7% of the total arable land is irrigated in 1990 (WRI, 1990). Industrial uses of water account for a minor percentage of the total water use in the region (ie, between 0.8 and 1.2% of total water

in the 1980s). The supply of potable water has improved in the last twenty years in LAC. In 1970, about 37% of the total LAC population had potable water supply; by 1980, this figure reached 54%. Finally, hydropower constitutes about 21% of the total energy consumed in LAC (WRI, 1990), and development of large dams and water power projects has increased substantially over the past several decades. The rise in petroleum prices has made use of water resources attractive. Yet the full potential of water power has barely been tapped.

Although LAC is rich in natural resources, there are serious degradation problems:

Forest resources in LAC are being rapidly depleted, degraded, wasted, and over-exploited. Deforestation occurs at a rapid rate of 0.61% per year in LAC, mainly due to conversion to pastureland and agriculture. The annual rates of increase are especially high in the Amazon Basin, between 10% and 60% (IDB/UNEP, 1990). Deforestation in itself is not necessarily "bad," as sometimes portrayed in the media. It has led to economic and social benefits, when leading to increased production on suitable soils, and when accompanied by resource management. However, the rate of forest clearing has accelerated too rapidly, and in an uncontrolled and unsustainable manner. Burning, the most common way of clearing the land, wastes wood and energy, harms local air quality, and disrupts the global atmosphere, constituting a source of carbon which contributes to global climate change. Deforestation on unsuitable lands, such as steep slopes or laterite tropical soils leads to soil erosion, and loss of soil productivity and fertility, as well as watershed degradation. Deforestation often has adverse social impacts. In areas such as the Amazon Basin, indigenous peoples (and their rich knowledge of local species) have been displaced and disrupted. This has caused loss of cultural diversity, social conflicts and political turmoil. In several countries, the conversion of forests to pastures has involved concentration of land and a "squeeze" on the peasantry. Excessive deforestation also results in fuelwood scarcity in many parts of LAC, meaning that prices have risen, and women and children must walk further to collect wood. Moreover, reforestation efforts are insufficient to offset the losses. At least 10 hectares are being cut for each hectare reforested (IDB/UNEP, 1990). Forestry, where developed by timber industries, tends to be poorly managed, and sustained methods are not used in many areas (WRI, 1990).

The loss of forest habitat and conversion of ecosystems threatens the rich flora and fauna, causing a loss of biodiversity. Over 1300 animal species are listed as endangered due the elimination of their habitats (WRI, 1990). In addition, the loss of biological diversity threatens agriculture and coastal zones. At present rates of deforestation, estimates are that 100,000 to 350,000 species will disappear in the next decade or two (Lugo, 1987). This trend results in economic and social losses to present and future generations. Losses of ecosystem and species diversity reduces the unmeasurable functions of ecosystems and species. This threatens the ecological regulating processes. Sources of many economic products, eg, pharmaceuticals, herbs, and foods, are being depleted. Loss of wildland areas also result in loss of actual and potential benefits from ecotourism development and recreation. Loss of diversity also affects agriculture: the expansion of large-scale monocultural plantations of genetic hybrids has displaced small diverse systems. Generally, monocultures are more susceptible to natural hazards and to pests and diseases than diverse agroecosystems. They also leave societies more vulnerable economically to uncertain markets.

Simultaneously, watersheds and water resources are affected by problems, despite the overall abundance of water in the region. Watershed degradation provoked from deforestation has contributed to soil erosion, decreased water retention, and flooding. It also leads to siltation of irrigation systems, dams, reefs and estuaries, causing declines in agricultural, fisheries, and hydropower productivity. Among the most serious water resource problems, as

discussed in the Health and Urban sections, are water pollution, which leads to health problems, and inadequacy of water supply infrastructure for providing potable water to millions of people. Additional water resource problems include: uneven distribution of water, whereby some areas have excesses, flooding, and damaging tropical storms (as in the Caribbean and parts of Central America) and other arid areas suffer from water shortages (eg, northern Mexico, north-west Venezuela, northeast Brazil, coastal Peru, valleys of Chile); competitive pressures between water users, as in Mexico and Chile, which can lead to depletion; inefficient irrigation systems; and negative impacts from large-scale hydropower development, such as watershed degradation, loss of land and biotic resources, threatening and displacing aquatic and terrestrial species, and dislocation and forced resettlement of indigenous peoples. (OAS/ILPES, 1989)

Many causes and many actors contribute to deforestation, loss of biodiversity and watershed degradation in the region (See Figures 10 and 11). The main interlinked reasons for deforestation are: a) conversion to pastureland, usually by large land-owners, and multinationals; b) conversion to large-scale export agriculture; c) conversion for subsistence farming; d) road-building and settlements of populations in colonization schemes; e) mining and hydroelectric projects in environmentally-unsustainable areas; and f) uncontrolled forest exploitation by timber companies. Fuelwood harvesting is another cause, though to a relatively minor extent; because the scale is much smaller than other factors; and people generally use tree branches and fallen wood wastes. Additional causes of watershed degradation and water pollution are: lack of soil conservation methods and over-grazing leading to erosion, cultivation of steep slopes; lack of controls over effluents, pesticide and fertilizer runoff, lack of sewage treatment, and lack of services for water supplies.

Underlying these factors, the important root causes of resource degradation include:

- i) Inequitable land ownership, and disparities in power, income, and resources in society;
- ii) Land speculation, especially by cattle-ranchers, partly due to inappropriate policies;
- iii) Fiscal incentives and credit/subsidies set by governments, which lead to deforestation;
- iv) Traditional land-titling laws, which enable people to gain title by clearing land;
- v) Government support of colonization schemes in unsuitable areas, sometimes used as "escape-valves" to avoid dealing with problems of poverty and landlessness;
- vi) Spontaneous migration of poor displaced people seeking land in "fragile" areas;
- vii) Economic pressures by national and international agencies to develop cattle, timber, mining, and energy projects, focused on short-term rather than long-term interests;
- viii) Lack of funding for resource management measures, exacerbated by economic crisis;
- ix) Undervaluation of the service functions of forests, watersheds, and biodiversity,
- x) Lack of control over those responsible for degradation of resources.

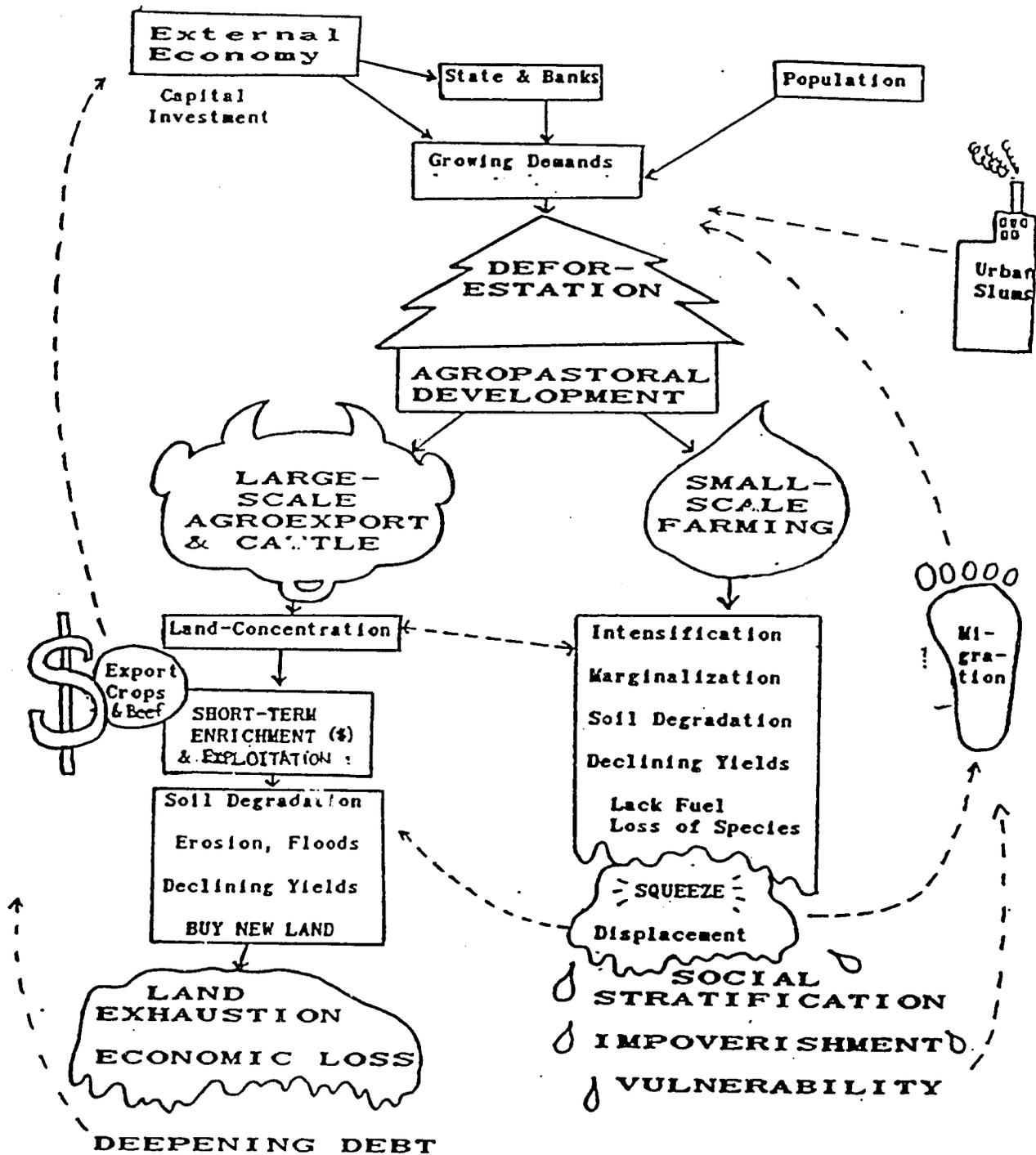
These underlying causes of natural resource degradation are rarely confronted in the attempted remedial actions. Yet confronting the roots of the problems will be necessary to address these problems. Further actions are clearly necessary to improve forest management, watershed and water management, and to conserve biodiversity. The challenges are to reverse degradation, overcome inequities which exacerbate the problems, incorporate conservation into development, and realize the multi-faceted economic benefits of such changes. In order to achieve these goals, it is important to involve local communities and industries fully in resource management and development, which can help to generate jobs and benefits local economies.

Social Actors in the Deforestation of Tropical Latin America

Deforested for:	Principal Social Actor:	Example:
Speculation	Planters Large landowners Multinationals	Brazil Colombia
Fiscal incentives	Large landowners Multinationals National agencies	Brazil
Resettlement of population	National agencies International agencies Planters	Central America Mexico Brazil Colombia Peru Ecuador
Large hydroelectric and/or mining projects	National agencies International agencies Multinationals State	Brazil Venezuela
Farming for export	Multinationals Planters	Central America Brazil
Subsistence farming	Planters, natives	Tropical America
Livestock	Multinationals Large landowners Planters	Brazil Colombia Central America
Forestry	Planters Small industrialists Large industrialists	Tropical America
Displacement of population	Planters Campesinos National agencies	Tropical America

Sources: Winograd, M. "Simulación del Uso de Tierras: Escenarios Tendencial y Sostenible" and "Comportamiento de los Grandes Ecosistemas Latinoamericanas"; In: Gallopín, Gómez and Winograd. "El Futuro Ecológico del Continente: Una Visión Prospectiva de América Latina" Final Report UNU-Grupo de Análisis de Sistemas Ecológicos. Bariloche. 1989.

DEFORESTATION, LAND-USE CHANGE, & REPERCUSSIONS



SOURCE: L.A. Thrupp, 1980

Strategic Actions:

To develop productive, sustainable, and equitable natural resource management and conservation, and to prevent degradation, it is necessary to develop the cross-cutting strategic principles and to undertake the following actions:

1) Reforestation

Widespread reforestation efforts are needed by public, private, and NGO activities. Replanting trees must be done in large scales to offset deforestation. Fuelwood plantations are particularly important in many areas where rural populations suffer from lack of access to affordable fuel. Reforestation projects are already being established, assisted by A.I.D. and other donors, but much work is still needed. Native species are usually most suitable. Reforestation by timber industries is especially important and should be required by laws. Successful reforestation serves multiple economic, ecological, and social purposes.

2) Reforms of tenure/title systems in forested areas

Reforms of legal rights of forest ownership, and land titling are important for improving forest management in Latin America and the Caribbean. In particular, inequities of distribution need to be overcome; tenurial concessions for the extracting commercial industries need to be reformed to eliminate short-term concessions (which induce "mining" of forests); and improved regulatory capabilities and monitoring of land title systems are necessary. Local communities and user groups must be assured legal rights over forest resources, to ensure that they benefit equitably from forest resource management and have guaranteed economic returns.

3) Comprehensive watershed management

Effective watershed management measures include: removal of incentives which induce deforestation (e.g., land tenure/title laws, speculation, tax breaks for cattle); protection of watershed forests; land use zoning, reforestation; soil conservation; agroforestry and social forestry; and provision of incentives for reforestation (catchment rehabilitation) such as tax breaks for forested land, subsidized seedlings, etc. where necessary; measures to mitigate negative environmental impacts from hydroelectric projects; periodic surveys of land use practices to indicate conditions of water production and quality.

4) Natural forest management for many services and extractive reserves

A broader definition of natural forest management encompasses a range of uses, beyond just timber and fuelwood, including use of non-timber forest products, biodiversity and watershed protection, buffer zone conservation, and climate regulation. The value of these services and features are increasingly recognized, but more needs to be done to realize their potential. "Extractive reserves," developed by indigenous Amazon people, also productively use forest products in sustainable ways. Establishment of protected forest areas, for purposes of biodiversity, wildlife management, and parks, has economic as well as environmental benefits. Buffer zone management (surrounding parks and reserves) is also important. Natural forest products, such as medicinal plants and unique spices, are abundant in the tropics, yet are underutilized. Measures are needed to ensure that the benefits accrue to local people.

5) Agroforestry

Experience has shown that agroforestry has multiple benefits and values. In many cases, agroforestry systems have high returns in terms of providing fruit, food, fuel, shade, fodder, construction materials, nutrients from leaf-fall, nitrogen (with some species), as well as providing soil conservation, diversity (which enhances stability), and watershed protection. These aspects represent economic, social, and environmental benefits, especially for small-

scale farmers and landless people. In developing agroforestry, special attention must be paid to social aspects such as: use of local knowledge of traditional agroforestry practices (which are common in much of Central America); collaboration between agriculture and forestry agencies for coordinated institutional support; farmer-to-farmer training workshops; two-way exchange between local people, including women, and scientists; and project planning, monitoring and guidance by local people. When agroforestry involves full participation and control by local people, it can be called "social forestry." (See Box)

**"WE DID THIS OURSELVES":
SUCCESSFUL FOREST MANAGEMENT AND SOIL CONSERVATION IN GUATEMALA**

The INAFOR/CARE/Peace Corps program (ICCP) in the highlands of Guatemala is a success story in forest management and soil conservation which has sustained socioeconomic benefits over 15 years. It has improved the well-being of poor rural people through two methods: 1) on-farm tree plantings that improve access to forest resources; and 2) introduction of soil conservation techniques, such as bench terraces, infiltration ditches, gully reclamation, and composting, that increase and sustain crop yields.

The ICCP program uses Food-for-Work supplied to CARE, under the USAID PL480 Program, as an incentive to encourage subsistence farmers to implement soil conservation and reforestation on their individual land holdings and on communal land. The program has operated successfully in 13 Guatemalan departments, with 10,661 participant farmers in 393 communities. The program aids the efforts of 250 tree nurseries and 193 agroforestry committees. It is supported by 80 local extensionist-promoters and 28 US Peace Corps Volunteers. The program produces about 3.5 million trees each year. Participating families have benefitted by improved access to fuelwood, easier access to timber and other forest resources, and increases in crop yields as outcomes of this program.

The use of food as an incentive for participation in the program has led some people to focus on acquiring food rather than on the benefits of the particular conservation techniques. This problem has been addressed by increasing the education on the long-term gains from improved management. Features accounting for success include the close cooperation between the participating institutions, full involvement and enthusiasm of local people, and the adaptability and strength of the conservation systems and extension efforts.

Source: Nations et al, 1987

6) Conservation of biodiversity, wildlands, and forest areas

Actions and policies for conserving biodiversity, wildlands, and forest areas can have multiple benefits and are needed to prevent and reduce losses. Examples of necessary conservation initiatives include: slowing deforestation, by removing fiscal and tenure incentives, restricting land speculation; incentives for reforestation; regulation of endangered/exotic species and fragile habitats (such as mangroves); incentives for establishing and managing biological reserves and parks in wildland areas. It is essential for local people to participate fully in such conservation initiatives, and that they are beneficiaries. Efforts are likely to fail if they do not have local people involved in conservation planning and management. Local private enterprises can also seize opportunities to profit from conservation activities, including park management, ecotourism, and development of seed banks. (See Box) Measures must be taken to ensure that ecotourism businesses have minimal pollution and benefit local communities.

7) Innovative approaches to link biological and cultural diversity, such as "extractive" reserves, ecotourism, and locally-managed seed banks

Inclusion of social factors, especially recognizing the importance of diverse cultures, is

important in biodiversity efforts. The success of biodiversity conservation projects depends largely on socially-appropriate implementation. These projects must involve the participation of people who live in the area, so that their knowledge of its ecology is used, and their needs are met. For example, parks and reserves should be viewed as more than just "protected areas." Potentially, they also offer ways to integrate ecological, economic, and human needs for sustainable development. They should be linked to plans for national integrated protected area systems, including buffer zones and migratory corridors. Other innovative measures, such as ecotourism, species-protection campaigns, educational projects, and participatory rural development projects, can contribute towards biodiversity conservation. The establishment of and locally-managed seed banks is another important activity which can contribute towards genetic conservation as well as being profitable for agriculture and local entrepreneurs.

NATIONAL PARK PROTECTION SUPPORTS BIODIVERSITY

Several biodiversity-wildlands activities are underway in Costa Rica. The \$7.5M FORESTA Project began in 1989, for the management of the volcano national parks, including large buffer zone forest management components surrounding the parks. The Forest Conservation and Management Project (BOSCOSA), initiated in 1987, is focussed on the Golfo Dulce Forest Reserve and Corcovado National Park, including buffer zone management, agroforestry, watershed management, and protection of Corcovado's biodiversity. USAID grants in 1988 and 1989 are going to planning and management of the Tortuguero National Park-Barra del Colorado Wildlife Reserve, which include lowland rain forests, wetlands, and important coastal habitat for the endangered green sea turtle. Biodiversity survey centers are being established in five Costa Rican parks, along with training programs. The wetland Carrizo Negro Wildlife Reserve which drains into Lake Nicaragua and is home to a number of threatened species, is also supported.

Source: A.I.D., 1990

8) Efficiency and equity in water delivery

Increasing efficiency and equity in distribution and supply of water is urgently needed, especially for poor farmers, who commonly suffer from fluctuating supplies and serious inequities in access to water. This requires measures such as: reforming or reducing water subsidy policies; pricing water to reflect its supply cost plus its social costs; technical improvements in irrigation systems, dams, and water delivery systems.

9) Dam siting and planning

Environmental impact studies and planning need to be fully integrated into water resource development projects, to ensure that dams are environmentally sustainable and economical and socially beneficial. Excessive costs and watershed degradation can be prevented through careful pre-analysis and engineering and siting of dams can help prevent watershed degradation and high costs, and can help improve profitability and sustainability of hydroelectricity production and irrigation from dams

10) Reforms of colonization and settlement schemes in forest areas

Measures are needed to prevent the problems arising from settlements and colonization in forest areas which are generally unsustainable for agriculture. Government-sponsored colonization schemes need to be more carefully planned to avoid lateritic soils of tropical rainforests and steeply-sloped forested areas. People need to be provided access to improved income-earning opportunities, through land-tenure changes or other rural development projects.

F. COASTAL RESOURCES

Objective: Improve coastal zone management and planning, and prevent coastal pollution, giving attention to sustainable development of tourism and fisheries.

Rationale:

The Latin America and Caribbean region has extensive coastal resources, including marine fisheries, coral reefs, mangroves, beaches, and of course, the seas and oceans. Nearly all of the LAC countries have long coastline zones, which total 58,457 miles. Only 2 of the 32 countries are landlocked. Coastal resources are thus important to economies of several countries of the region, and form the basis for tourism and fishing industries. Coastal tourism has become a major source of foreign exchange for the Caribbean, Mexico, and Central America. Coastal "ecotourism," such as activities in parks and reserves along beaches, has also become important in some countries, such as Costa Rica. Many coastal areas and marine fisheries in the region have not yet been tapped, and they offer potential for development.

However, coastal and marine resources suffer from degradation in several areas. Overfishing, water and beach pollution (from sewage, effluents, solid waste, and siltation from upland erosion), and destruction of coastal fishery habitats, and uncontrolled sand mining are serious problems, reducing aquaculture and fisheries production. Furthermore more than 50% of the mangrove forests and swamps of Latin America (60,000 square kilometers) are converted, exploited, or degraded in some manner, and coral reefs are also declining. Certain endangered species, such as sea turtles, continue to be threatened. This causes biodiversity losses and harms habitats crucial to species reproduction. These forms of coastal degradation result in high economic losses, especially for fishing and tourist industries. They decrease the aesthetic qualities that attract people and harm the resources needed to support coastal economies. Thousands of small fishermen and their families, as well as large tourist enterprises, can suffer the costs. Cleaning up the pollution is very expensive, often prohibitive.

The main causes of coastal resource degradation and pollution include:

- i) Uncontrolled and unplanned development of coastal regions, tourism, and waste disposal;
- ii) Lack of consideration of environmental factors in development and in engineering;
- iii) Overfishing (in cases of reductions of particular species' yields)
- iv) Lack of appropriate regulations and ineffective laws over fishing and pollution;
- v) Uncontrolled expansion of shrimp farming in some areas (eg, Mexico);
- vi) Lack of political will to give attention to coastal resource degradation.
- vii) Population pressures/concentration, along with insufficient infrastructure and services;
- viii) Unregulated oil exploration, production, distribution;
- ix) Siltation due to deforestation and poor soil conservation in agriculture upcountry.

These coastal resource problems demand innovative solutions. Pollution control, conservation, and sustainable use of coastal resources are essential as the coastal areas of LAC become increasingly important for economic growth opportunities, especially for fisheries industries and tourism. Improved management of coastal zones is especially crucial in countries of the Caribbean, Central America, and in Ecuador and Colombia, which depend on their coastal resources as major sources of income. Strategic planning, actions by private and public sectors, and work by NGOs together can help to improve coastal resource conditions.

Strategic actions:

For effective coastal resource management, the following priority actions are needed:

1) Sustainable fisheries management

It is necessary to improve fisheries regulations to prevent overfishing (e.g., consider catch quota trading and regulations of fishing technology, rather than open access seasons, and strengthen monitoring and enforcement. Increase funding for Fisheries Departments' training and institutional development.

2) Control of effluents, waste disposal, petrochemicals, and sand extraction

In coastal areas, measures are needed to control industrial effluents, waste and sewage disposal, petrochemical industry activities, and sand extraction along the shores. Effective incentives for these kinds of coastal management activities can increase role of private sector, but monitoring and law enforcement by the public sector are also needed. Proper sewage and waste treatment facilities should be required with all new construction. Control of oil drilling and transport and other industrial activities is fundamental to prevent spills which can create irreversible damages of marine life and shorelines.

3) Environmental planning & management for tourism & infrastructure construction

The negative impacts of tourism and construction in beach areas can be prevented through careful environmental impact assessments, planning, engineering, and management. Integration of environmental concerns is needed for numerous activities, including buildings, roads, harbor infrastructure, and oil rigs. In developing new hotels and beach resorts, crucial necessary services include potable water supply, waste disposal services, and sewage treatment. Developing services of this kind can generate jobs as well. Tourist businesses can suffer high losses if such planning and management are neglected.

4) Integration of coastal management with watershed management

It is important to recognize that watershed management and coastal zone management are often closely interrelated and require coordination, in order to reduce the negative impacts of siltation and agricultural runoff (eg, pesticides and fertilizers). Collaboration between institutions is an economical and effective way to improve the chance of success.

5) Management of reefs, mangroves, and endangered species (ie, biodiversity)

Actions are needed to protect fragile ecosystems and biodiversity in coastal ecosystems. Measures include: laws to prevent mangrove and reef destruction; fuelwood plantations to substitute for mangrove cutting; rehabilitation of mangroves; laws to control spearfishing and harvesting of endangered species (turtles, marine mammals, corals, shells). These kinds of measures have long-term economic benefits as well as enhancing inherent ecological values.

PARTICIPATORY COASTAL RESOURCE MANAGEMENT IN ECUADOR

Ecuador is undertaking a national coastal management program which emphasizes a community-based approach. The Ecuadorians have been compelled by a sense of urgency to address the serious coastal problems of pollution, solid waste contamination, rapid loss of mangrove forests (ie, 15% or 30,000 hectares since 1969), tourist over-crowding, over-fishing, and poverty in coastal communities. In this program, initiated in 1989, the government is establishing long-term environmental and development strategies for the 2,860 km coastline, assisted by USAID, and the University of Rhode Island. Local residents of special area planning zones (ZEMs) are playing an active role in shaping plans for water quality and sanitation improvements, shoreline construction, tourism facilities, sustainable artisanal fisheries, and mangrove management. In all of these areas, effective strategies are urgently needed. Evaluation and planning processes are being carried out by teams consisting of U.S. advisors and Ecuadorians. Working together, these groups will develop strategies and actions aimed to benefit the coastal residents and economies of Ecuador.

Source: A.I.D.

G. ENERGY

Objective: Increase energy efficiency and conservation, develop renewable energy sources, and eliminate barriers to appropriate energy production technologies.

Rationale:

Energy is fundamental to human survival and to economic development. It is required for improvements in income, health, food production, industrial growth, education, and resource management. Only a few countries of the region have substantial petroleum resources (i.e., Mexico, Brazil, Colombia, and Ecuador); but many of the nations are fortunate to have abundant renewable energy resources, especially water and biomass. In the region, petroleum accounts for the major proportion of total consumption, followed by hydropower. Fuelwood is also vital for the domestic consumption of millions of people. Oil imports currently consume an average of 20-30% of total export earnings, and power sector infrastructure averages 25% of total development investment budgets (A.I.D./S&T/Energy Office, 1990). Projections indicate that about 7% growth of energy supply per year will be necessary to meet development goals.

Although renewable energy resources are abundant in the region, they are under-utilized and/or inefficiently used. The countries face rapidly increasing demand and a growing deficit in supply of energy for their growing populations. Inefficiency in energy production, distribution, and consumption is a widespread problem in the region for all forms of energy, resulting in economic losses. Inefficient fossil fuel use combined with lack of control of emissions, particularly in the transport sector, has contributed to air and water pollution in many Latin American cities, with adverse human health consequences (such as lead poisoning in Mexico City). It also adds to carbon dioxide buildup and is the largest contributor to expected changes in global climate. Depletion of fuelwood supplies is a major problem which affects millions of people who depend on fuelwood for meeting basic needs. This can increase time spent gathering wood and household expenses, and can lead to declining nutritional standards and health. Rural people usually lack options for other fuels. Indoor wood or charcoal burning for cooking and heating also causes health problems such as eye and lung disorders.

Many non-oil producing countries are heavily dependent on imported petroleum, which leaves them vulnerable to fluctuating prices, drains scarce foreign exchange, and diverts money which could be more effectively used to develop renewable sources locally. Pollution and resource degradation also occur from the exploration, extraction, processing, and delivery of petroleum. Alternative renewable sources are not being used to their full potential. Finally, although hydropower offers important potential, development of large hydroelectric dam projects have sometimes led to negative environmental and socioeconomic impacts.

Causes contributing to these energy-related problems include:

- i) artificially low prices of fossil fuels (below world market prices) which thwart conservation;
- ii) support to parastatal power monopolies, which exclude private sector production;
- iii) biases favoring highly capital intensive, mega-engineering projects which are often more disruptive and expensive than energy efficiency and renewable energy technologies;
- iv) economic policies and short-term pressures which give incentives for inefficient production;
- v) lack of economic incentives for development of renewable sources on energy;
- vi) lack of pollution and efficiency controls of energy production, extraction, and delivery;
- vii) lack of planning and environmental impact studies for energy development;
- viii) in the case of fuelwood scarcity, lack of reforestation, lack of alternative fuels, and inequitable distribution and control over forest and land resources.

Waste and underuse of the abundant renewable energy resources in the region clearly need to be overcome. Developing energy efficiency and renewable energy sources is a "no-regrets" strategy which has simultaneous economic, human, and ecological benefits. Activities already being undertaken by A.I.D. in these areas (especially by the Bureau of Science and Technology) have proven to have positive outcomes (A.I.D. interviews, 1990). Yet, more projects and funds are needed to expand successful endeavors. It is logical for the nations in this region to take advantage of the rich renewable energy endowments, and to use the energy efficiently, environmentally-soundly, and equitably for sustained economic development.

Strategic actions:

Effective energy resource management and development requires the following actions:

1) Sector-wide Energy efficiency and conservation

Energy efficiency and conservation have multiple benefits in all sectors: They reduce waste, decrease the need for oil imports and major new capital investments in electricity generation, and extend the life of non-renewable energy reserves, while contributing to economic growth. Efficiency is especially important in the countries of Latin American and the Caribbean which are projected to have energy deficits for meeting their development goals. Greater efficiency results in greater availability of resources to fund development programs. It also reduces the environmental and health "externalities" of energy use, while making manufactured products more competitive internationally. Specific measures for this purpose include demand management in electric power systems, industry, buildings, and transport; information dissemination; and training programs for mission staff.

2) Comprehensive energy planning and policies

Useful measures of energy planning include: gradual energy price reform (for promoting efficiency); reforms of legal/regulatory framework to provide the possibility for private-sector participation; changes in incentive systems to encourage conservation and use of renewable sources; least-cost and avoided-cost power sector investment planning; promotion of technology innovation and commercialization programs (through measures such as institution-strengthening); prefeasibility studies to ensure that projects are economical and environmentally-sound, especially for rural power delivery; and incorporating environmental concerns and impact assessments into all energy projects.

3) Renewable energy, including biomass, hydropower, wind, solar, and geothermal

Renewable energy sources are abundant in the region. Production and use of these sources has economic, health, and ecological benefits, often superior to conventional fossil-fuel sources. Renewable sources include biomass, eg, crop and forest residues, wind energy, solar, and geothermal. They are generally cleaner in terms of avoiding pollution and greenhouse gas emissions. These sources also tend to be more practical for smaller-scale production systems which are adaptable for decentralized specific needs and amenable for private sector investment; but legal and economic incentives are needed to promote investments in renewable energy production.

4) Electricity co-generation by independent producers

Electrification can be made more efficient and economical through the development of co-generation systems. These kinds of systems enable industries to use energy sources for dual purposes. For example, electricity can be produced from excess heat which is generated from large oil-powered industries such as steel manufacturing. Natural gas, a sizable but often wasted resource in some countries of the region, is cleaner and more efficient than other fossil

fuels, particularly when used in conjunction with new electricity production technologies. More efforts should be made to promote and promulgate the development of cogeneration systems by private and independent enterprises.

5) Fuelwood access, efficiency, and substitutes

Changes in the regulation of fuelwood markets and reforms of tenure in forested areas may be needed in some areas to improve peoples' access to fuelwood. Increased efforts in reforestation for fuelwood supplies is vital in several countries, as mentioned in the forest resource section. Also needed are socially-acceptable improvements in fuelwood use efficiency (e.g., through improved efficiency stoves and charcoal production). Health of women who cook over smoky stoves can also be improved in this manner. In many cases, however, increasing production of substitutes for fuelwood, such as hydroelectricity, may be preferred.

ALTERNATIVE ENERGY PROJECTS GAINING STEAM

The Science and Technology Bureau of USAID has recently assisted Costa Rica to legalize independent power generation and establish a pricing regime which makes micro-hydro and power co-generation from biomass residuals (sugar) viable. Other industries are becoming interested in participating. The mission in the Dominican Republic is also working on the legal and regulatory framework to allow independent producers to sell into the electricity grid. Guatemala is working on pricing for co-generation from sugar residuals, the forestry officer in the Honduras mission has discovered interest from the wood products industry, and in Belize, interest has been expressed by the citrus industry. Sustained technical and financial support is likely to bring significant improvements in energy production and efficiency.

Source: A.I.D., S&T

H. HUMAN RESOURCES DEVELOPMENT AND DEMOCRATIC INITIATIVES

Objective: Strengthen human resource development through education & training and support democratic initiatives for sustainable and equitable development.

Rationale:

Human Resources -- including people, and their capacities and skills, social organizations, and institutions -- are central to all dimensions of development. The Latin America and Caribbean region has a long cultural heritage with a diversity of human resource capacities. From the early Indian civilizations, to present-day cultures, the region's people have developed a wealth of knowledge about the environments in which they live.

In recent years, institutions, legal systems, and educational programs have been formed specifically for natural resource management and exploitation in many of the countries. LAC government agencies now involved in resource-related activities include Ministries of Forestry, Agriculture, Energy, Fisheries, and more recently, ministries for Environmental Protection, Natural Resources, and law enforcement bodies. Environmental initiatives are also being developed by NGOs, universities, scientific institutes, and primary schools, some with the support of donors and development agencies.

Furthermore, in several nations, "grass-roots" activities have emerged in response to resource-related problems. Local community groups, farmers' and workers' associations have taken actions to protect their human rights and economic needs, such as access to resources, clean water, land tenure security, and have attempted to stop encroachment and pollution by companies and state projects. These are important democratic initiatives which have an "environmental" orientation. These local-level activities are usually representing diverse interests and allow peoples' voices to be heard in decision-making concerning resource utilization and development. They also are fundamental to develop an empowered and engaged citizenry.

Although these efforts are positive, there are still weaknesses in education systems, institutional capacities, and human resources for environmental management in LAC. A central problem in many countries is lack of coordination and collaboration between institutions involved in environmental initiatives within and among countries. Programs are often piecemeal, lacking coherence and direction, and there are often conflicts and competition between institutions and leaders, and/or duplication of activities. These problems can even occur in NGOs, although they tend to be more common in government agencies. Government agencies involved tend to have excessive bureaucratic procedures as well. Their efforts are sometimes counteracted by other laws and institutions which promote conflicting aims. Environmental programs are often "compartmentalized" minor programs within institutions, and are not well-integrated throughout. Although many environmental laws have been passed, law enforcement is generally weak. (eg, Leonard, 1987, Hartshorn et al, 1982, IDB/UNEP, 1990)

Technical and scientific capacities are lacking for environmental management in some cases. Similarly, lack of public awareness of environmental problems is common throughout the region. Although some community groups, organizations, and enterprises have developed consciousness and actions, many are unaware of these issues. People tend to lack information and educational opportunities about natural resources and environmental sciences. Although environmental education programs exist in some areas, the courses rarely exist at all levels, and they are often modelled on North American courses which are unsuited for local conditions. In sum, these weaknesses constrain effectiveness of environmental initiatives.

The causes of weaknesses in environmental institutions, laws, and education are mainly:

- i) lack of funding, resources, and political support for effective programs;
- ii) economic recession which has exacerbated the difficulties of undertaking changes;
- iii) development of environmental capacity receives less political support than economic issues;
- iv) decision-makers maintain the false belief that environmental management conflicts with economic growth, which is partly due to insufficient information about environmental actions;
- v) lack of coordination among institutions and lack of trainers and teachers.

Therefore, the support and development of human resource capacities is essential to the sound management of natural resources and economic development. Strengthening institutions, educational programs and training opportunities is fundamental to support and build human resources in these areas, and can contribute to sustainability and productivity in many areas. Priority must be given to supporting local knowledge, involving people in "hands-on" participatory approaches to education and learning, and building grassroots environmental-related movements, which represent democratic initiatives. Achieving successes in these efforts for justice and democratic pluralism are important for social, economic, and environmental aims.

Strategic actions:

In order to strengthen human resources, institutions, and democratic initiatives for sustainable development, is essential to develop the cross-cutting strategic approaches (described in Chapter 3) and the following actions:

1) Environmental education programs at all levels

Educational opportunities are needed in environmental studies and resource management for a broad spectrum of people, including children in primary and secondary schools, university students, adults, private enterprise managers, policy decision-makers, and scientific professionals. The curricula and materials should be well-suited to the interests and needs of the audience. Materials adopted from temperate Northern regions, especially those stressing parks and wildlife ecology, should be de-emphasized in relation to other resource priorities of local people. Two-way exchange and "hands-on" methods of environmental education should be developed in teaching, avoiding conventional top-down teaching approaches which often alienate students. University education for environmental studies can be attained through U.S. universities, through the provision of scholarships, as is already being done for some college students from the region. However, it is generally preferable to develop such programs and education in the countries of Latin America and the Caribbean, because this facilitates better adaptation of curricula and course materials to local conditions, and enables strengthening and utilization of local expertise in teaching and administration. An example of a broad-based environmental educational system is described in the Box below.

2) Laws, regulatory systems, and enforcement mechanisms

The improvement of legislative mandates, legal and regulatory systems, and law enforcement mechanisms for environmental conservation and resource use is urgently needed. Reforms and changes in present laws can help ameliorate and prevent degradation and promote sustainable forms of development. For example, present land-titling and colonization laws (which presently enable people to claim titles through indiscriminate deforestation) need to be reformed or eliminated. Stricter regulations of industrial activities are essential for alleviating serious pollution problems; and such regulations require strong enforcement measures and careful monitoring. These kinds of laws must be backed by political support and commitment to ensure that they result in effective changes of behavior.

3) Public Awareness-Raising Efforts

Various medium can be used effectively to raise public awareness of the importance of environment-related issues and their economic impacts. Television, radio, and newspapers, as well as books and more formal education can help in campaigns and news on these issues. The information in such media should stress effective remedial actions to involve local people. The campaigns require effective institutional management and coordination. (See Box below)

4) Training of Policy-Makers, Technicians, and Managers

Technicians, managers, and policy-makers can benefit greatly from training courses for building their capacities in environmental management. Courses should include technical problem-solving courses covering a variety of environmental problems, and policy-related courses for conflict resolution, and policy-related environmental issues. Examples of useful training course topics include techniques of environmental impact assessments, forest management, agroforestry, pollution control measures, and means of environmental law enforcement. Short-term training courses are often preferred over longer-term courses, because they facilitate rapid learning and possibilities of immediate application of environmental knowledge into decision-making. Such courses can be done in the U.S. or local institutions, but it is generally better to undertake the courses in the countries of the region, so that they are better adapted to local conditions and involve trainers from the region.

FUNDACION NATURA'S ENVIRONMENTAL EDUCATION CAMPAIGN

Since 1983, Ecuador's environmental NGO, Fundacion Natura, has been implementing the most comprehensive environmental education program undertaken by a conservation NGO in Latin America. This program was supported by a \$659,000 grant over four years from USAID. The objectives of EDUNAT II were to institutionalize environmental education in the formal and non-formal education systems (in both public and private institutions); to provide public environmental education through the media; and to promote coordination and collaboration on environmental actions among institutions in Ecuador.

Over the life of the project, 56 programs, publications, studies and reports were produced and disseminated through television, radio and the print media. Approximately 5000 teachers received primary school curriculum guides. A National Environmental Congress was held, and was attended by 600 participants. EDUNAT II contracted a public survey firm to send a questionnaire to 1600 homes to measure their understanding of ecodevelopment concepts, providing a strong basis for the design of further programs. They have also received and responded to hundreds of requests for information and additional materials, including copies of EDUNAT II's newsletter for teachers. Many of EDUNAT II's products, however, are intangible though equally important. They include: the creation of the General Direction of Environment, linked to the Ministry of Mines and Energy, the creation of the Permanent Commission on Ecology of the Ecuadorian Parliament, the strengthening of the State Petroleum Corporation's environmental department, and the creation of the Department of Environmental Education in the Ministry of Education.

The Fundacion Natura has taken the first step towards building a strong environmental management capacity in the country. There is strong potential for further success through wide dissemination of the experiences of the Fundacion Natura's EDUNAT II program. Furthermore, public awareness of environmental issues is likely to be increased through the continued expansion and cultivation of good relationships between this NGO, USAID and the Ecuadorian government, specifically the Ministry of Education. Among their longer-term goals are to work more extensively in rural communities, and to establish environmental education programs targeted at the business and industry communities.

Source: A.I.D./WWF, 1988

5) Innovative institutional linkages and networking, and improved communication

Forming US - LAC and LAC - LAC linkages and networks between Environmental Studies programs of universities, and between NGOs and government organizations is an excellent way of sharing information and coordinating efforts, contributing to human resource development. Improving communication and information-exchange between LAC environmental organizations is an important way of learning. This is being attempted through the University linkage program sported by A.I.D., but such efforts need to be expanded.

6) Support of locally-based expertise, taking advantage of indigenous knowledge

More attention needs to be given to support indigenous human resource capacities. People from the grassroots level should be central actors in design, planning, implementation of activities pertaining to environmental management. Communities can benefit if they are fully involved with foreign "experts;" and projects will benefit from interactive exchange of ideas and skills. For example, the experiences of rural people about rural resource conditions and land-use practices sometimes offer important insights about what methods of land use have and have not been successful over time. Participatory activities of this kind can be vital to sustain efforts for effective change.

7) Democratic initiatives, local movements, and non-government organizations

Enabling citizens' groups to gain support, information, and resources, can strengthen their organizations and the effectiveness of their actions, and it can help people become empowered and engaged in constructive social change. Effective "empowerment" means that people at the grassroots: a) have the opportunity to express their views, and be heard, and fully accounted for in decision-making regarding resources; b) improve their economic and social welfare, and/or economic control over resources; and c) strengthen their self-esteem and legitimacy through participation in development and social change. Support to grassroots initiatives in this area should thus be a priority. These actions help to promote participation and democracy, while also giving people tangible economically-beneficial results and contributing to increases in production.

VI. CONCLUSION

This draft Environmental Strategy report for Latin America and the Caribbean has presented: a framework which clarifies the environment-development nexus in LAC; the broad range of environmental issues which are linked to economic issues, and an array of strategic principles and actions for environmental management and sustainable development. The paper has clarified that environmental management must be integrated into all activities of A.I.D., governments, private enterprises, NGOs and citizens. The rational management of natural and human resources is thus integral for sustained economic development and growth.

As described throughout this analysis, there are many existing technologies and methods to overcome resource degradation and to harmonize economic and environmental aims. Although the implementation of these technologies has thwarted by economic, institutional, and political constraints, the urgency of the problems now calls for major changes to apply sustainable development methods and activities. Reversing these negative trends is by no means easy, but we need to build on successes and overcome past constraints.

Although environmental management/conservation and economic production/growth are generally compatible and mutually beneficial, it should be recognized that these two aims sometimes entail *trade-offs* or conflicts. For example, if a pesticide is banned because it poses health or environmental risks, the costs of protecting crops may rise *unless* a same-cost or equally effective pest control method is available as a substitute. Sometimes those trade-offs involve present vs. future costs and benefits. For instance, installing energy conservation technologies in industries may entail high short-term costs, but in the long run, it will be economically profitable and advantageous. Such trade-offs and conflicts can be resolved, however, through the development of technologies, policies, incentives, and institutional support which enable the linkage between economic and environmental aims.

The report identified particularly important *cross-cutting principles* to achieve these aims. They include: addressing the root causes of problems; sustainable economic and environmental policies; institutions and legal systems; participatory approaches; activities and investments of the private sector; research, information exchange and technology transfer; environmental education and training; environmental impact studies incorporated into development process; and donor coordination. These principles, along with the actions in each priority area, are crucial in attaining the objectives for economically and environmentally sustainable development.

Finally, this strategy report has stressed the importance of understanding and addressing the human dimensions of environmental problems, ie, the social and economic roots and repercussions of these dilemmas. Overcoming "brown" environmental problems as well as "green" problems is vital for human livelihoods, economic development and political security in the final decade of the twentieth century. Effective operationalization of the strategic actions will require political commitment, finances, and careful determination of priorities. Discussions and dialogue about the options in this report will help to identify the most crucial strategic priorities for bringing about sustainable forms of development.

The principles and actions in this draft are to be seen as *options*, not conclusive mandates. These options require further consideration and evaluation by many individuals participating in the formulation of the final strategy. Moreover, the options were at a general level, and logically not all of them will apply to all countries. These strategic options, as well as the problems and causes, are summarized in the Matrix on the next page. Each country and LAC mission will need to select priorities adapted to local conditions and constraints.

ENVIRONMENTAL STRATEGY FOR LAC:
SUMMARY OF ISSUES, PROBLEMS, CAUSES AND OPTIONS

<u>SECTOR</u>	<u>ISSUES & PROBLEMS</u>	<u>CAUSES/CONSTRAINTS</u>	<u>STRATEGIC APPROACHES</u> (cross-cutting)	<u>STRATEGIC OPTIONS</u>
Agriculture	Soil erosion Low soil fertility Low productivity Degraded pastures Underutilized land Unstable water supply Loss of species diversity Loss of jobs Rural-urban migration Pesticide problems	Land inequity Insecure tenure Use of unsuitable soils Lack of soil conservation Deforestation Over-grazing Distorted incentives Inappropriate policies	<i>Address root causes and prevent problems</i> <i>Develop effective environ/economic policies</i>	<u>Sustainable agriculture</u> * Land tenure/security reforms * Match land use w/soil capacity * Soil conserv, agroforestry systems * Fair pricing to help productivity * IPM and reduce pesticides * Crop diversification & diversity * Balance export and local foods * Market and Credit reforms * Sound narcotics interventions
Trade and Investment	Overexploitation by extractive industries Uneven trade relations Overdepend on foreign mkts Lack of int'l competitiveness Lack of access to markets Unequitable distribution of benefits from trade Uncontrolled toxics trade Lack info. & tech. transfer	Lack of consideration of environ. impacts Focus on short-term time horizon Lack of environ. laws Lack of information on environ. investments	<i>Strengthen institutions and broaden participation</i> <i>Strengthen private sector role</i> <i>Promote research, info and technology transfer</i>	<u>Environmentally-Sound Trade/Investment</u> * Environmentally-sound businesses * Economic/env. accounting reforms * Env. controls of trade & investmts * Ecotourism and sustainable tourism * Innovative financing (eg, debt swaps) * Local business management * Technology transfer & commerce
Human Resources & Democratic Initiatives	Weak education for environ. management Lack of coordination between institutions Lack of technical capacities Lack of env. training Weak support of local movements	Lack of funding Lack of political will Lack of educational programs Lack of attention to local knowledge "Turf" struggles	<i>Strengthen environmental education and training</i> <i>Carry out environmental impact studies</i> <i>Promote donor collaboration</i>	<u>Human resources & Democratic initiatives</u> * Environmental education -all levels * Public awareness-raising * Training for technicians/managers * Local dem. initiatives & grassroots * Educational linkages & networks * Support local-level expertise

<u>SECTOR</u>	<u>ISSUES & PROBLEMS</u>	<u>CONSTRAINTS/CAUSES</u>	<u>STRATEGIC APPROACHES</u> (cross-cutting)	<u>STRATEGIC OPTIONS</u>
Forest Resources	Deforestation Waste of wood/energy Over-exploit. of wood Soil erosion Watershed degradation Decline in fuelwood Loss of biodiversity Disruption in climate	Land speculation Economic incentives Land tenure laws Coloniz. schemes Timber exploitation Inequit. land tenure Pasture expansion (& cattle subsidies) Cutting for fuelwood	<i>Address root causes and prevent problems</i> <i>Develop effective environ/economic policies</i>	<u>Forest resources management</u> * Reform land/forest tenure/titles * Agroforestry & social forestry * Reforestation for multi-purposes * Natural forest management * Colonization & settlement reforms
Water Resources	Water pollution Unevenness (shortages and excesses of water) Limited water infrastruc. Inequitable access to water Inefficient irrigation Watershed degradation Negative impacts of dams	Lack of control of wastes/pollution Over-exploitation of groundwater Inefficient water use Competition among water users Deforestation Lack of conservation	<i>Strengthen institutions and broaden participation</i> <i>Strengthen private sector role</i>	<u>Watershed and water management</u> * Comprehensive watershed mgt * Efficiency & equity of water supply * Flood damage prevention * Careful dam planning & siting
Coastal Resources	Degradation/depletion of marine fisheries Pollution/degradation of coasts and beaches Sand mining Water pollution Loss of mangroves & reefs	Uncontrolled devt. Lack of planning/zoning Overfishing Improperly planned construction projects Lack of tourism laws Excessive wastes/runoff	<i>Promote research, info and technology transfer</i> <i>Strengthen environmental education and training</i>	<u>Coastal Management</u> * Sustainable fisheries management * Control of effluents, waste & oil * Careful planning/siting new buildings * Tourism planning & guidelines * Integrate watershed & coastal mgt
Energy	Inefficiency in production, consumption, distribution Depletion of fuelwood Dependency on oil imports Pollution from powerplants Underuse of renew. energy	Lack of efficient production methods Lack of conservation Bias toward large-scale energy plants Fuelwood cutting Lack info on renewables	<i>Carry out environmental impact studies</i> <i>Promote donor collaboration</i>	<u>Energy efficiency & renewable energy</u> * Efficiency in all sectors * Renewable energy sources (all kinds) * Co-generation by independents * Fuelwood access, efficiency * Comprehensive energy planning

<u>SECTOR</u>	<u>PROBLEMS</u>	<u>CONSTRAINTS/CAUSES</u>	<u>STRATEGIC APPROACHES</u> (cross-cutting)	<u>STRATEGIC OPTIONS</u>
Health and Population	Over-crowding High population growth rate High infant mortality Infectious diseases Occupational health Increases in vector diseases Air pollution Toxic & hazardous waste Loss of labor productivity	Lack of economic opportunities Lack of education Inadequate prevention of disease Water pollution Lack of sewer facilities Lack of clean water Lack of funds	<i>Address root causes and prevent problems</i> <i>Develop effective environ/economic policies</i>	<u>Environmental health & population</u> * Family planning * Comprehensive population policies * Access to Safe water * Hygiene and Sanitation Improvement * Occupational safety & health
Urban & Industrial Conditions	Water pollution (disease) Over-crowding Air pollution Solid & hazardous wastes Depletion of rural resources High costs of pollution	Excessive/rapid urbanization Rapid migration Lack of economic opportunities Lack of sewage treatment & services Lack of clean water Lack of pollution laws Lack of finances	<i>Strengthen institutions and broaden participation</i> <i>Strengthen private sector role</i> <i>Promote research, info and technology transfer</i>	<u>Urban/Indus. plans & pollut'n control</u> * Water systems and quality * Waste management & disposal * Pollution reduction/prevention * Recycling * Natural Disaster avoidance
Biodiversity & Wildlands	Loss of biodiversity Loss of cultural diversity Loss of genetic resources	Deforestation Uncontrolled growth Expansion of monocultures	<i>Strengthen environmental education and training</i> <i>Carry out environmental impact studies</i> <i>Promote donor collaboration</i>	<u>Bio-diversity conservation</u> * Incentives for biodiversity conservation * Innovation for cultural & bio. diversity Extractive reserves and ecotourism * Private sector investments * Local people involvement in parks

APPENDIX 1

PEOPLE INTERVIEWED

Within USAID:

Bill Alli, Working Group on Environment
Matt Auer, HUD, LAC
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Art Danart, Health & Population, LAC
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Mike Hanrahan, DAI-DESFIL
Mary Lou Higgins, WWF
Brian Houseal, TNC
Carlos Linares, CF-Environmental Information Service
Jim Nations, CI
Dennis McAffrey, Abt Associates
Diane Wood, WWF

Note: Additional individuals, especially officers in LAC country Missions will be consulted as part of the preparation of the final strategy.

APPENDIX 2

A.I.D. FUNDING FOR ENVIRONMENT-RELATED ACTIVITIES

FUNDING FOR LAC BUREAU ENVIRONMENTAL ACTIVITIES BY COUNTRY

(and as a percentage of AID total country funding)

COUNTRY	----- 1990 -----			--- 1991(est) ---			1992(est)
	ENV	TOT	(%)	ENV	TOT	(%)	ENV
BELIZE	915	6457	(14.2)	1284	7320	(17.5)	1480
BOLIVIA	4706	54513	(8.6)	3720	54341	(6.8)	4082
COSTA RICA	4675	75394	(6.2)	2738	49705	(5.5)	29013
DOMIN REP	971	14512	(6.7)	253	23335	(1.1)	1901
ECUADOR	1084	14091	(7.7)	1111	23752	(4.7)	2741
EL SALVADOR	6405	203173	(3.2)	14548	244118	(6.0)	6067
GUATEMALA	2100	86553	(2.4)	3753	94295	(4.0)	4825
HAITI	5240	27301	(19.2)	6277	39471	(15.9)	6392
HONDURAS	4427	164387	(2.7)	6200	116933	(5.3)	4775
JAMAICA	2021	18989	(10.6)	2227	32642	(6.8)	2767
PANAMA	270	530125	(0.1)	10000	0	-	5000
PERU	264	15289	(1.7)	673	14975	(4.5)	4469
CARIB REGION	1115	18602	(6.0)	1804	27664	(6.5)	3124
ROCAP REGION	10538	21354	(49.3)	9730	20430	(47.6)	10825
LAC REGION	6645	75716	(8.8)	9798	75486	(13.0)	9638
LAC TOTAL	51376	1329660	(3.9)	82116	1026467	(6.0)	97099
AFR TOTAL	32541	587147	(5.5)				
ANE TOTAL	180330	3537530	(5.1)				

SOURCES: AID Environmental activities are defined as those falling under the eight NR Activity Codes (see table 2). AID country totals are derived from AID's FY1991 Congressional Presentation

COMPARISON OF REGIONAL FUNDING FOR ENVIRONMENTAL ACTIVITIES ACCORDING TO SPECIAL ISSUES CODES

	----- 1990 -----			AID
	AFR	ANE	LAC	TOTAL
ARC - Int'l Ag Rerch Cntrs	12942	815	48	60297
BDV - Biological Diversity	21640	2197	7034	38206
CLZ - Coastal Zone Mgmt	0	12161	1806	14061
EEF - Energy Efficiency	171	35548	908	45084
FSD - Fisheries Development	145	19121	342	21749
LSK - Livestock	4432	767	2611	18368
RBM - Biomedical Research	3346	1798	4594	19641
REF - Reforeststion	5990	2333	8995	20945
WTL - Wetlands	1446	0	1583	4073
ICT/BDV*	582	1617	1632	8058

SOURCES: DATA FROM ICT STUDY, SUMMER 1989

FUNDING FOR ENVIRONMENTAL ACTIVITIES ACCORDING TO ACTIVITY CODE

ACTIVITY CODE (A)	----- 1990 -----		----- 1990 -----		----- 1991(est) -----		----- 1992(est) -----	
	LAC (%)TOT	AFR (%)TOT	ANE (%)TOT	LAC (%)TOT	LAC (%)TOT	LAC (%)TOT	LAC (%)TOT	
NRFR - Forestry	13440 (26.2)	4171 (12.9)	33658 (18.6)	24386 (32.9)	34937 (36.0)			
NRMP - Env Mgmt, Plan/Pol	16359 (31.8)	19085 (58.6)	20302 (11.3)	21329 (28.8)	36559 (37.7)			
NRWH - Water Quality Hlth	10569 (20.6)	2273 (7.0)	1932 (1.1)	15294 (20.6)	8583 (8.8)			
NRLD - Ag Land Devt	3155 (6.1)	3722 (11.4)	8278 (4.6)	3475 (4.7)	3953 (4.1)			
NRWR - Water Res Mgmt	3525 (6.9)	740 (2.3)	697 (0.4)	6054 (8.2)	7383 (7.6)			
NRHW - Hazard Wastes	1675 (3.3)	25 (0.1)	4674 (2.6)	0 (0.0)	0 (0.0)			
NRSL - Soils	2029 (3.9)	1411 (4.3)	507 (0.3)	2094 (2.8)	2651 (2.7)			
NRWQ - Water Qual Improve	624 (1.2)	1114 (3.4)	110282 (61.1)	1484 (2.0)	3033 (3.1)			
TOTAL	51376 (100.0)	32541 (100.0)	180330 (100.0)	74116 (100.0)	97099 (100.0)			

SOURCES: LAC funding figures are derived from the LAC/DR/E Analysis.
 All other figures are taken from the USAID Summary of 6/18/90.

FUNDING FOR ACTIVITIES WITH ENVIRONMENTAL COMPONENTS ACCORDING TO ACTIVITY CODE

ACTIVITY CODE (B)	----- LAC -----			AFR 1990	ANE 1990	AID TOT 1990
	1989	1990	1991			
AGLS-Land Use & Settlement	2061	2917	3969	350	355	4003
AGPM-Pest Management	1833	983	1314	391	1002	5690
EYFF-Fossil Fuels	0	0	400	0	33575	34426
EYFW-Fuelwood	508	275	482	440	225	940
EYRN-Renewable Energy	3750	1500	2000	99	2764	8246
EYMP-Energy Mgmt, Plan/Pol	1250	14	622	57	15750	22156
INPO-Infrastructure/Power	25311	11795	8254	1991	125049	140026
						205794 TOTAL

SOURCE: USAID DA AND ESF ANALYSIS (6/18/90)

APPENDIX 3

OVERVIEW OF ENVIRONMENTAL INDICATORS FOR LAC

The Latin America and Caribbean region is comprised of 32 countries and 450 million people. It covers approximately 20 million square kilometers (roughly 15% of the Earth's land area) and has varied geographical terrain, ranging from the deserts of northern Mexico, to tropical lowlands of Central America and the Caribbean, dense Amazon rainforests, high mountain ranges of the Andes, to the frigid southern tip of Tierra Del Fuego (See Map). LAC is endowed with vast resources and biodiversity. As a whole, it has a great wealth of rivers, forest resources, agricultural land, fossil fuels and renewable energy resources, minerals, and coastal resources.

The following tables of indicators for the LAC region present the conditions and trends of economic activity, resources endowments and use, and human resources. A summary table of the endowments is shown as Table A. The tables have been grouped according to the following categories:

A) Endowments Includes economic, human, and natural resources:

1. GNP and GDP
2. World Trade
3. External Debt
4. Population
5. Population and Labor Force
6. Urban and Rural Populations
7. Health: Vital Statistics and Nutrition
8. Literacy and Education
9. Land Use
10. Agriculture
11. Agricultural Inputs
12. Land Distribution
13. Forest Sizes and Types
14. Wood Production
15. Energy Production and Consumption
16. Energy Reserves
17. Water Resources
18. Coastline Activity
19. Tropical Coastal Resources

B) Degradation and Problems

20. Soil Erosion
21. Water Quality at Selected GEMS/Water Stations
22. Air Pollution in Selected Cities
23. Globally Threatened Animal Species, 1989
24. Habitat Loss, 1980s
25. Lack of Access to Safe Drinking Water, Sanitation, and Health Services

C) Resource/Environmental Management

These indicators pertain to the **effectiveness** of natural resource policies, actions, and institutions in resolving environmental problems. Indicators for this category address qualitative and qualitative aspects. They include:

1. Indicators of rehabilitation or amelioration
2. Indicators of Slowing or reversing negative trends
3. Scoring "Performance" on management actions and policies

Evaluating performance or **effectiveness** (or success) is ambiguous, and must be clarified. In general, effectiveness should be judged in relation to how well the resource policy:

- fulfills the objectives of ameliorating/preventing the resource degradation problem; and/or
- fulfills the objectives for economically, environmentally, and socially Sustainable Development. In other words, is the policy/action "effective" in resolving the environmental problem(s) in ways that are economically productive and socially beneficial and equitable.

Management activities should be evaluated in all of the sectors, including trade and investment, forest resources, urban conditions, water resources, coastal resources, agriculture, energy, health and population, and human resources. One of the most important areas to evaluate is economic policies which affect natural resource management. It is crucial to consider whether governments are changing or eliminating policies which contribute to or cause environmental degradation (or which promote practices which lead to degradation).

Scoring such activities is difficult, but the issue must be addressed if we are to develop an "objective" measure of effectiveness. The following variable scale could be used to "score" policies in each sector:

- 5 = comprehensive program/policy; highly effective
- 4 = comprehensive program/policy; moderately effective
- 3 = program/policy exists and is incomplete in coverage; and only slightly effective
- 2 = program/policy exists in writing; but only partially implemented and partially effective.
- 1 = program/policy is incomplete in coverage; very ineffective
- 0 = no program/policy exists

Although these indicators are currently not available in any systematic or standardized form, future evaluation exercises should attempt to include such measures.

**TABLE
1**

**GROSS NATIONAL PRODUCT
AND GROSS DOMESTIC PRODUCT**

	Gross National Product				Comparison of Relative Sizes			Gross Domestic Product							
	GNP Total 1987 (millions \$ US)	GNP Growth Rate		GNP Per Capita 1987 (\$ US)	% OF LAC POP	% OF LAC GNP	% OF REGION GNP	Total #		Distribution (%)					
		1967-77	1977-87					(millions \$ US)	1977	1987	Agriculture		Industry		Services, etc.
								1977	1987	1977	1987	1977	1987	1977	1987
LAC BUREAU	712673				100.0	100.0									
CARIBBEAN	19139				7.5	2.7	100.0								
Antigua and Barbuda	248	X	X	3000	0.0	0.0	1.3	70 b	146 b	9	4	14	22	76	75
Bahamas	2494	X	X	10300	0.1	0.3	13.0	X	X	X	X	X	X	X	X
Barbados	1417	2.7	1.30	5580	0.1	0.2	7.4	697 b	882 b	11	8	21	21	68	71
Cuba	X	X	X	X	2.3	0.0	0.0	X	X	X	X	X	X	X	X
Dominica	122	X	X	1520	0.0	0.0	0.6	58 b	57 b	44	36	13	17	43	47
Dominican Rep	5101	7.6	2.0	760	1.6	0.7	26.7	5855 a	7891 a	21	19	29	30	50	51
Grenada	142	X	X	1420	0.0	0.0	0.7	X	87 b	X	24	X	15	X	61
Haiti	2211	2.9	1.1	360	1.5	0.3	11.6	X	X	X	X	X	X	X	X
Jamaica	2257	3.0	-1.2	940	0.6	0.3	11.8	2890 a	2856 a	8	8	40	36	51	55
St. Kitts and Nevis	97	X	X	2220	0.0	0.0	0.5	X	X	X	X	X	X	X	X
St. Lucia	200	X	X	1410	0.0	0.0	1.0	X	159 b	15	15	20	20	65	64
Trinidad and Tobago	4851	3.5	-0.3	3970	0.3	0.7	25.3	5102 b	4643 b	3	2	63	56	34	42
CENTRAL AMERICA	173536				26.3	24.3	100.0								
Belize	241	X	X	1370	0.0	0.0	0.1	146 b	218 b	31	27	21	23	48	51
Costa Rica	4329	5.3	0.9	1660	0.7	0.6	2.5	4303 a	5421 a	19	19	26	26	55	55
El Salvador	4264	4.8	-2.3	860	1.2	0.6	2.5	3713 a	3350 a	24	36	22	21	54	53
Guatemala	8016	6.2	0.1	950	2.1	1.1	4.6	X	X	X	X	X	X	X	X
Honduras	3797	4.5	1.9	810	1.1	0.5	2.2	2180 b	2907 b	26	25	24	24	50	51
Mexico	144893	6.9	2.5	1770	19.8	20.3	83.5	151997 a	209782 a	9	9	31	31	59	60
Nicaragua	2909	4.6	-2.3	830	0.9	0.4	1.7	2921 a	2100 a	22	22	32	33	45	46
Panama	5087	5.2	4.0	2240	0.5	0.7	2.9	2684 a	4337 a	12	9	21	17	67	74
SOUTH AMERICA	519998				66.2	73.0	100.0								
Argentina	75003	3.6	-0.9	2410	7.2	10.5	14.4	53779 b	54516 b	9	10	40	34	51	56
Bolivia	3297	4.9	-2.0	490	1.6	0.5	0.6	3001 a	2736 a	18	23	39	28	44	49
Brazil	280037	10.0	3.2	1980	33.6	39.3	53.9	199515 b	282811 b	12	12	38	39	50	49
Chile	17058	0.2	1.5	1360	2.9	2.4	3.3	21787 a	30165 a	9	8	37	38	54	53
Colombia	36543	6.0	2.9	1240	7.1	5.1	7.0	28063 a	41823 a	20	18	32	34	48	47
Ecuador	10393	9.4	1.7	1050	2.4	1.5	2.0	X	X	X	X	X	X	X	X
Guyana	311	4.4	-4.8	390	0.2	0.0	0.1	603 b	499 b	22	27	37	28	41	45
Paraguay	3728	6.6	4.0	950	1.0	0.5	0.7	3246 a	5205 a	33	30	22	25	45	45
Peru	26915	4.4	1.8	1330	5.0	3.8	5.2	18651 a	24010 a	12	11	40	40	49	48
Suriname	952	10.1	-3.2	2270	0.1	0.1	0.2	964 b	704 b	8	12	44	34	48	55
Uruguay	6742	2.6	-0.5	2260	0.7	0.9	1.3	6458 b	9881 b	12	12	32	29	56	59
Venezuela	59019	4.8	-0.9	3230	4.4	8.3	11.3	70391 a	73066 a	4	6	45	47	50	48

Source: IBRD's BESD database.

Notes: GNP in current dollars, GDP in constant 1980 dollars.

a. GDP calculated with value added at producer prices.

b. GDP calculated with value added at basic prices.

X = not available.

TABLE
2

WORLD TRADE

Year (a)	Trade (millio. \$US)										
	Food, Live Animals, etc.		Raw Materials		Fuels		Manufactures		Services (1987)		
	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports	
LAC BUREAU											
CARIBBEAN											
Antigua and Barbuda	X	X	X	X	X	X	X	X	X	X	X
Bahamas	X	X	X	X	X	X	X	X	X	X	X
Barbados	1986	87.1	43.0	25.1	1.3	60.7	45.0	420.3	188.1	X	X
Cuba	1986	853.6	5415.2	539.2	407.7	3075.3	315.5	4694.5	159.0	X	X
Dominica	X	X	X	X	X	X	X	X	X	X	X
Dominican Rep	1985	83.4	334.5	101.8	0.0	439.7	0.0	623.0	137.2	X	X
Grenada	X	X	X	X	X	X	X	X	X	X	X
Haiti	1984	95.8	63.9	46.8	2.7	60.8	0.0	268.7	100.6	222.4	116.0
Jamaica	1984	197.3	141.7	73.5	489.8	352.0	18.3	521.4	92.7	849.7	932.3
St. Kitts and Nevis	X	X	X	X	X	X	X	X	X	X	X
St. Lucia	X	X	X	X	X	X	X	X	X	X	X
Trinidad and Tobago	1987	239.5	65.8	91.3	10.3	52.4	1041.4	835.5	344.9	X	X
CENTRAL AMERICA											
Belize	X	X	X	X	X	X	X	X	X	X	X
Costa Rica	1984	96.9	682.9	56.4	25.5	166.7	18.1	766.3	223.7	541.4	389.8
El Salvador	1984	135.8	415.7	72.7	29.5	497.1	16.6	608.4	152.9	372.0	355.0
Guatemala	1984	81.3	619.1	67.1	191.4	485.7	26.2	837.7	256.9	467.9	189.0
Honduras	1985	73.5	579.7	20.9	86.7	226.3	5.9	552.9	27.1	429.2	131.0
Mexico	1985	1365.2	1940.8	1985.0	1176.5	705.5	14639.8	12096.2	6607.0	14320.0	9104.0
Nicaragua	1984	84.2	208.9	39.2	145.6	146.0	0.1	555.7	31.9	X	X
Panama	1985	148.2	228.9	37.5	11.6	293.0	21.8	904.7	38.8	2612.9	3401.6
SOUTH AMERICA											
Argentina	1987	260.3	3012.9	552.3	1249.0	664.3	85.4	4340.9	2012.8	7076.0	2243.0
Bolivia	1984/85	66.7	25.2	17.4	270.3	2.0	374.5	330.2	2.5	577.0	145.5
Brazil	1987/85	1195.1	7812.9	1390.1	4692.7	5725.4	1624.5	8598.0	11464.0	14996.0	2467.0
Chile	1986	122.8	1165.3	180.3	2604.6	440.5	2.5	2220.5	385.2	3421.0	1264.0
Colombia	1986	259.3	3433.5	368.7	216.8	153.2	665.0	3070.9	792.7	3976.0	1404.0
Ecuador	1984	142.3	735.2	167.0	24.1	27.2	1797.4	1379.2	20.9	1421.0	362.0
Guyana	1979	43.8	137.3	12.1	135.4	63.1	0.0	171.1	17.1	X	X
Paraguay	1986	52.1	59.7	11.3	151.8	124.0	0.0	390.6	21.1	531.7	250.8
Peru	1986/84	511.7	400.9	169.2	1098.7	68.1	651.6	1616.8	373.3	X	1029.0
Suriname	X	X	X	X	X	X	X	X	X	73.8	81.7
Uruguay	1987	86.8	373.4	86.0	290.6	178.7	2.1	790.4	525.0	709.2	467.6
Venezuela	1985/83	730.4	86.2	833.3	330.8	176.2	13838.8	5678.3	187.5	4833.0	2123.0

Source: WRI, WRR 1990-91, Table 15.3.

Note: a. When two years are given for trade statistics, the first refers to imports, the second to exports.

X = not available.

65

TABLE
3

EXTERNAL DEBT INDICATORS

	Total External Debt (million \$US)			Disbursed Long- Term Public Debt (million \$US)			Long-Term Public Debt as a Percentage of GNP			Debt Service as a Percentage of Exports of Good and Services			Debt Service as a Percentage of Current Borrowing		
	1977	1982	1987	1977	1982	1987	1977	1982	1987	1977	1982	1987	1977	1982	1987
	LAC BUREAU														
CARIBBEAN															
Antigua and Barbuda	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Bahamas	88	303	233	88	230	175	14	16	7	5	4	3	113	51	1181
Barbados	58	336	621	50	226	501	10	23	37	3	4	X	34	38	235
Cuba	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Dominica	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Dominican Rep	818	2266	3563	610	1666	2938	15	23	63	7	22	11	46	62	113
Grenada	472	1969	2709	217	1144	2345	4	13	34	1	8	25	28	31	234
Haiti	157	536	804	138	416	674	14	28	30	11	5	7	29	23	24
Jamaica	1179	2793	4389	969	2112	3511	31	67	139	16	18	27	133	46	140
St. Kitts and Nevis	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
St. Lucia	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Trinidad and Tobago	339	1203	1801	247	907	1635	8	11	39	1	4	23	8	71	298
CENTRAL AMERICA															
Belize	21	69	139	14	62	113	12	38	51	X	X	X	9	38	93
Costa Rica	991	3249	4437	733	2378	3629	24	109	89	9	12	12	37	79	211
El Salvador	482	1286	1692	266	972	1597	9	28	35	6	8	20	121	25	150
Guatemala	472	1369	2709	217	1144	2345	4	13	34	1	8	25	28	31	234
Honduras	612	1686	3188	458	1431	2681	29	53	71	7	19	23	31	64	124
Mexico	26665	79111	93734	20703	51642	82771	25	32	59	43	34	30	53	79	108
Nicaragua	1274	721	7291	845	2488	6150	0	0	0	13	36	X	41	55	7
Panama	1684	3923	5323	1333	2917	3722	66	74	73	12	7	6	49	80	276
SOUTH AMERICA															
Argentina	8178	32407	53955	5036	15886	47451	10	31	62	15	24	46	88	49	134
Bolivia	1713	3184	5348	1428	2861	4599	46	49	115	23	31	22	35	127	65
Brazil	28392	68799	109497	22401	50798	91653	13	20	29	21	43	27	51	96	493
Chile	4904	8588	18773	3675	5243	15536	28	23	89	34	20	21	132	79	235
Colombia	4664	9114	15482	2700	5990	13828	14	16	41	9	18	34	84	71	195
Ecuador	1967	6233	10407	1111	4042	9026	17	32	93	7	42	20	20	410	76
Guyana	481	922	1285	416	678	874	100	158	353	12	18	X	54	65	122
Paraguay	390	1166	2419	336	940	2218	16	16	49	6	10	21	24	28	104
Peru	7054	10621	16625	4711	6956	12485	37	28	29	30	36	12	50	72	91
Suriname	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Uruguay	1022	2441	4091	736	1700	3048	18	19	42	30	13	24	108	52	171
Venezuela	9852	27045	29015	4426	12342	25245	10	16	52	8	16	23	41	166	910

Source: WRI, WRR 1990-91, Table 15.2.

Note: X = not available.

TABLE
4

POPULATION

	Percent of LAC Region 1990	Percent of Sub- Region 1990	Total Population (millions)			Average Annual Population Change (percent)			Average Annual Increment to the Population (000)		
			1960	1990	2025	1965-70	1975-80	1985-90	1965-70	1975-80	1985-90
			LAC BUREAU	100.00		217.6	448.1	753.5			
CARIBBEAN	7.51	100.00	20.4	33.6	42.0						
Antigua and Barbuda	0.02	0.26	0.1	0.1	0.1	2.1	1.3	X	X	X	X
Bahamas	0.06	0.77	0.1	0.3	0.4	4.1	1.8	X	X	X	X
Barbados	0.06	0.78	0.2	0.3	0.3	0.3	0.3	0.6	1	1	2
Cuba	2.30	30.69	7.0	10.3	12.0	1.9	0.8	0.8	153	80	76
Dominica	0.02	0.24	0.1	0.1	0.1	1.9	0.3	1.3	X	X	X
Dominican Rep	1.60	21.31	3.2	7.2	11.4	3.0	2.4	2.2	123	130	151
Grenada	0.02	0.31	0.1	0.1	0.2	0.1	0.2	1.3	X	X	X
Haiti	1.45	19.33	3.7	6.5	11.5	2.1	1.8	1.9	90	91	117
Jamaica	0.56	7.49	1.6	2.5	3.8	1.2	1.2	1.5	22	26	37
St. Kitts and Nevis	0.01	0.15	0.1	0.1	0.1	-1.2	-0.3	1.4	X	X	X
St. Lucia	0.03	0.40	0.1	0.1	0.2	1.4	1.2	1.3	X	X	X
Trinidad and Tobago	0.29	3.81	0.8	1.3	1.9	1.3	1.6	1.6	12	17	20
CENTRAL AMERICA	26.26	100.00	50.5	117.7	213.2	X	X	X	X	X	X
Belize	0.04	0.15	0.1	0.2	0.3	2.2	2.0	2.2	X	X	X
Costa Rica	0.67	2.56	1.2	3.0	5.3	3.1	3.0	2.6	50	63	75
El Salvador	1.17	4.46	2.6	5.3	11.3	3.5	2.1	1.9	117	88	97
Guatemala	2.05	7.82	4.0	9.2	21.7	2.8	2.8	2.9	136	179	247
Honduras	1.15	4.37	1.9	5.1	11.5	2.7	3.5	3.2	67	116	151
Mexico	19.77	75.29	38.0	88.6	150.1	3.3	2.6	2.2	1604	1699	1844
Nicaragua	0.86	3.29	1.5	3.9	9.2	3.2	2.8	3.4	60	73	120
Panama	0.54	2.05	1.1	2.4	3.9	2.9	2.3	2.1	41	42	47
SOUTH AMERICA	66.23	100.00	146.8	296.8	498.3						
Argentina	7.21	10.89	20.6	52.3	45.5	1.5	1.6	1.3	336	437	398
Bolivia	1.63	2.46	3.4	7.3	18.3	2.4	2.6	2.8	97	135	189
Brazil	33.56	50.67	72.6	150.4	245.8	2.6	2.3	2.1	2311	2651	2961
Chile	2.94	4.44	7.6	13.2	19.8	2.1	1.5	1.7	185	159	210
Colombia	7.10	10.72	15.5	31.8	51.7	2.8	2.1	2.1	538	523	621
Ecuador	2.41	3.63	4.4	10.8	22.9	3.2	2.9	2.8	178	218	281
Guyana	0.23	0.35	0.6	1.0	1.6	1.9	2.1	1.7	13	17	17
Paraguay	0.95	1.44	1.8	4.3	9.2	2.7	3.2	2.9	60	93	117
Peru	4.98	7.52	9.9	22.3	41.0	2.8	2.6	2.5	345	427	527
Suriname	0.09	0.14	0.3	0.4	0.6	2.3	-0.5	1.5	8	-1	6
Uruguay	0.70	1.05	2.5	3.1	3.9	0.8	0.6	0.8	23	16	23
Venezuela	4.40	6.65	7.5	19.7	38.0	3.4	3.4	2.6	327	472	484

Sources: WRI, WRR 1990-91, Table 16.1 and UN World Population Prospects, 1988, Table 2.

Note: X = not available.

TABLE
5

POPULATION

LABOR FORCE

	POPULATION						LABOR FORCE									
	Crude Birth Rate (births per thousand population)		Crude Death Rate (deaths per thousand population)		Total Fertility Rate		Total Labor Force (000)	Average Annual Growth of Labor Force (percent)				Percentage of Labor Force in				
	1965-70	1985-90	1965-70	1985-90	1965-70	1985-90		1985	1960-80	1970-80	1980-90	1960	1980	1960	1980	1960
LAC BUREAU																
CARIBBEAN																
Antigua and Barbuda	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Bahamas	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Barbados	23.8	18.5	9	8	3.5	2.0	127	-0.1	2.7	1.5	26	10	27	21	47	69
Cuba	32.0	16.0	7	7	4.3	1.7	3987	1.0	3.1	2.3	39	24	22	29	39	48
Dominica	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Dominican Rep	44.9	31.3	13	7	6.7	3.8	1862	2.2	3.1	3.4	67	46	12	15	21	39
Grenada	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Haiti	42.5	34.3	19	13	6.2	4.7	2822	1.3	0.9	2.0	80	70	6	8	14	22
Jamaica	37.3	26.0	8	6	5.4	2.9	1095	0.7	2.9	2.8	39	31	25	16	36	52
St. Kitts and Nevis	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
St. Lucia	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Trinidad and Tobago	30.3	24.0	8	6	3.9	2.7	450	1.2	2.3	2.4	22	10	34	39	44	51
CENTRAL AMERICA																
Belize	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Costa Rica	38.3	28.3	7	4	5.8	3.3	904	3.4	3.9	2.8	51	31	19	23	30	46
El Salvador	45.5	36.3	13	9	6.6	4.9	1832	3.5	3.0	3.1	62	43	17	19	21	37
Guatemala	45.6	40.8	16	9	6.6	5.8	2261	2.5	2.2	2.9	67	57	14	17	19	26
Honduras	50.1	39.8	16	8	7.4	5.6	1303	2.5	3.2	3.9	70	61	11	16	19	23
Mexico	44.5	29.0	10	6	6.7	3.6	26080	2.7	4.4	3.2	55	37	20	29	25	35
Nicaragua	48.4	41.8	15	8	7.1	5.5	993	2.8	2.9	3.8	62	47	16	16	22	38
Panama	39.3	26.7	8	5	5.6	3.1	760	3.0	2.5	2.9	51	32	14	18	35	50
SOUTH AMERICA																
Argentina	22.6	21.4	9	9	3.1	3.0	10884	1.4	1.0	1.1	20	13	36	34	44	53
Bolivia	45.6	42.8	20	14	6.6	6.1	1987	1.8	2.1	2.8	61	46	18	20	21	34
Brazil	36.4	28.6	11	8	5.3	3.5	49642	3.1	3.4	2.2	52	31	15	27	33	42
Chile	31.6	23.8	10	6	4.4	2.7	4276	1.7	2.5	2.4	30	17	20	25	50	58
Colombia	39.6	29.2	10	7	6.0	3.6	9195	2.7	2.5	2.7	51	34	19	24	30	42
Ecuador	44.5	35.4	13	8	6.7	4.7	2839	2.6	2.7	3.0	57	39	19	20	24	42
Guyana	35.4	24.8	8	5	5.3	2.8	337	2.1	3.8	2.8	38	27	27	26	35	47
Paraguay	39.5	34.8	10	7	6.4	4.6	1223	2.4	3.5	3.0	56	49	19	21	25	31
Peru	43.6	34.3	16	9	6.6	4.5	6204	2.0	3.4	2.9	53	40	20	18	27	42
Suriname	40.0	25.9	9	6	5.9	3.0	117	2.1	0.5	2.6	30	20	22	20	48	60
Uruguay	20.5	18.9	10	10	2.8	2.6	1171	0.8	0.2	0.7	21	16	30	29	49	55
Venezuela	40.6	30.7	8	5	5.9	3.8	5871	2.8	4.9	3.3	35	16	22	28	43	56

Source: WRI, WRR 1990, Tables 16.1, 16.2, 16.3 and 17.2.

Notes: X = not available.

Numbers may not add to 100 percent due to rounding.

TABLE
6

URBAN AND RURAL POPULATIONS

	Population Density 1990 (persons per 1,000 ha)	Average Annual Population Change 1960-90 (percent)		Percentage of Population in Urban Areas by Size of Area (000 ha) (a)							Year of Data (b)	Urban Population as a Percentage of Total		
		Urban	Rural	50-	100-	250-	500	1,000	2,000+	1960		1975	1990	
				100	250	500	1,000	2,000	2,000+					
LAC BUREAU														
CARIBBEAN														
Antigua and Barbuda	1955	X	X	X	X	X	X	X	X	X	X	X	X	X
Bahamas	260	X	X	X	X	X	X	X	X	X	X	X	X	X
Barbados	6070	1.2	-0.1	34.8	0.0	0.0	0.0	0.0	0.0	80	35.4	38.6	44.7	
Cuba	931	2.3	-0.7	5.3	9.9	6.3	0.0	0.0	20.3	86	54.9	64.2	74.9	
Dominica	1080	X	X	X	X	X	X	X	X	X	X	X	X	
Dominican Rep	1482	5.1	0.8	6.1	3.9	0.0	13.1	0.0	0.0	70	30.2	45.3	60.4	
Grenada	3029	X	X	X	X	X	X	X	X	X	X	X	X	
Haiti	2360	4.2	1.3	X	0.0	0.0	11.2	0.0	0.0	84	15.6	22.1	30.3	
Jamaica	2328	3.0	0.4	0.0	0.0	0.0	22.4	0.0	0.0	82	33.8	44.1	52.3	
St. Kitts and Nevis	1389	X	X	X	X	X	X	X	X	X	X	X	X	
St. Lucia	2230	X	X	X	X	X	X	X	X	X	X	X	X	
Trinidad and Tobago	2501	5.3	-1.7	34.1	0.0	0.0	0.0	0.0	0.0	82	22.5	48.4	69.1	
CENTRAL AMERICA														
Belize	80	X	X	X	X	X	X	X	X	X	X	X	X	
Costa Rica	590	4.3	2.0	0.0	0.0	15.2	0.0	0.0	0.0	70	36.6	42.2	53.6	
El Salvador	2535	2.9	2.1	6.3	0.0	6.1	0.0	0.0	0.0	71	38.3	40.4	44.4	
Guatemala	848	3.7	2.4	X	0.0	0.0	9.5	0.0	0.0	81	33.0	37.1	42.0	
Honduras	459	5.6	2.2	4.9	2.4	9.1	13.7	0.0	0.0	85	22.7	32.3	43.6	
Mexico	464	4.1	0.9	3.0	6.3	8.7	5.3	1.7	24.4	80	50.8	62.8	72.6	
Nicaragua	326	4.7	1.8	3.0	0.0	0.0	18.6	0.0	0.0	79	39.6	50.3	59.8	
Panama	318	3.5	1.6	X	10.2	19.9	0.0	0.0	0.0	86	41.2	49.1	54.8	
SOUTH AMERICA														
Argentina	118	2.0	-0.7	6.1	4.8	5.4	6.1	6.8	35.1	80	73.6	80.6	86.2	
Bolivia	67	3.5	1.8	2.2	4.6	11.9	15.6	0.0	0.0	85	39.3	41.5	51.4	
Brazil	178	4.3	-0.5	3.5	0.0	0.0	0.0	0.0	0.0	85	44.9	61.8	76.9	
Chile	176	2.6	-0.9	9.4	15.5	6.8	34.1	0.0	0.0	85	67.8	78.3	85.6	
Colombia	306	3.7	0.5	2.7	10.8	4.5	5.0	9.8	14.5	85	48.2	60.8	70.3	
Ecuador	389	4.8	1.6	X	7.5	0.0	9.8	13.6	0.0	86	34.4	42.4	56.9	
Guyana	53	2.6	1.8	X	19.6	0.0	0.0	0.0	0.0	76	29.0	29.6	34.6	
Paraguay	108	4.0	2.3	3.1	0.0	0.0	19.5	0.0	0.0	82	35.6	39.0	47.5	
Peru	174	4.2	0.7	7.3	5.7	6.6	5.4	0.0	25.4	85	46.3	61.4	70.2	
Surinam	25	1.1	1.1	X	48.6	0.0	0.0	0.0	0.0	64	47.3	44.8	47.5	
Uruguay	179	0.9	-0.4	6.3	0.0	0.0	0.0	41.4	0.0	85	80.1	83.0	85.5	
Venezuela	224	4.3	-1.0	6.7	5.0	9.0	9.1	14.0	18.8	87	66.6	77.8	90.5	

Sources: WRI, WRR 1990-91, Table 17.1 and 17.2; UN World Population Prospects 1988, Table 5; FAO, unpublished data, July 1990.

Notes: X = not available.

a. Urban population totals do not agree because definitions vary; moreover, data are of varying ages and from different sources.

b. Year shown is that of most recent city-size data; 1985 total country population figures were used to calculate percentage.

TABLE 7	VITAL STATISTICS						NUTRITION	
	Life Expectancy at Birth (years)		Infant Mortality (infant deaths per 1,000 live births)		Child Mortality (deaths of children <5 years old per 1,000 live births)		Maternal Mortality (deaths from pregnancy per 100,000 live births)	Daily Caloric Intake as Percentage of Requirement
	1965-70	1985-90	1965-70	1985-90	1965-70	1985-90	1980-87	1983-85
LAC BUREAU								
CARIBBEAN								
Antigua and Barbuda	X	X	X	X	X	X	X	X
Bahamas	X	X	X	X	X	X	X	X
Barbados	67.6	73.5	33	11	55	14	X	129
Cuba	68.5	74.0	49	15	61	18	31	134
Dominica	X	X	X	X	X	X	X	X
Dominican Rep	57.0	64.6	105	65	158	82	56	109
Grenada	X	X	X	X	X	X	X	X
Haiti	46.2	54.7	172	117	257	170	340	82
Jamaica	66.3	73.8	45	18	62	23	100	115
St. Kitts and Nevis	X	X	X	X	X	X	X	X
St. Lucia	X	X	X	X	X	X	X	X
Trinidad and Tobago	65.7	70.2	41	20	50	23	81	123
CENTRAL AMERICA								
Belize	X	X	X	X	X	X	X	X
Costa Rica	65.6	73.7	66	18	88	22	26	124
El Salvador	55.9	67.1	112	59	161	84	74	X
Guatemala	50.1	62.0	108	59	193	99	110	105
Honduras	50.9	62.6	123	69	195	106	82	98
Mexico	60.3	67.2	79	47	113	68	92	135
Nicaragua	51.6	63.3	115	62	173	93	65	X
Panama	64.3	72.1	52	23	82	33	90	105
SOUTH AMERICA								
Argentina	66.0	70.6	56	32	68	38	85	121
Bolivia	45.1	53.1	157	110	259	171	480	88
Brazil	57.9	64.9	100	63	139	86	150	110
Chile	60.6	70.7	95	20	112	24	55	106
Colombia	58.4	64.8	74	46	119	68	130	111
Ecuador	56.8	65.4	107	63	156	87	720	89
Guyana	62.5	69.8	56	30	74	37	100	110
Paraguay	65.0	66.1	67	42	105	61	470	122
Peru	51.5	61.4	126	88	200	122	310	91
Suriname	63.5	69.6	55	31	72	37	X	118
Uruguay	68.6	71.0	48	27	54	30	56	102
Venezuela	63.7	69.7	60	36	84	43	65	103
Source 1: WRI, WRR 1990-91, Table 16.2 and 16.3.								
Note: X = not available.								

**TABLE
8**

LITERACY AND EDUCATION

	Adult Literacy Rate (percent)				Primary School Enrollment as % of Age Group (gross)				First Grade Enrollment Completing Primary School (%)	Secondary School Enrollment as % of Age Group 1986-88 (gross)		Number of Third Level Students per 100,000 in 1985		Current Educational Expenditure (1985) As % of Current Government Expenditure	
	Female		Male		Female		Male		1985-87	Female Male		Female Male		%	%
	1970	1985	1970	1985	1960	1986-88	1960	1986-88		1986-88	1986-88	1986-88	1986-88		
LAC BUREAU															
CARIBBEAN															
Antigua and Barbuda	X	X	X	X	X	X	X	X	X	X	X	X	X	2.6 a	X
Bahamas	X	X	X	X	X	X	X	X	X	X	X	X	X	4.4 b	21.0 b
Barbados	X	X	X	X	X	X	X	X	X	X	X	1931	2213	5.4 a	X
Cuba	87	96 c	86	96 c	109	100	109	107	92	92	85	2603	2135	6.2 d	18.7 d
Dominica	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Dominican Rep.	65	77	69	78	98	103	99	99	35	X	X	1929 c	1929 c	1.9 a	20.1 a
Grenada	X	X	X	X	X	X	X	X	X	X	X	X	X	4.6	X
Haiti	17 f	35	26 f	40	42	72	50	83	15	17	19	74	150	1.2	16.7
Jamaica	97	X	96	X	93	106	92	104	X	67	62	407	533	5.3	15.8
St. Kitts and Nevis	X	X	X	X	X	X	X	X	X	X	X	X	X	6.5	19.1
St. Lucia	X	X	X	X	X	X	X	X	X	X	X	X	X	7.1 d	X
Trinidad and Tobago	89	95	95	97	87	100	89	99	84	85	80	404	525	5.0	X
CENTRAL AMERICA															
Belize	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Costa Rica	87	93	88	94	95	97	97	100	81	43	40	2414 c	2414 c	4.3	26.2
El Salvador	53	69	61	75	X	81	X	77	31	30	27	1277	1686	2.6 a	X
Guatemala	37	47	51	63	39	70	50	82	36	X	X	741 c	741 c	1.7 a	23.1 a
Honduras	50	58	55	61	67	108	68	104	43	X	X	636	1031	4.3	X
Mexico	69	88	78	92	77	116	82	119	71	53	54	1144	1899	2.3	X
Nicaragua	57	X	58	X	66	104	65	94	20	58	29	1000	773	5.9	12.2
Panama	81	88	81	89	94	104	98	109	82	63	56	2980	2109	5.1	19.9
SOUTH AMERICA															
Argentina	97	95	94	96	99	110	98	110	X	78	69	2909	2669	1.8	8.9
Bolivia	46	65	68	84	50	85	78	97	X	35	40	1492 c	1492 c	0.4 a	X
Brazil	63	76	69	79	93	X	97	X	22	41	32	1121 g	1202 g	X	X
Chile	88	96 a	90	97 a	107	101	111	103	33	76	72	1394	1869	4.4	X
Colombia	76	82	79	82	77	115	77	112	57	56	55	1328	1399	2.9 a	33.2 a
Ecuador	68	80	75	85	79	116	87	118	50	57	55	2231 h	3387 h	3.5	25.8
Guyana	89	95	94	97	106	X	107	X	84	X	X	254	254	8.7	13.0
Paraguay	75 i	85	85 i	91	90	99	105	104	50	30	30	958 c	958 c	1.2	18.8
Peru	60	78	81	91	71	120	95	125	51	61	68	1258 g	2276 g	2.6	17.9
Suriname	X	X	X	X	X	X	X	X	X	X	X	779	688	X	X
Uruguay	93 j	X	93 j	X	111	109	111	111	86	X	X	1426 g	1253 g	2.5	9.3
Venezuela	71	85	79	88	100	107	100	107	73	59	48	2129	2979	5.0 a	29.3 a

Sources: WRI, WRR 1990-91, Table 16.5.
UNICEF, The State of the World's Children 1990, Table 4.
UNESCO, Statistical Yearbook 1989, Tables 3.10 and 4.1.

Notes: a. 1984 data; b. 1983 data; c. 1981 age 10 years or older; d. 1986 data; e. female/male average; f. 1971 data; g. 1980 data; h. 1987 data; i. 1972 data; j. 1975 data.

TABLE
9

LAND USE

	Total Land Area 1985 (000 ha)	% of Region	% of Sub-Region	Land Use (000 hectares)								Major changes in distribution (3+ percentage points change) 1975-77 to 1985-87				
				Cropland		Permanent Meadows and Pastures		Forest and Woodland		Other Land		Cropland	Pastures	Forest	Other	
				75-77	85-87	75-77	85-87	75-77	85-87	75-77	85-87					
LAC BUREAU	2007707	100		159887	178764	545328	564980	1016316	964367	284666	298015	12	4	-5	5	
CARIBBEAN	21977	1.09	100.00	5781	6182	5542	5570	3937	4204	6207	5443	7		7	-12	
Antigua and Barbuda	44	0.00	0.20	8	8	3	4	6	5	27	27			33	-17	
Bahamas	1388	0.07	6.32	9	10	2	2	324	324	666	665	11				
Barbados	43	0.00	0.20	33	33	4	4	0	0	6	6					
Cuba	11086	0.55	50.44	3120	3305	2672	2752	2420	2739	2770	2114	6	3	13	-20	
Dominica	75	0.00	0.34	17	17	2	2	31	31	25	25					
Dominican Rep	4838	0.24	22.01	1302	1473	2092	2092	643	623	801	650	13			-3	-19
Grenada	34	0.00	0.15	16	14	1	1	4	3	13	16	-11	-25	-25		
Haiti	2775	0.14	12.63	867	903	537	503	62	52	1291	1303	4		-8	-16	
Jamaica	1083	0.05	4.93	263	269	213	195	199	189	407	430			-9	-5	6
St. Kitts and Nevis	36	0.00	0.16	14	14	1	1	6	6	15	15					
St. Lucia	62	0.00	0.28	17	17	3	3	8	8	33	33					
Trinidad and Tobago	513	0.03	2.33	115	119	11	11	234	224	153	159	3		-4	4	
CENTRAL AMERICA	241849	12.05	100.00	30337	31486	86305	87840	72409	62838	52786	59668	4		-13	13	
Belize	2296	0.11	0.95	49	54	39	48	1012	1012	1180	1166	12	22			
Costa Rica	5106	0.25	2.11	495	525	1710	2293	2127	1640	775	648	6	34	-23	-16	
El Salvador	2072	0.10	0.86	673	733	610	610	164	106	629	623	9		-35		
Guatemala	10843	0.54	4.48	1677	1848	1260	1360	4870	4070	3036	3565	10	8	-16	17	
Honduras	11189	0.56	4.63	1683	1783	2327	2520	4350	3580	2789	3306	6	8	-18	19	
Mexico	190569	9.51	78.92	23983	24703	74499	74499	50620	44620	41767	47047	3		-12	13	
Nicaragua	11875	0.59	4.91	1230	1268	4650	5200	4937	3820	1058	1587	3	12	-23	50	
Panama	7599	0.38	3.14	547	572	1210	1310	4290	3990	1552	1727	5	8	-7	11	
SOUTH AMERICA	1743881	86.86	100.00	123769	141095	453482	471570	939970	897325	225673	232904	14	4	-5	3	
Argentina	273669	13.63	15.69	34850	35950	143600	142600	60267	59607	34952	35519	3				
Bolivia	108439	5.40	6.22	3298	3398	27133	26800	56556	55830	21451	22411	3			4	
Brazil	845651	42.12	48.49	62532	76717	157000	167000	584720	560420	41399	41514	23	6	-4		
Chile	74880	3.73	4.29	5340	5553	11700	11900	8680	8680	49160	48747	4				
Colombia	103870	5.17	5.96	5134	5299	37080	39804	54500	51507	7156	7260	3	7	-5		
Ecuador	27684	1.38	1.59	2558	2594	3033	4900	15050	12098	7042	8092			62	-20	15
Guyana	19685	0.98	1.13	408	495	1051	1230	17733	16369	492	1591	21	17	-8	223	
Paraguay	39730	1.98	2.28	1271	2176	15200	19152	20800	16564	2459	1839	71	26	-20	-25	
Peru	128000	6.38	7.34	3289	3710	27120	27120	71900	69400	25691	27770	13		-3	8	
Suriname	16327	0.81	0.94	43	65	16	20	14910	14860	631	656	49	23		4	
Uruguay	17741	0.88	1.02	1445	1324	13630	13544	619	663	1786	1950	-4		7	9	
Venezuela	88205	4.39	5.05	3600	3815	16917	17500	34235	31335	33453	35555	6	3	-8	6	

Source: WRI, WRR 1990-91, Table 17.1 and FAO, unpublished data, July 1990.

Note: X = not available.

**TABLE
10**

AGRICULTURE

	Index of Agricultural Production (1979-81 = 100)				Index of Food Production (1979-81 = 100)				Yields, Cereals		Yields, Roots and Tubers	
	Total		Per Capita		Total		Per Capita		Kilograms per Hectare	Percentage Change Over	Kilograms per Hectare	Percentage Change Over
	1976-78	1986-88	1976-73	1986-88	1976-78	1986-88	1976-78	1986-88	1986-88	1976-78	1986-88	1976-78
LAC BUREAU												
CARIBBEAN												
Antigua and Barbuda	X	X	X	X	X	X	X	X	X	X	X	X
Bahamas	X	X	X	X	X	X	X	X	X	X	X	X
Barbados	89	80	90	78	89	80	90	78	2500	-4	8260	-20
Cuba	90	109	92	106	89	109	91	105	2559	8	6485	7
Dominica	X	X	X	X	X	X	X	X	X	X	X	X
Dominican Rep	98	107	106	90	99	109	106	92	3519	33	5920	-1
Grenada	X	X	X	X	X	X	X	X	X	X	X	X
Haiti	94	105	99	93	95	108	101	95	1144	16	4110	-7
Jamaica	101	113	105	102	101	113	105	102	1447	-24	12426	25
St. Kitts and Nevis	X	X	X	X	X	X	X	X	X	X	X	X
St. Lucia	X	X	X	X	X	X	X	X	X	X	X	X
Trinidad and Tobago	140	75	148	67	141	76	149	68	2501	-16	9386	-22
CENTRAL AMERICA												
Belize	X	X	X	X	X	X	X	X	X	X	X	X
Costa Rica	94	112	103	92	97	108	106	89	2284	13	7103	-11
El Salvador	89	84	94	77	96	100	101	91	1708	11	14162	39
Guatemala	95	106	103	86	94	118	102	97	1665	20	5488	43
Honduras	85	110	94	86	88	106	98	85	1476	54	7456	121
Mexico	90	111	97	94	89	112	96	95	2280	26	14009	11
Nicaragua	115	82	124	64	111	87	120	68	1839	61	12091	161
Panama	92	117	98	101	93	115	99	99	1643	30	9030	10
SOUTH AMERICA												
Argentina	96	107	101	97	95	107	100	97	2457	13	17358	36
Bolivia	96	114	104	94	95	114	103	95	1322	19	5459	-12
Brazil	88	123	95	106	91	126	98	108	1801	32	12190	5
Chile	89	117	94	104	89	118	94	104	3370	90	14383	44
Colombia	91	113	97	97	91	116	97	99	2554	11	11302	9
Ecuador	95	119	103	97	94	118	103	96	1458	7	6430	-35
Guyana	99	85	105	74	99	85	105	74	2644	14	7023	3
Paraguay	87	133	96	106	87	134	96	108	1671	20	15575	10
Peru	102	116	110	97	105	119	114	99	2446	30	8138	15
Suriname	80	108	79	100	80	108	79	100	3922	1	6427	7
Uruguay	96	110	98	105	97	108	99	102	2105	70	5773	18
Venezuela	92	114	101	94	91	113	100	93	1999	13	8220	9

Source: WRI, WRR 1990-91, Table 18.1.

Note: X = not available.

**TABLE
11**

AGRICULTURAL INPUTS

	Cropland		Irrigated Land as a Percentage of Arable and Permanent Cropland		Average Annual Fertilizer Use (kilograms per ha cropland)		Average Annual Pesticide Use (metric tons of active ingredient)		Tractors	
	Total (000 hectares)	Hectares per Capita	1975-77	1985-87	1975-77	1985-87	1975-77	1982-84	Annual Average Number	Percentage Change Since 1975-77
	1987	1989							1985-87	1975-77
LAC BUREAU										
CARIBBEAN										
Antigua and Barbuda	X	X	X	X	X	X	X	X	X	X
Bahamas	X	X	X	X	X	X	X	X	X	X
Barbados	33	0.13	X	X	127	103	X	X	592	14
Cuba	3320	0.32	21	26	118	192	7817	9567	62462	11
Dominica	X	X	X	X	X	X	X	X	X	X
Dominican R.	1475	0.21	11	14	51	47	1961	3297	2270	10
Grenada	X	X	X	X	X	X	X	X	X	X
Haiti	905	0.14	8	8	3 ^a	3	156 ^b	X	572	27
Jamaica	269	0.11	12	13	60	66	861	1420	2997	16
St. Kitts and Nevis	X	X	X	X	X	X	X	X	X	X
St. Lucia	X	X	X	X	X	X	X	X	X	X
Trinidad and Tobago	120	0.10	17	19	60	52	X	X	2603	21
CENTRAL AMERICA										
Belize	X	X	X	X	X	X	X	X	X	X
Costa Rica	526	0.18	8	21	127	166	3027	3667	6250	10
El Salvador	733	0.14	6	15	149	111	1310	2838 ^c	3397	14
Guatemala	1865	0.21	4	4	50	62	4627	5117	4120	10
Honduras	1785	0.36	5	5	14	19	940	859	3370	16
Mexico	24705	0.28	20	21	45	73	19148	27630	160000	60
Nicaragua	1268	0.34	6	7	31	49	2943	2003	2453	84
Panama	575	0.24	4	5	43	58	1542	2393	6150	46
SOUTH AMERICA										
Argentina	35750	1.12	4	5	2	4	7448	14313	206000	14
Bolivia	3399	0.48	4	5	1	2	612	833	790	13
Brazil	77500	0.53	2	3	41	49	55292	46698	775000	148
Chile	5580	0.43	23	23	20	46	1838	1800	37843	10
Colombia	5318	0.17	6	9	49	81	19344	16100	33813	36
Ecuador	2646	0.25	20	21	26	34	5445	3110	8000	52
Guyana	495	0.48	30	26	26	37	705	658	3560	5
Paraguay	2176	0.52	4	3	1	5	2957	3423	9900	175
Peru	3725	0.17	35	33	38	43	2370	2753	14933	19
Suriname	68	0.17	79	88	85	171	974 ^a	1720 ^c	1703	38
Uruguay	1444	0.47	4	7	43	41	1390	1517	32603	3
Venezuela	3865	0.20	8	9	44	143	6923	8143	44667	43

Source: WRI, WRR 1990-91, Table 18.2.

Notes: X = not available.

a. Two years of data.

b. Imports of pesticides.

c. One year of data.

**TABLE
12**

LAND DISTRIBUTION

	Agricultural Holdings: Distribution by Size of Holdings (percent)									Agricultural Area: Distribution by Size of Holdings (percent)								
	1960			1970			1980			1960			1970			1980		
	less than 5 ha	more than 5-50 ha	50 ha	less than 5 ha	more than 5-50 ha	50 ha	less than 5 ha	more than 5-50 ha	50 ha	less than 5 ha	more than 5-50 ha	50 ha	less than 5 ha	more than 5-50 ha	50 ha	less than 5 ha	more than 5-50 ha	50 ha
LAC BUREAU																		
CARIBBEAN																		
Antigua and Barbuda	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Bahamas	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Barbados	81	7	13	X	X	X	X	X	X	6	5	89	X	X	X	X	X	X
Cuba	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Dominica	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Dominican Rep	86	13	1	77	21	2	X	X	X	21	31	48	13	30	57	X	X	X
Grenada	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Haiti	X	X	X	96	4	0	X	X	X	X	X	X	78	23	0	X	X	X
Jamaica	90	10	1	94	6	0	94	5	1	23	23	54	29	19	52	28	17	55
St. Kitts and Nevis	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
St. Lucia	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Trinidad and Tobago	72	27	2	X	X	X	X	X	X	20	34	46	X	X	X	X	X	X
CENTRAL AMERICA																		
Belize	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Costa Rica	39	48	15	49	37	15	X	X	X	2	22	76	2	18	80	X	X	X
El Salvador	85	13	2	89	16	1	X	X	X	15	28	57	20	31	49	X	X	X
Guatemala	7	24	3	X	X	X	84	14	2	13	24	63	X	X	X	13	24	63
Honduras	X	X	X	64	32	4	X	X	X	X	X	X	9	35	56	X	X	X
Mexico	66	22	12	60	26	14	X	X	X	1	3	96	1	4	96	X	X	X
Nicaragua	40	43	16	X	X	X	X	X	X	2	18	79	X	X	X	X	X	X
Panama	46	47	6	56	37	8	66	27	7	5	37	58	4	33	64	4	30	66
SOUTH AMERICA																		
Argentina	15	39	47	X	X	X	X	X	X	0	2	98	X	X	X	X	X	X
Bolivia	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Brazil	31	51	19	37	47	16	37	45	18	1	13	86	1	14	85	1	12	87
Chile	38	44	18	X	X	X	X	X	X	1	5	94	X	X	X	X	X	X
Colombia	63	31	7	60	32	8	X	X	X	5	20	76	4	19	78	X	X	X
Ecuador	X	X	X	67	27	7	X	X	X	X	X	X	7	28	65	X	X	X
Guyana	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Paraguay	44	51	6	X	X	X	34	59	7	1	7	92	X	X	X	1	9	90
Peru	84	14	2	78	20	2	X	X	X	6	8	86	7	14	79	X	X	X
Suriname	81	19	0	81	19	0	X	X	X	24	27	49	28	28	45	X	X	X
Uruguay	15	50	36	14	48	38	12	46	42	0	5	95	0	4	96	0	4	96
Venezuela	50	40	10	44	43	14	X	X	X	1	7	92	1	7	93	X	X	X

Source: WRI, WRR 1988-89, Table 17.3.

Notes: Numbers may not add to 100 percent due to rounding; X = not available.

**TABLE
13**

FOREST SIZES AND TYPES

	Extent of Forest and Woodland 1980 (000 ha)			Average Annual Deforestation, 1980s						Average Annual Reforestation 1980s (000 ha)	Managed Closed Forest 1980 (000 ha)	Protected Closed Forest 1980 (000 ha)
				Closed Forest		Open Forest		Total				
	Closed	Open	Total	Extent	Percent	Extent	Percent	Extent	Percent	1980s (000 ha)	1980 (000 ha)	1980 (000 ha)
				(000 ha)	Percent	(000 ha)	Percent	(000 ha)	Percent			
LAC BUREAU												
CARIBBEAN												
Antigua and Barbuda	9	X	9	X	X	X	X	X	X	X	X	X
Bahamas	323	X	324	X	X	X	X	X	X	X	X	X
Cuba	1455	X	1455	2	0.2	X	X	2	0.1	11	200	X
Dominica	41	X	41	X	X	X	X	X	X	X	X	X
Dominican Rep	629	X	629	4	0.6	X	X	4	0.6	1	X	X
Grenada	5	X	5	X	X	X	X	X	X	X	X	X
Haiti	48	X	48	2	3.8	X	X	2	3.8	0	X	X
Jamaica	67	X	67	2	3.0	X	X	2	3.0	1	X	2
St. Kitts and Nevis	5	X	5	X	X	X	X	X	X	X	X	X
St. Lucia	8	X	8	X	X	X	X	X	X	X	X	X
Trinidad and Tobago	208	X	208	1	0.4	X	X	1	0.4	1	14	X
CENTRAL AMERICA												
Belize	1354	92	1446	9	0.6	X	X	9	0.6	X	X	X
Costa Rica	1638	160	1798	124	a 7.6	X	X	124	6.9	0	X	320
El Salvador	141	X	141	5	3.2	X	X	5	3.2	0	X	X
Guatemala	4442	100	4542	90	2.0	X	X	90	2.0	8	X	62
Honduras	5797	200	3997	90	2.3	X	X	90	2.3	X	58	X
Mexico	46250	2100	48350	595	1.3	20	1.0	615	1.3	22	X	360
Nicaragua	4496	X	4496	121	2.7	X	X	121	2.7	1	250	X
Panama	4165	X	4165	36	0.9	X	X	36	0.9	0	X	X
SOUTH AMERICA												
Argentina	44500	X	44500	X	X	X	X	X	X	40	X	2594
Bolivia	44010	22750	66760	87	0.2	30	0.1	117	0.2	1	X	X
Brazil	357480	157000	514480	2600	b 0.7	1350	0.7	3650	0.7	449	0	4660
Chile	7550	X	7550	X	X	X	X	50	0.7	74	X	845
Colombia	46400	5300	51700	820	1.8	70	1.3	890	1.7	8	X	2280
Ecuador	14250	480	14730	340	2.4	0	X	340	2.3	4	X	350
Guyana	18475	220	18695	2	0.0	1	0.2	3	0.0	0	X	12
Paraguay	4070	15640	19710	190	4.7	22	0.1	212	1.1	1	X	90
Peru	69680	960	70640	270	0.4	0	X	270	0.4	6	X	850
Suriname	14830	170	15000	3	0.0	X	X	3	0.0	0	X	580
Uruguay	490	X	490	X	X	X	X	X	X	5	X	X
Venezuela	31870	2000	53870	125	0.4	120	6.0	245	0.7	19	X	4500

Sources: WRI, WRR 1990-91, Table 19.1; FAO, *An Interim Report on the State of Forest Resources in the Developing Countries*, 1988; Philip M. Fearnside, Antonio Tebaldi Tardin, Luiz Gylvan Meira Filho, *Deforestation Rates in Brazilian Amazonia*, August 1990.

Notes: Deforestation of total forest area for some countries may not match, because of missing information in some classes.

a. Annual deforestation for 1977-83.

b. Annual deforestation for 1968-89.

X = not available.

**TABLE
14**

WOOD PRODUCTION

Average Annual Production (thousand cubic meters)

	Total Roundwood		Fuelwood and Charcoal		Industrial Roundwood		Sawwood		Pamls		Paper (000 metric tons)	
	% Change Since		% Change Since		% Change Since		% Change Since		% Change Since		% Change Since	
	1985-87	1975-77	1985-87	1975-77	1985-87	1975-77	1985-87	1975-77	1985-87	1975-77	1985-87	1975-77
LAC BUREAU												
CARIBBEAN												
Antigua and Barbuda	X	X	X	X	X	X	X	X	X	X	X	X
Bahamas	115	X	X	X	115	X	1	X	X	X	X	X
Barbados	X	X	X	X	X	X	X	X	X	X	X	X
Cuba	3294	41	2707	44	587	32	109	4	132	X	143	36
Dominica	X	X	X	X	X	X	X	X	X	X	X	X
Dominican Rep	982	113	976	116	6	-33	0	0	0	0	10	7
Grenada	X	X	X	X	X	X	X	X	X	X	X	X
Haiti	6055	27	5816	28	239	0	14	0	0	0	0	0
Jamaica	127	114	13	86	114	118	29	-6	4	-51	21	X
St. Kitts and Nevis	X	X	X	X	X	X	X	X	X	X	X	X
St. Lucia	X	X	X	X	X	X	X	X	X	X	X	X
Trinidad and Tobago	62	-37	22	38	40	-52	20	-39	0	0	0	0
CENTRAL AMERICA												
Belize	171	X	126	75	45	25	5	X	X	X	X	X
Costa Rica	3124	-8	2617	32	508	-64	398	-34	48	-16	13	76
El Salvador	4502	34	4820	34	82	6	44	27	0	0	16	220
Guatemala	7012	24	6871	32	141	-70	99	-67	8	-41	16	-18
Honduras	5505	26	4683	41	822	-21	415	-30	8	-32	0	0
Mexico	21497	22	14182	31	7315	7	2253	6	774	162	2473	86
Nicaragua	3675	26	2795	37	880	0	222	-45	14	40	0	0
Panama	2047	26	1708	14	339	163	45	-18	12	11	25	55
SOUTH AMERICA												
Argentina	11177	23	5755	13	5422	37	1067	62	398	25	947	65
Bolivia	1348	13	1199	31	149	-46	94	-28	5	1	1	100
Brazil	237779	39	171670	25	66109	95	17969	58	2538	31	4395	121
Chile	16185	48	6169	17	10015	77	2341	84	235	294	400	49
Colombia	17525	17	14853	24	2673	-11	721	-23	113	12	460	68
Ecuador	8670	48	6140	48	2530	46	1243	59	171	290	41	21
Guyana	218	18	18	80	200	14	61	-18	0	0	0	0
Paraguay	8100	62	4987	27	3113	189	795	139	92	468	8	743
Peru	7733	6	6523	18	1210	-32	535	-10	39	-44	155	5
Suriname	205	-31	14	-49	191	-27	67	0	13	-53	0	0
Uruguay	3283	22	3026	28	257	-19	57	-48	13	-11	56	70
Venezuela	1307	15	684	36	623	-2	327	-6	140	76	612	43

Source: WRI, WRR 1990-91, Table 19.2 and FAO, unpublished data, June 1990.

Note: X = not available.

**TABLE
15**

ENERGY PRODUCTION AND CONSUMPTION

	Production (petajoules)								Consumption					
	Total (a)		Solid		Liquid		Gas		Total	Per Capita		Per Constant 1980\$US of GNP		
	Change over 1977		Change over 1977		Change over 1977		Change over 1977		Change over 1977	1987	Change over 1977	1987	Change over 1977	
	1987	(%)	1987	(%)	1987	(%)	1987	(%)	(petajoules)	(%)	(giga-joules)	(%)	(kilojoules)	(%)
LAC PUEAU														
CARIBBEAN														
Antigua and Barbuda	X	X	X	X	X	X	X	X	4	X	48	X	X	X
Bahamas	X	X	X	X	X	X	X	X	15	-64	60	-69	97014	-89
Barbados	4	300	0	X	3	200	1	X	11	31	43	34	12785	11
Cuba	39	225	0	X	37	236	1	0	426	17	42	11	X	X
Dominica	0	X	X	X	X	X	X	X	1	100	13	1300	11540	-32
Dominican Rep	3	X	0	X	0	X	0	X	83	19	12	-8	12413	-5
Grenada	X	X	X	X	X	X	X	X	1	0	10	-9	1722	-33
Haiti	1	0	0	X	0	X	0	X	9	0	1	-50	6446	-15
Jamaica	0	X	0	X	0	X	0	X	74	-25	31	-34	29484	-18
St. Kitts and Nevis	X	X	X	X	X	X	X	X	1	X	20	X	15345	X
St. Lucia	X	X	X	X	X	X	X	X	2	100	15	67	13831	32
Trinidad and Tobago	496	-16	0	X	338	-32	158	72	207	7	169	-9	41908	1
CENTRAL AMERICA														
Belize	X	X	X	X	X	X	X	X	2	-33	12	-45	10139	-54
Costa Rica	10	100	0	X	0	X	0	X	41	11	15	-17	8237	-6
El Salvador	6	100	0	X	0	X	0	X	27	-13	5	-29	3502	1
Guatemala	10	900	0	X	8	X	0	X	41	-15	5	-38	5434	-22
Honduras	3	50	0	X	0	X	0	X	26	0	6	-25	9681	-23
Mexico	7317	143	233	69	5990	169	1011	76	4130	66	50	32	20129	22
Nicaragua	2	X	0	X	0	X	0	X	30	-17	9	-36	15008	11
Panama	7	X	0	X	0	X	0	X	39	X	17	X	9708	X
SOUTH AMERICA														
Argentina	1736	39	9	-31	967	3	657	143	1745	31	56	12	33475	36
Bolivia	139	2	0	X	43	-38	91	42	61	9	9	-18	23830	25
Brazil	2152	168	138	68	1228	256	114	185	3178	36	22	5	11301	-7
Chile	197	13	46	21	74	25	34	-37	345	17	28	0	12069	-12
Colombia	1479	175	397	268	820	167	171	101	717	43	24	14	18041	0
Ecuador	392	-1	0	X	373	-4	3	50	182	96	18	50	15658	63
Guyana	0	X	0	X	0	X	0	X	14	-46	14	-56	38965	-15
Paraguay	10	900	0	X	0	X	0	X	32	100	8	33	6155	26
Peru	438	84	4	300	368	88	25	32	343	19	17	-6	14595	-8
Suriname	10	233	0	X	7	X	0	X	14	-50	36	-54	20815	-32
Uruguay	15	150	0	X	0	X	0	X	59	-23	19	-30	6285	-31
Venezuela	5137	-8	2	-50	4141	-18	908	78	1616	43	88	6	23118	44

Source: WRI, WRR 1990-91, Table 21.1 and the UN 1987 Energy Statistics Yearbook.

Notes: a. Total includes primary electricity (hydro, nuclear, geothermal). The production of primary electricity was assessed at the heat value of electricity (1 kilowatt hour = 3.6 million joules at 100 percent efficiency).

1 petajoule = 1,000,000,000,000 joules = 947,800,000,000 Btus.

1 gigajoule = 1,000,000,000 joules = 947,800 Btus.

X = not available.

**TABLE
16**

RESERVES

	Bituminous Coal (million metric tons) 1987		Lignite and Subbituminous Coal (million metric tons) 1987		Proved Recoverable Reserves 1987		Hydroelectric (megawatts)	
	Proved Reserves in Place	Proved Recoverable Reserves	Proved Reserves in Place	Proved Recoverable Reserves	Crude Oil (million metric tons)	Natural Gas (billion cubic meters)	Technical Potential	Installed Capacity (1987)
LAC BUREAU								
CARIBBEAN								
Antigua and Barbuda	X	X	X	X	X	X	X	X
Bahamas	X	X	X	X	X	X	X	X
Barbados	X	X	X	X	1	X	X	0
Cuba	X	X	.	X	X	X	X	49
Dominica	X	X	X	X	X	X	X	X
Dominican Rep	X	X	X	X	X	X	503 a	165
Grenada	X	X	X	X	X	X	4 a	X
Haiti	X	X	13	X	X	X	152	70
Jamaica	X	X	X	X	X	X	67 a	25
St. Kitts and Nevis	X	X	X	X	X	X	X	X
St. Lucia	X	X	X	X	X	X	X	X
Trinidad and Tobago	X	X	X	X	77	294	X	0
CENTRAL AMERICA								
Belize	X	X	X	X	X	X	X	X
Costa Rica	X	X	27	X	X	X	9472 a	736
El Salvador	X	X	X	X	X	X	664 a	233
Guatemala	X	X	X	X	6	X	8674 a	445
Honduras	X	X	21	X	X	X	4800 a	130
Mexico	1569	1252	793	634	7703	2119	34400 a	7780
Nicaragua	X	X	X	X	X	X	4106	103
Panama	X	X	X	X	X	X	3031	551
SOUTH AMERICA								
Argentina	X	X	195	130	308	670	37208 b	6591
Bolivia	X	X	X	X	22	143	18000	295
Brazil	X	X	3276	1245	361	105	150322 a	40106
Chile	79	31	4500	1150	40	120	26487 a	2279
Colombia	16524	9666	X	X	216	110	83640 a	4675
Ecuador	X	X	28	23	157	12	36000 a	917
Guyana	X	X	X	X	X	X	12620 a	2
Paraguay	X	X	X	X	X	X	4585 a	3340
Peru	X	960	X	100	75	18	60000	2150
Suriname	X	X	X	X	X	X	2334	189
Uruguay	X	X	X	X	X	X	2000 a	1039
Venezuela	642	417	X	X	7794	3480	37186 a	5500

Source: WRI, WRR 1990-91, Table 21.3 and World Energy Conference, 1989 Survey of Energy Resources.

Notes: All data on exploitable and theoretical hydropotential assume use of 5,000 hours per year as representative for all hydropower (57 percent load factor).

a. Exploitable potential at large-scale sites (over 1 megawatt) only.

b. Exploitable potential.

X = not available.

**TABLE
17**

WATER RESOURCES

	Internal Renewable Water Resources		River Flows		Total Withdrawal			Sectoral Withdrawal (percent)			
	Total (cubic kilometers per year)	Per Capita 1990 (thousand cubic meters per year)	from Other Countries (cubic kilometers per year)	to Other Countries (cubic kilometers per year)	Year of Data	Total (cubic kilometers per year)	Percentage of Water Resources (a)	Per Capita (cubic meters per year)	Domestic	Industry	Agriculture
LAC BUREAU											
CARIBBEAN											
Antigua and Barbuda	X	X	X	X	X	X	X	X	X	X	X
Bahamas	X	X	X	X	X	X	X	X	X	X	X
Barbados	0.05	0.20	0.00	0.00	1962	0.03	51	117	52	41	7
Cuba	34.50	3.34	0.00	0.00	1975	8.10	23	868	9	2	89
Dominica	X	X	0	0	1987 b	0	X	14	73	0	27
Dominican Rep	20.00	2.79	X	X	1987 b	2.97	15	453	5	6	89
Grenada	X	X	0	0	1987 b	0	X	16	73	0	27
Haiti	11.00	1.69	X	X	1987 b	0.04	0	46	24	8	68
Jamaica	8.30	3.29	0.00	0.00	1975	0.32	4	157	7	7	86
St. Kitts and Nevis	X	X	X	X	X	X	X	X	X	X	X
St. Lucia	X	X	0	0	1987 b	0.01	X	89	11	0	89
Trinidad and Tobago	5.10 b	3.98	0.00	0.00	1975	0.15	3	149	27	38	35
CENTRAL AMERICA											
Belize	16.00	87.91	X	X	1987 b	0.02	0	104	10	0	90
Costa Rica	95.00	31.51	X	X	1970	1.35	1	779	4	7	89
El Salvador	18.95	3.62	X	X	1975	1.00	5	241	7	4	89
Guatemala	116.00	12.61	X	X	1970	0.73	1	139	9	17	74
Honduras	102.00	19.85	X	X	1970	1.34	1	508	4	5	91
Mexico	357.40	4.03	X	X	1975	54.20	15	901	6	8	86
Nicaragua	175.00	45.21	X	X	1975	0.89	1	370	25	21	54
Panama	144.00	59.55	X	X	1975	1.30	1	744	12	11	77
SOUTH AMERICA											
Argentina	694.00	21.47	300.00	X	1976	27.60	3	1059	9	18	73
Bolivia	300.00 b	41.02	X	X	1987 b	1.24	0	184	10	5	85
Brazil	5190.00	34.52	1760.00	X	1987 b	35.04	1	212	43	17	40
Chile	468.00 b	35.33	X	X	1975	16.80	4	1625	6	5	89
Colombia	1070.00	33.63	X	X	1987 b	5.34	0	179	41	16	43
Ecuador	314.00	29.12	X	X	1987 b	5.56	2	561	7	3	90
Guyana	241.00 b	231.73	X	X	1971	5.40	2	7616	1	0	99
Paraguay	94.00 b	21.98	220.00	X	1987 b	0.43	0	111	15	7	78
Peru	40.00	1.79	X	X	1987 b	6.10	15	294	19	9	72
Suriname	200.00 b	496.28	X	X	1987 b	0.46	0	1181	6	5	89
Uruguay	59.00 b	18.86	65.00	X	1965	0.65	1	241	6	3	91
Venezuela	856.00	43.37	461.00	X	1970	4.10	0	387	43	11	46

Source: WRI, WRR 1990-90, Table 22.1.

Notes: X = not available; 0 = zero or less than half the unit of measure.

a. Water resources include both internal renewable resources and river flows from other countries.

b. Estimated by the Institute of Geography, U.S.S.R.

**TABLE
18**

COASTLINE ACTIVITY

	Length of Marine Coastline (kilometers)	Maritime Area (000 sq km)		Percentage of Urban Population in Large Coastal Cities	Average Annual Volume of Goods Loaded and Unloaded 1983-85 (000 metric tons)			Offshore Production, 1988		Average Annual Marine Fish Catch	
		Shelf to 200-m Depth	Exclusive Economic Zone		1983-85 (000 metric tons)		Oil (000 metric tons)	Gas (million cubic meters)	1985-87 (000 metric tons)	Percentage Change Over 1975-77	
					Petroleum Crude	Dry Product					Dry Cargo
LAC BUREAU	58457	2840.6	16233.1								
CARIBBEAN	12239	184.2	2140.0								
Antigua and Barbuda	153	X	X	0	0	61 a	82	0	0	X	X
Bahamas	3542	85.7	759.2	100	19035	7266	3370	0	0	X	X
Barbados	97	0.3	167.3	0	137	150 b	573	0	0	3.9	-6
Cuba	3735	X	362.8	76	5100	4350	16916	0	0	209.2	21
Dominica	148	X	20.0	0	0	4	78	0	0	X	X
Dominican Rep	1288	18.2	268.8	77	1559	653	3464	0	0	16.9	217
Grenada	121	X	27.0	0	0	19	58	0	0	X	X
Haiti	1771	10.6	160.5	100	0	111	899	0	0	7.6	101
Jamaica	1022	40.1	297.6	100	1052	1029	7959	0	0	9.2	-9
St. Kitts and Nevis	X	X	X	X	X	X	X	X	X	X	X
St. Lucia	X	X	X	X	X	X	X	X	X	X	X
Trinidad and Tobago	362	29.2	76.8	0	8535	3477	5198	5837	3872	3.0	-31
CENTRAL AMERICA	15933	671.6	3968.3								
Belize	386	X	X	0	0	63 a	211	0	0	X	X
Costa Rica	1290	15.8	258.9	0	476	200	2401	0	0	20.1	51
El Salvador	307	17.8	91.9	0	614	65 b	1099	0	0	14.9	140
Guatemala	400	12.3	99.1	0	540	349	3906	0	0	2.2	-31
Honduras	820	53.5	200.9	9	364	272	1947	0	0	12.1	151
Mexico	9350	442.1	2851.2	2	62905	5725	15534	82979	11360	1181.3	146
Nicaragua	910	72.7	159.8	0	482	152	1115	0	0	3.8	-62
Panama	2490	57.3	306.5	66	1447	622	1201	0	0	192.7	7
SOUTH AMERICA	30285	1984.9	10124.8								
Argentina	4989	796.4	1164.5	58	X	3871	36583	X	X	453.4	65
Bolivia	X	X	X	X	X	X	X	X	X	X	X
Brazil	7491	768.6	3168.4	30	32039 a	5475	150779	18725	4693	607.5	9
Chile	6435	27.4	2288.2	86	1913	124	14682	450	934	5062.6	322
Colombia	2414	67.9	603.2	14	1511 a	3052	9563	X	2533	24.1	5
Ecuador	2237	47.0	1159.0	55	9500 c	1198	2634	X	X	922.2	189
Guyana	459	50.1	130.3	100	0	446	1586	0	0	40.6	86
Paraguay	X	X	X	X	X	X	X	X	X	X	X
Peru	2414	82.7	1026.9	73	1351	1101	11818	5156	X	4745.6	38
Suriname	386	X	101.2	100	0	700 a	6757	0	0	4.2	-23
Uruguay	660	56.6	119.3	100	1193	78 b	1127	0	0	138.4	287
Venezuela	2800	88.1	363.8	19	49157 c	24666	20944	49252	6213	272.6	91

Source: WRI, WRR 1990-91, Table 23.1 and 23.2.

Notes: X = not available.

a. Goods unloaded.

b. Two years of data.

c. Goods loaded.

**TABLE
19**

TROPICAL COASTAL RESOURCES

	Mangrove Forests			Seagrass Beds			Coral Reefs		
	Area (sq km)	Length (km)	Length as % of	Area (sq km)	Length (km)	Length as % of	Area (sq km)	Length (km)	Length as % of
			Total Coastline			Total Coastline			Total Coastline
LAC BUREAU									
CARIBBEAN									
Antigua and Barbuda	X	X	X	X	X	X	X	X	X
Bahamas	P	P	X	38486	1638	46.0	P	1727	49.0
Barbados	X	X	X	X	X	X	X	X	X
Cuba	4000	P	X	42752	1092	29.0	P	1046	28.0
Dominica	X	X	X	X	X	X	X	X	X
Dominican Rep.	90	P	X	3726	273	21.0	P	455	35.0
Grenada	X	X	X	X	X	X	X	X	X
Haiti	180	P	X	P	P	X	P	182	10.0
Jamaica (a)	70	P	X	327	273	27.0	P	442	43.0
St. Kitts and Nevis	X	X	X	X	X	X	X	X	X
St. Lucia	X	X	X	X	X	X	X	X	X
Trinidad and Tobago	81	63	11.0	414	46	8.0	13	22	4.0
CENTRAL AMERICA									
Belize (b)	2400	386	100.0	650	386	100.0	P	474	123.0
Costa Rica	390	210	16.0	2457 c	136 c	11.0 c	6	2.5	0.2
El Salvador	450	100	33.0	P	P	X	0	0	0.0
Guatemala	500	100	25.0	3312	182	46.0	0	0	0.0
Honduras (d)	3000	430	53.0	22362 c	546 c	67.0 c	P	364	44.0
Mexico	6600	P	X	P	1000	10.0	P	820	8
Nicaragua (d)	600	700	77.0	28129 c	636 c	70.0 c	P	455	50.0
Panama	4550	880	35.0	9000 c	500 c	20.0 c	P	320 c	13.0 c
SOUTH AMERICA									
Argentina	X	X	X	X	X	X	X	X	X
Bolivia	X	X	X	X	X	X	X	X	X
Brazil	25000	P	X	P	P	X	P	P	X
Chile	X	X	X	X	X	X	X	X	X
Colombia	4400	P	X	27327 c	1001 c	41.0 c	P	500 c	21.0 c
Ecuador	2158	P	X	P	P	X	P	P	X
Guyana	1500	P	X	P	P	X	0	0	0.0
Paraguay	X	X	X	X	X	X	X	X	X
Peru	280	P	X	X	X	X	0	0	0.0
Suriname	1150	P	X	P	P	X	0	0	0.0
Uruguay	X	X	X	X	X	X	X	X	X
Venezuela (d)	6736	1102	39.0	2542	288	10.0	P	227	8.0

Source: WRI, WRR 1986, Table 10.3.

Notes: X = not available; P = resource present but not quantified.

a. Excludes offshore islands/islets.

b. Includes three major offshore atolls: Turneffe Islands, Lighthouse Reef, and Glovers Reef.

c. Does not include the Pacific coast seagrass beds.

d. Includes offshore islands.

e. Does not include the Pacific coast coral assemblages.

TABLE 20		SOIL EROSION			
Extent and Location	Affected Area as Percentage of National Area	Amount of Erosion (metric tons per year)	Rate of Erosion (metric tons per hectare per year)	Year of Estimate	
CARIBBEAN					
Jamaica	Total cropland (20%, 2751)	19	7.45 million	36	1980s
	Upper Yallahs Valley	X	X	90	X
CENTRAL AMERICA					
Dominican Republic	Boa watershed (9,330 ha)	0.2	X	346	1970s
El Salvador	Cultivated land Acelhuate basin (46,300 ha)	2	X	19-190	1970s
Guatemala	Western highlands	X	X	5-35	1979
Source: WRI, WRR 1988-89, Table 17.6.					
Note: X = not available.					

**TABLE
21**

WATER QUALITY AT SELECTED GEMS/WATER STATIONS

		Median Dissolved Oxygen (mg/l)			Median Biochemical Oxygen Demand (BOD) (mg/l)			Median pH			Median Fecal Coliforms (no./100 ml)			Median Dissolved Mercury (micrograms/l)			Median Dissolved Lead (mg/l)		
		1979	1982	1985	1979	1982	1985	1979	1982	1985	1979	1982	1985	1979	1982	1985	1979	1982	1985
		-81	-84	-87	-81	-84	-87	-81	-84	-87	-81	-84	-87	-81	-84	-87	-81	-84	-87
RIVERS																			
CENTRAL AMERICA																			
Costa Rica	Pitahaya	7.0	6.8	X	20.0	3.9	X	7.9	8.1	X	1275	24000	X	X	X	X	X	X	X
Mexico	Colorado	7.9	8.3	8.8	6.0	3.6	1.3	8.0	7.8	8.0	240	122	23	X	X	X	X	X	X
	Blanco	4.9	4.7	3.4	9.8	14.3	6.5	7.6	8.0	7.7	19500	40000	40000	X	X	X	X	X	X
	Lerma	0.1	0.1	0.6	51.4	61.7	18.9	8.5	8.2	7.6	180000	100000	5965	X	X	X	X	X	X
Panama	San Felix	8.2	8.1	8.0	2.0	2.0	2.0	7.8	7.9	7.8	883	925	460	X	X	X	X	0.145	X
	Agua Clara	7.9	2.0	8.3	2.0	2.0	X	7.6	7.7	7.5	224	162	130	X	X	X	X	0.150	X
SOUTH AMERICA																			
Argentina	Parana Rosario	7.5	5.9	7.3	2.5	1.1	2.1	X	7.0	7.4	X	X	4300	X	X	X	X	X	X
	Rio de la Plata, Buenos Aires	7.6	7.4	7.6	0.9	1.1	1.0	7.4	7.2	7.3	620	310	230	X	X	X	X	X	X
Paraguay	Paraguay	6.9	4.9	X	0.8	0.9	X	7.3	7.4	X	493	614	X	X	X	X	X	X	X
Brazil	Quandu (Tomada d'Agua)	7.9	7.8	7.7	1.2	0.8	1.2	7.0	6.8	6.8	2	4900	4	X	0.10	X	X	0.023	X
	Paraiba do Sul (Barra Mansa)	X	7.6	7.6	X	1.2	1.6	7.0	6.9	6.9	3	13000	4900	X	0.10	X	X	0.024	X
	Jacui (JA 042)	X	8.1	7.7	X	1.0	1.0	X	6.9	7.0	X	330	230	X	0.00	0.00	X	0.019	0.013
Chile	Mápocho en Los Alamos	11.4	12.4	10.6	1.0	0.9	0.8	7.5	7.3	6.9	2	2	2	X	X	X	X	X	X
	Mápocho	11.4	14.0	12.8	1.0	1.2	0.8	8.1	8.1	8.0	330	855	1100	X	X	X	X	X	X
Colombia	Cauca Juncalito	X	5.1	5.4	X	2.2	2.2	X	7.1	7.1	X	X	X	X	X	X	X	X	X
Ecuador	Dauic	X	7.0	X	X	1.2	X	7.9	7.2	X	515	2400	X	X	X	X	X	X	X
	San Pedro	8.1	8.0	7.6	10.0	2.3	3.2	8.0	7.8	8.0	16000	11660	80190	X	X	X	X	X	X
Peru	Rimac	7.7	8.2	X	X	X	X	8.0	7.9	X	1100	X	X	X	X	X	X	0.220	X
Uruguay	Santa Lucia	X	9.0	7.0	X	2.0	1.2	X	7.4	7.3	X	0	0	X	0.00	X	X	0.000	X
	Uruguay Salto	X	8.9	8.0	X	1.2	0.8	X	6.9	7.3	X	20	23	X	0.00	X	X	0.000	X
	Rio de la Plata, Colonia	X	8.8	8.8	X	1.0	0.8	X	7.1	7.5	X	30	190	X	0.00	X	X	0.000	X
LAKES																			
CENTRAL AMERICA																			
Costa Rica	Amatlan	7.3	4.6	X	14.7	7.0	X	8.5	8.2	X	97	43	X	X	X	X	X	X	X
Mexico	Lago de Chapala	7.0	5.9	7.3	1.3	1.2	1.4	8.8	8.9	8.7	3	4	4	X	X	X	X	X	X
	Preso de la Amistad	7.8	X	8.5	1.6	1.2	1.1	8.1	8.2	8.4	X	X	X	X	X	X	X	X	X
Panama	Lagomedan Station 001	6.0	6.5	5.9	X	X	X	7.4	7.4	7.7	4	8	7	X	X	X	X	X	X
SOUTH AMERICA																			
Argentina	Embalse Salto Grande	8.6	X	6.8	X	X	X	7.5	X	8.0	X	X	1	X	X	X	X	X	X
Bolivia	Water Supply Station 001	6.3	6.3	X	1.0	1.0	X	7.3	7.1	X	0	0	X	X	X	X	X	X	X
Brazil	Reservatorio de Guarapiranga	X	7.6	7.5	X	1.0	2.0	X	6.8	7.5	X	95	30	X	0.00	X	X	0.001	X
	Reservatorio de Promissão	X	8.1	8.7	X	1.5	1.5	X	6.9	7.5	X	50	105	X	0.00	X	X	0.001	X
	Rio Paranaçu Pedra do Cavalo	X	6.6	6.4	X	1.2	1.6	X	7.4	7.3	X	23	17	X	0.20	0.10	X	0.050	0.050
GROUNDWATER																			
CENTRAL AMERICA																			
Mexico	Pozo Hacienda Tlahuilichan	3.9	3.8	4.8	2.4	2.9	2.4	7.7	7.6	7.2	400	430	40	X	X	X	X	X	X
	Pozo en Aguascalientes	X	X	X	X	0.1	0.4	7.4	7.4	7.5	X	3	3	X	X	X	X	X	X
	Pozo en la Region Llanosera	X	X	X	X	X	X	7.6	7.7	7.5	X	X	X	X	X	X	X	X	X
SOUTH AMERICA																			
Argentina	Salto Dio. Anta (Tolliche)	8.4	9.1	X	X	3.9	X	8.4	8.6	X	X	0	X	X	X	X	X	X	X
Chile	Pozo en Panoramica 1377	X	3.8	4.6	0.6	0.5	X	7.2	7.6	7.1	2	2	X	X	X	X	X	X	X
Uruguay	Amalero Rivers	X	8.0	7.3	X	0.7	X	6.2	6.2	X	X	0	0	X	X	X	X	X	X

Source: WRI, WRR 1990-91, Table 22.2.

Note: X = not available.

**TABLE
22**

AIR POLLUTION IN SELECTED CITIES

City	Sulfur Dioxide			Gravimetrically Determined Suspended Particulate Matter				Smoke					
	Site	Number of days over			Site	Number of days over			Site	Number of days over			
		150 µg/cubic meter				230 µg/cubic meter				150 µg/cubic meter			
	Years	Min.	Avg.	Max.	Years	Min.	Avg.	Max.	Years	Min.	Avg.	Max.	
SOUTH AMERICA													
Brazil	Rio de Janeiro	X	X	X	X	6	0	11	35	X	X	X	X
	Sao Paulo	11	0	12	32	X	X	X	X	11	16	31	52
Chile	Santiago	9	0	19	55	X	X	X	X	9	11	102	299
Colombia	Cali	1	0	0	0	X	X	X	X	X	X	X	X
	Medellin	3	0	0	0	3	0	0	0	X	X	X	X
Venezuela	Caracas	8	0	0	0	X	X	X	X	8	0	0	0

Source: WRI, WRR 1990-91, Table 24.3.

Notes: µg = microgram; Min. = minimum; Avg. = average; Max. = maximum.
X = not available.

**TABLE
23**

GLOBALLY THREATENED ANIMAL SPECIES, 1989

	Mammals		Birds		Reptiles		Amphibians		Swallowtail Butterflies	
	Number of		Number of		Number of		Number of		Number of	
	Species Known	Number Threatened	Species Known	Number Threatened						
LAC BUREAU										
CARIBBEAN										
Antigua and Barbuda	X	X	X	X	X	X	X	X	X	X
Bahamas	17	2	218	8	39	18	6	0	5	0
Barbados	X	X	X	X	X	X	X	X	X	X
Cuba	39	9	286	14	100	10	40	0	13	1
Dominica	X	X	X	X	X	X	X	X	X	X
Grenada	X	X	X	X	X	X	X	X	X	X
Hispaniola	23	3	211	2	134	6	53	0	8	2
Jamaica	29	2	223	5	38	4	20	0	7	2
St. Kitts and Nevis	X	X	X	X	X	X	X	X	X	X
St. Lucia	X	X	X	X	X	X	X	X	X	X
Tobago	29	2 ^a	157	6 ^a	39	8 ^a	8	0 ^a	13-14	0 ^a
Trinidad	85	X	347	X	76	X	15	0	X	X
CENTRAL AMERICA										
Belize	121	9	504	1	107	8	26	0	X	X
Costa Rica	203	10	796	5	218	8	151	1	X	X
El Salvador	129	7	432	3	92	7	38	0	X	X
Guatemala	174	9	666	8	204	10	99	0	X	X
Honduras	179	8	672	5	161	9	57	0	X	X
Mexico	439	32	961	123	717	35	284	4	52	2
Nicaragua	177	9	610	4	162	9	59	0	X	X
Panama	217	13	920	6	212	10	155	2	X	X
SOUTH AMERICA										
Argentina	255	26	927	18	204	7	124	1	36-37	1
Bolivia	267	24	1177	5	180	10	96	0	43-44	2
Brazil	394	42	1567	35	467	19	487	1	74	8
Chile	90	10	393	6	82	3	38	0	2-3	0
Colombia	358	25	1665	28	383	24	375	0	59	0
Ecuador (b)	280	21	1447	17	345	36	350	0	64	0
Guyana	193	12	728	3	157	14	105	0	30-31	1
Paraguay	157	14	630	8	110	8	69	0	26-32	0
Peru	359	30	1642	10	297	15	235	0	58-59	2
Suriname	200	11	670	3	131	12	99	0	30-31	1
Uruguay	77	7	367	3	66	9	37	1	7-8	0
Venezuela	305	18	1295	8	245	20	183	0	35-39	1

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10

23

Source: WRI, WRR 1990-91, Table 20.2.

Notes: X = not available.

a. Refers to both Trinidad and Tobago.

b. Includes the Galapagos Islands.

**TABLE
24**

HABITAT LOSS, 1980s

	Habitat Types (areas in square kilometers)													
	Forests				Savanna/ Grassland				Desert/ Scrub		Wetlands/ Marsh		Mangroves	
	All Forests		Dry Forests		Moist Forests									
	Current sq km	% Lost	Current sq km	% Lost	Current sq km	% Lost	Current sq km	% Lost	Current sq km	% Lost	Current sq km	% Lost	Current sq km	% Lost
LAC BUREAU														
CARIBBEAN														
Antigua and Barbuda	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Bahamas	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Barbados	X	X	X	X	X	X	X	X	X	X	X	0	X	X
Cuba	X	X	X	X	X	X	X	X	X	X	X	17465	X	4000
Dominica	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Dominican Rep	X	X	X	X	X	X	X	X	X	X	X	48442	X	90
Grenada	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Haiti	X	X	X	X	X	X	X	X	X	X	X	1129	X	180
Jamaica	1841	X	X	X	X	X	X	X	X	X	X	138	X	70
St. Kitts and Nevis	X	X	X	X	X	X	X	X	X	X	X	X	X	X
St. Lucia	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Trinidad and Tobago	X	X	X	X	X	X	X	X	X	X	X	213	X	40
CENTRAL AMERICA														
Belize	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Costa Rica	X	X	X	X	X	X	X	X	X	X	X	818	X	390
El Salvador	X	X	X	X	X	X	X	X	X	X	X	768	X	450
Guatemala	X	60	X	X	X	X	X	X	X	X	X	2202	X	500
Honduras	X	X	X	X	X	X	X	X	X	X	X	6470	X	1450
Mexico	384608	66	X	X	X	X	X	X	1000000	X	X	32640	X	6600
Nicaragua	X	X	X	X	X	X	X	X	X	X	X	20537	X	600
Panama	X	X	X	X	X	X	X	X	X	X	X	6472	X	4860
SOUTH AMERICA														
							7890629							
Argentina	360000	50	X	X	X	X	1300	X	X	X	X	61689	X	X
Bolivia	X	X	X	X	X	X	X	X	X	X	X	74191	X	X
Brazil	X	X	X	X	X	X	X	X	X	X	X	296903	X	25000
Chile	X	X	X	X	X	X	X	X	X	X	X	83267	X	X
Colombia	X	X	X	X	X	X	X	X	X	X	X	19281	X	4400
Ecuador	X	X	X	X	27000	89	X	X	X	X	X	9926	X	1601
Guyana	167322	X	X	X	X	X	X	X	X	X	X	8139	X	1500
Paraguay	X	X	X	X	X	X	X	X	X	X	X	57236	X	X
Peru	X	X	X	X	280	X	X	X	X	X	X	13033	X	280
Suriname	X	X	X	X	X	X	X	X	X	X	X	16250	X	1150
Uruguay	X	X	X	X	X	X	X	X	X	X	X	6250	X	X
Venezuela	X	X	X	X	X	X	X	X	X	X	X	145006	X	X

Source: WRI, WRR 1990-91, Table 20.4.

Note: X = not available.

**TABLE
25**

**ACCESS TO SAFE DRINKING WATER, SANITATION
AND HEALTH SERVICES**

	Percentage of Population with Access to:											Numbers of Trained Medical Personnel		
	Safe Drinking Water				Sanitation Services				Health Services			Nurses and		
	Urban		Rural		Urban		Rural		1980-87			Doctors Midwives Other		
	1980	1985	1980	1985	1980	1985	1980	1985	All	Urban	Rural	Doctors	Midwives	Other
LAC BUREAU														
CARIBBEAN														
Antigua and Barbuda	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Bahamas	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Barbados	99	100	98	100	X	100	X	100	X	X	X	225	1134	X
Cuba	X	X	X	X	X	X	X	X	X	X	X	18850	35062	X
Dominica	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Dominican Rep	85	72	34	24	25	72	4	59	80	X	X	3555	5184	X
Grenada	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Haiti	51	59	8	32	42	42	10	14	70	80	70	810	2537	102
Jamaica	50	59	46	93	12	92	2	90	X	X	X	1115	4675	X
St. Lucia	X	X	X	X	X	X	X	X	X	X	X	X	X	X
St. Kitts and Nevis	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Trinidad and Tobago	100	100	93	93	96	100	88	100	X	X	X	1213	4521	X
CENTRAL AMERICA														
Belize	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Costa Rica	100	100	82	82	99	100	84	88	80	100	63	2539	5400	X
El Salvador	67	76	40	47	48	89	26	35	56	80	40	1664	5038	1214
Guatemala	90	89	18	39	45	73	20	42	34	47	25	3544	9093	X
Honduras	93	51	40	49	49	22	26	38	73	85	65	2800	6300	614
Mexico	90	95	40	50	77	77	12	15	45	X	X	X	87398	3207
Nicaragua	67	77	6	13	34	35	X	16	83	100	60	2110	5917	250
Panama	100	100	62	64	83	99	59	61	80	95	64	2167	5475	410
SOUTH AMERICA														
Argentina	61	63	17	17	80	76	35	35	71	80	21	80100	30505	X
Bolivia	69	81	10	27	37	51	4	22	63	90	36	4032	1066	X
Brazil	83	86	51	53	X	33	1	2	X	X	X	122818	110052	X
Chile	100	97	17	22	100	79	10	21	X	X	X	9684	32150	X
Colombia	93	100	73	76	93	96	4	13	60	X	X	23520	44520	X
Ecuador	79	83	20	33	73	79	17	34	62	90	30	11033	14794	X
Guyana	100	100	60	60	73	100	80	87	89	X	X	125	887	X
Paraguay	39	49	9	8	95	66	80	40	61	90	38	2453	3584	195
Peru	68	73	18	17	57	67	0	13	X	X	17	18200	14900	X
Suriname	100	100	79	94	100	100	79	100	X	X	X	306	1400	X
Uruguay	96	95	2	27	59	59	6	59	80	X	X	5756	3000	2300
Venezuela	93	88	53	65	60	57	12	5	X	X	X	24083	15214	434

Source: WRI, WRR 1990-91, Table 16.4.

Note: X = not available.

APPENDIX 4

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