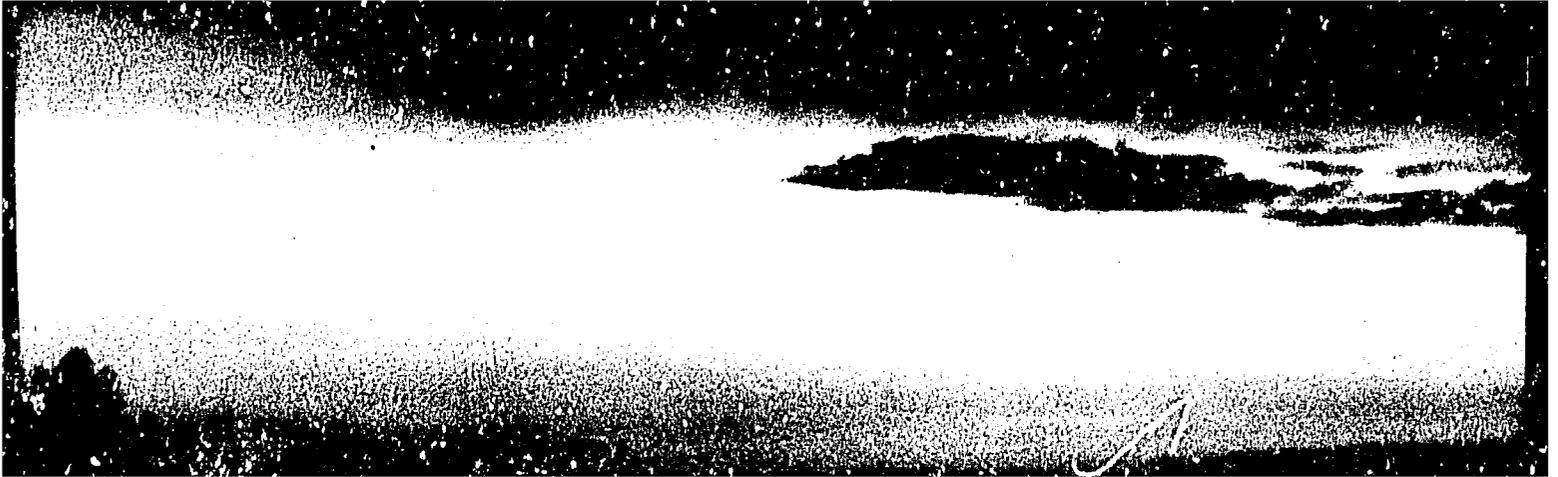


COASTAL 2000

- PN ABP-777



Recommendations for

A Resource Management Strategy for Sri Lanka's Coastal Region

Volume I



**Recommendations for
A Resource
Management
Strategy for
Sri Lanka's
Coastal Region
Volume I**

Editors

**S. Olsen
D. Sadacharan
J.I. Samarakoon
A.T. White
H.J.M. Wickremeratne
M.S. Wijeratne**

**The Coastal Resources Management Project
Sri Lanka**

Coast Conservation Department of Sri Lanka

and

**Coastal Resources Center
The University of Rhode Island**



**Recommendations for
A Resource
Management
Strategy for
Sri Lanka's
Coastal Region

Volume I**

Edited by

**S. Olsen
D. Sadacharan
J.I. Samarakoon
A.T. White
H.J.M. Wickremeratne
M.S. Wijeratne**

1992

Published by the COAST CONSERVATION DEPARTMENT, the Coastal Resources Management Project, Sri Lanka, and Coastal Resources Center, The University of Rhode Island.

Funding for the preparation and printing of this document was provided in part by the Government of Sri Lanka, and in part by the Office of Environment and Natural Resources, Bureau for Research and Development, United States Agency for International Development as part of their cooperative program in coastal management with The University of Rhode Island Coastal Resources Center.

Printed in Colombo, Sri Lanka

Olsen, S., D. Sadacharan, J.I. Samarakoon, A.T. White, H.J.M. Wickremeratne, and M.S. Wijeratne, editors. 1992. Coastal 2000: Recommendations for A Resource Management Strategy for Sri Lanka's Coastal Region, Volumes I and II. CRC Technical Report No. 2033, Coast Conservation Department, Coastal Resources Management Project, Sri Lanka and Coastal Resources Center, The University of Rhode Island.

Cover: A photo of Sri Lanka's coast by D. Sansoni
Inside: Photos by D. Sansoni, A.T. White and H. Scheffer as noted

Library of Congress 92-082763
ISBN 955-9108-05-0

Acknowledgements

Coastal 2000 is the product of three years of dedicated work by various leading environmental social-economic and resource management specialists from Sri Lanka and the United States. Formulation of the document has been a collaborative effort of the URI/USAID Coastal Resources Management Project in Sri Lanka and the Coast Conservation Department. Funding for the preparation and printing of this document was provided in part by the Government of Sri Lanka, and in part by the Office of Environment and Natural Resources, Bureau for Research and Development, United States Agency for International Development as part of their cooperative program in coastal management with the URI Coastal Resources Center.

Background information was provided for this *Coastal 2000* Strategy document by reports commissioned by the Coastal Resources Management Project. These reports identify trends in the condition and use of Sri Lanka's coastal ecosystems (see "Background Papers").

The preparation of the "Trends and Conditions" reports was coordinated by Dr. J.I. Samarakoon. Ms. Lynne Hale, Dr. Kem Lowry, Dr. Madduma Bandara, Messrs. Anton Nanayakkara, Anil Premaratne, Indra Ranasinghe, R.A.D.B. Samaranayake, and K.W. Thilakaratne reviewed initial drafts and made valuable suggestions. Many others made useful contributions at meetings, workshops and roundtables, and helped in numerous other ways.

The late Mr. B.W. Perera, former In-Country Project Administrator of the Coastal Resources Management Project, initiated work on the preparation of the background reports for *Coastal 2000* and labored tirelessly towards making this strategy a document that can help define a positive future for Coastal Development in Sri Lanka.

Background Papers

The following reports were completed for the Coastal Resources Management Project to serve as background material in the preparation of *Coastal 2000*.

"Agriculture in Sri Lanka's Coastal Areas," T.B. Subasinghe.

"Aquaculture in Sri Lanka's Coastal Environment: Activities, Contributions, Conflicts and Projections," P.P.G.S.N. Siriwardena.

"Coastal Fisheries and Brackishwater Aquaculture," L. Joseph.

"Ecological Functioning of Sri Lanka's Coastal Habitats," L. Pinto.

"Economic Significance of Sri Lanka's Coastal Region," T.G. Savundranayagam, N. Siripala, L. Joseph, L. de Alwis and P.S.M. Muthukuda.

"The Fisheries Industry in Sri Lanka's Coastal Areas," A.R. Atapattu.

"Impacts of Land Use on River Basins," S. Dimantha.

"Industries That Depend upon or Impact on Sri Lanka's Coastal Resources," M.S. Wijeratne.

"Infrastructure in the Management of the Coastal Resources," N. Jayawardene.

"Legislative and Institutional Arrangements for Coastal Zone Management in Sri Lanka," E.W.M. Perera.

"Mineral Resources in the Coastal Area of Sri Lanka," M.R.D. Fernando and L.K. Seneviratne.

"Nutritional Status of the Coastal Population," B. de Mel.

"Parks and Protected Areas in the Coastal Region," S.W. Kotagama.

"Population Management in Sri Lanka," A.T.P.L. Abeykoon.

"Population Trends in the Coastal Areas of Sri Lanka," R.B.M. Korale.

"Preservation and Restoration of Historic, Cultural and Archaeological Resources along Sri Lanka's Coastal Zone," P.L. Prematilleke.

"Review of the Planning Division of the Coast Conservation Department," Sri Lanka Institute of Development Administration.

"Shoreline Erosion in Sri Lanka's Coastal Areas," H.V. Dayananda.

"Tourism in Sri Lanka's Coastal Environment: Activities, Contributions, Conflicts and Projections," P. Seneviratne.

"Urbanization in Sri Lanka's Coastal Environment," M.H. Pavey.

Contents

Volume I

Preface	9
Foreword	11
List of Acronyms and Abbreviations	12
Section 1. Why a Second-Generation Coastal Resources Management Strategy is Required	15
Section 2. The Status of Coastal Resources Management in Sri Lanka Today	23
Section 3. The Context for Coastal Management: Likely Social, Economic and Environmental Conditions Within the Coastal Region After 2000	31
The People	
The Economy	
The Environment	
Section 4. Major Issues and Opportunities to Be Addressed in the Coastal Region	53
Issue A. Enhancing Food Production Through Environmental Management and Habitat Protection	53
A1. Agriculture	
A2. Fisheries	
A3. Aquaculture	
Issue B. Increasing Income and Generating Employment While Maintaining Environmental Quality	71
B1. Industry	
B2. Tourism	
References	80

Volume II

Introduction	
Section 5. Policies and Implementing Strategies	5
Long-Term Goals for Coastal Management	7
Resource Management Issues to Be Addressed	7
Policy 1. Work at the National and Local Levels	8
Policy 2. Implement a Monitoring Program	12
Policy 3. Implement a Research Program	15
Policy 4. Strengthen Institutional Capacity	18
Policy 5. Elaborate and Update the Coast Erosion Management Master Plan	19
Policy 6. Enhance Public Awareness	19

List of Figures

- Figure 1.1. Sri Lanka Territory and Exclusive Economic Zone
- Figure 1.2. Population Growth Trends and Projections, 1871-2040
- Figure 1.3. The Sri Lanka Coastal Zone as Defined by the Coast Conservation Act of 1981
- Figure 1.4. AGA Divisions in the Coastal Region, and Coastal River Basins
- Figure 1.5. Lands, Population and Production of the Coastal Region as Percent of National Total
- Figure 1.6. Important Coastal Habitats
- Figure 2.1. History of Coastal Management in Sri Lanka, 1960-91
- Figure 2.2. Investment Level for Shoreline Protection Works from 1955 to 1987 on the West, Southwest and South Coasts
- Figure 3.1. Birth and Death Rates and Natural Population Increases, 1841-1987
- Figure 3.2. Population Density in Coastal AGA Divisions, 1981
- Figure 3.3. Educational Attainment in the Whole Country
- Figure 3.4. Income Shares in Quintiles of Income Receivers
- Figure 3.5. Total Unemployed and as Percent of Work Force, 1952-86
- Figure 3.6. Trends in Population and Land Area per Person, 1871-2000
- Figure 3.7. Gross Domestic Product in the Coastal Region in 1983 and 1989
- Figure 3.8. Gross Domestic Agriculture Product for the Coastal Region and the Nation, 1989
- Figure 3.9. Trends in Employment, 1963-86
- Figure 3.10. Where the Jobs were in 1971 and 1986
- Figure 3.11. Distribution and Condition of Coral Reefs
- Figure 3.12. Basin Estuaries and Coastal Lagoons
- Figure 3.13. Coral Collection along the Southwestern Coast in 1984
- Figure 3.14. Erosion and Accretion Along the Coasts of Selected Countries
- Figure 3.15. Trends in Population Growth and Forest Cover
- Figure 3.16. Waste Sources Affecting the Kelani River Before Construction of the Ocean Outfall
- Figure 3.17. Drainage Canals and Water Bodies in North and South Colombo
- Figure 3.18. Some Linkages Among Coastal Habitats and the Activities Influencing Them
- Figure 4.1. Composition of Calorie Intake from Major Food Items, 1987

List of Figures

- Figure 4.2. Land Use in the Coastal AGA Divisions
- Figure 4.3. Source of Food Fish Production, 1989
- Figure 4.4. Total Landings from Marine Fisheries, 1926-88
- Figure 4.5. Total Fish Production, 1977-88
- Figure 4.6. Trends in the Trade of Ornamental Fish
- Figure 4.7. Major Fish Landing Sites and Fish Captured
- Figure 4.8. Estimated Fisheries Demand and Production Targets, 1990-94
- Figure 4.9. Potential Areas for Coastal Aquaculture Development
- Figure 4.10. Share of Cultured Shrimp in the Total Volume of Shrimp Exports
- Figure 4.11. Revenue from Tourism and Other Major Foreign Exchange Earners, 1982
- Figure 4.12. Major Tourist Areas and Hotel Room Capacities in 1983
- Figure 4.13. Tourist Arrivals, 1979-90
- Figure 4.14. Hotel Rooms in the Country and in Beach Resorts, Colombo City and Circuit

List of Tables

- Table 2.1. Applications Approved for Coastal Permits, 1983-87
- Table 3.1. Population Trends in Urban Environments, 1891-2001
- Table 3.2. Industrial and Agricultural Gross Domestic Product National and Coastal Region 1989
- Table 3.3. Extent of Coastal Habitats by District (ha)
- Table 3.4. Activities Contributing to Coastal Erosion
- Table 3.5. Location and Estimated Volume of Sand Mining, 1984 and 1991
- Table 4.1. Fish Supply and per Capita Consumption, 1977-89
- Table 4.2. Overall Fish Production (mt), 1980-89
- Table 4.3. Fishing Fleet and Levels of Production
- Table 4.4. Impacts on Coastal Habitats of Particular Concern to CCD
- Table 4.5. Shrimp Production, 1985-90
- Table 4.6. Percent Gross National Product Contributed by the Manufacturing Industry, 1982-91
- Table 4.7. Origin of Tourists by Region

Preface

Sri Lanka is known for its natural beauty—hills, rivers, waterfalls, forests, wildlife and sandy beaches—and its people have a rich cultural heritage. Can these assets be maintained in a healthy condition or will the increasing intensity of human activities lower the quality and productivity of the island's ecosystems and erode the quality of life of the societies they support? Can sustainable-use practices be put into effect which will accommodate human needs and uses without compromising the quality of the resource base? Can public awareness and participation be strengthened through education so that these questions and their answers are subjects of common discussion and government policy debates?

We cannot at present answer such questions in the affirmative. The current population of some 17 million is projected to increase to 24 million by 2040, and this will create unprecedented demands for food, industrial raw materials, energy, water and land. One-third of the population and two-thirds of the urbanized lands are today within the coastal region as also are the units producing two thirds of factory industrial output and 80 percent of the tourism-related infrastructure and sites. The major social, economic and institutional infrastructure of Sri Lanka will become larger and will almost certainly continue to be concentrated along the coast.

Coastal environments and their valuable resources of water, fisheries, estuaries and lagoons, mangroves, coral reefs and seagrasses, sand dunes, beaches and tourist sites, and arable land will increasingly come under pressure as human activity becomes more intense. Use conflicts will increase between social and economic groups and between human uses and the environment.

The strategies and management options contained in this document have evolved from the experiences gained from the first-generation efforts of coastal management in the 1980s pioneered by the Coast Conservation Department. The strategies suggested herein have grown out of extensive research and thinking by members of government and the private sector who were concerned about the future condition of Sri Lanka's rich coastal resources. These strategies are a response to the specific resource management issues that have been identified in the coastal zone. We have attempted to look at both the root causes of problems and their symptoms.

The policies and strategies we suggest were formulated through a lengthy process of analysis and discussion with a diverse group of national and international experts. They may be summarized as follows:

- A second-generation coastal resources management program must be implemented simultaneously at national, provincial, district and local levels and must actively involve the private sector.
- Special Area Management plans must be developed and must be implemented at specific geographic sites of ecological and economic significance.
- Monitoring and research programs must be undertaken to find answers to specific resource management problems concerning the utilization of coastal habitats, fisheries, water quality, mineral resources, and sites appropriate for aquaculture and tourism.
- The institutional and human resource capacity to address the management problems must be strengthened.
- Public awareness and education will be priorities for all aspects of the program.

Preface

Coastal 2000 is presented in two volumes. Volume I provides the rationale for a second-generation coastal resources management strategy and describes the current status of coastal management in Sri Lanka. It highlights the context of people, economy and environment in which resource management occurs and identifies the major resource management issues and opportunities. Volume II gives the policies and strategies for improved management of the coastal region. Volume I should logically precede Volume II, but the decision to divide the document into two volumes was made to accommodate those who would like to go straight to the substance of the recommendations.

The policies, their implementing strategies and wording in Volume II may not always be exactly in line with current Sri Lankan Government policy statements. *Coastal 2000* is a broad and far reaching document compiled before 1992 which could not anticipate current changes in Government policies and their wording.

Whatever your choice of approach, please bear in mind that *Coastal 2000* is action-oriented. It is innovative and forward-thinking and can bring favourable and significant change. Let us consider how we all can contribute to its implementation!

Stephen Olsen
Director
Coastal Resources Center
The University of Rhode Island

Alan T. White
Manager
Coastal Resources Management Project
Sri Lanka
The University of Rhode Island

Dianeetha Sadacharan
Manager
(Coastal Resources Development)
Coast Conservation Department
Sri Lanka

H.J.M. Wickremeratne
Consultant to Coastal Resource Management
Project, Sri Lanka.

J. I. Samarakoon
Consultant to Coastal Resource Management
Project, Sri Lanka.

Mervyn S. Wijeratne
In-Country Administrator
Coastal Resources Management Project
Sri Lanka

Foreword

Coastal 2000 is a valuable addition to recent planning efforts for environmental and resource management in Sri Lanka. It provides a farsighted view of the problems and suggests potential solutions which need to be tested and implemented over the coming decade. The two volumes of this document provide the background for coastal resources management and a reasonable plan of action based on solid evidence and practical approaches for addressing critical coastal resources management issues.

The priority issues in the coastal zone can only be resolved through the concerted efforts of a coalition of agencies and personnel in government working in close collaboration with communities and the private sector. This document should be seen as a detailed set of policies and actions that amplify the sections on coastal zone and resource management in the Coastal Zone Management Plan, the National Conservation Strategy, the National Environmental Action Plan and the National Investment Program. *Coastal 2000* shows how efforts that integrate traditional sectors and agency divisions can achieve long-lasting solutions to some of the pressing issues now facing the nation. This strategy must, thus, be integrated with other efforts to address environmental issues in Sri Lanka.

The Coast Conservation Advisory Council strongly endorses *Coastal 2000* as a necessary step toward actions needed to address our resource management problems in an integrated manner. This document should be used as a guide for more detailed planning and for field implementation in the immediate future. It has laid the groundwork for sorely needed programs which should be undertaken as soon as possible.

T.K. Dassanayake,
Chairman, Coast Conservation
Advisory Council
Secretary
Ministry of Ports and Shipping

B.S. Kahawita
Director
Coast Conservation Department

Acronyms and Abbreviations

ADB	Asian Development Bank
AGA	Assistant Government Agent
CCA	Coast Conservation Act
CCAC	Coast Conservation Advisory Council
CCD	Coast Conservation Department
CEA	Central Environmental Authority
CEMP	Coast Erosion Management Plan
CRM	Coastal Resources Management
CRMP	Coastal Resources Management Project
CZM	Coastal Zone Management
DANIDA	Danish International Development Agency
DWLC	Department of Wildlife Conservation
EIA	Environmental Impact Assessment
EEZ	Exclusive Economic Zone
FAO	Food and Agriculture Organization
GCEC	Greater Colombo Economic Commission
GDP	Gross Domestic Product
GSL	Government of Sri Lanka
GTZ	German Technical Cooperation Agency
ha	hectare
ID	Irrigation Department
IPZ	Investment Promotion Zone
LHI	Lanka Hydraulic Institute Limited
kg	kilogram
km	kilometer
m	meter
mt	metric ton
MEIP	Metropolitan Environmental Improvement Program
MFAR	Ministry of Fisheries and Aquatic Resources
MSY	Maximum Sustainable Yield
NARA	National Aquatic Resources Agency
NARESA	Natural Resources, Energy and Science Authority
NGO	Non-governmental Organization
NORAD	Norwegian Agency for International Development
SAM	Special Area Management
UDA	Urban Development Authority
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Program
URI	University of Rhode Island
USAID	United States Agency for International Development



**Recommendations for
A Resource
Management
Strategy for
Sri Lanka's
Coastal Region
Volume I**



Section 1.

WHY A SECOND- GENERATION COASTAL RESOURCES MANAGEMENT STRATEGY IS REQUIRED

Sri Lanka as an island republic faces daunting challenges as it moves into the twenty-first century (Figure 1.1). A population of 17 million already places it among the countries with a high population density. Although the current rate of population growth is low, it is still expected to produce half again as many people before the population stabilizes at about 24 million around 2040 (Figure 1.2). Population pressure is perhaps the root cause for poverty, community violence and environmental degradation. Such problems can only be solved by bold and progressive policies and a commitment to rational planning that directly addresses both the needs of the people and the condition of the ecosystem of which they are a part.

This coastal resources management strategy is an attempt to define the issues, the policies and the actions that together can provide the foundation for a long-term planning and management process for the coastal region of the country. Such planning and management must be based upon scientific principles and a pragmatic recognition of social realities. This strategy is based upon experience gained in managing coastal environments in Sri Lanka and other nations around the world.

A coastal strategy is required because of the unique identity and significance of the coastal region. The question of whether sustainable forms of development, and therefore a sustainable and healthy society, can be achieved in the twenty-first century must be answered in the coming decade. Responses to the key issues and questions will unfold during the 1990s. In some cases, irrevocable environmental management decisions will be made. The key questions that must be addressed in the 1990s, as stated in *Natural Resources of Sri Lanka* (NARESA/USAID, 1991), are:

- How will information on trends in the condition and use of ecosystems be gathered, interpreted and processed in making decisions on the manner in which resources will be managed?
- How will the public and concerned coastal communities be involved in framing coastal resources management strategies?
- How will environmental objectives be achieved by governmental and non-governmental entities?

This strategy attempts to outline the process by which questions may be answered for the coastal region of the nation.

The first-generation efforts in coastal management in Sri Lanka, commencing in the early 1980s, has had many successes including the development of a Coastal Zone Management Plan which has led to the formulation of *Coastal 2000*. Work in the 1980s has also made apparent certain problems in the approach to coastal management which now need to be adjusted. Examples of such problems and suggested changes include:

- Single agency and sectoral approaches to solving coastal resources management problems must be replaced by a more comprehensive perspective and approach.
- The implementation of the Coast Conservation Act (CCA) by the Coast Conservation Department (CCD) has demonstrated that the emphasis on regulation needs to be revised.
- Important resource management concerns such as water quality, habitat degradation, natural resource use by people and institutional

Section 1.

WHY A SECOND-GENERATION COASTAL RESOURCES MANAGEMENT STRATEGY IS REQUIRED

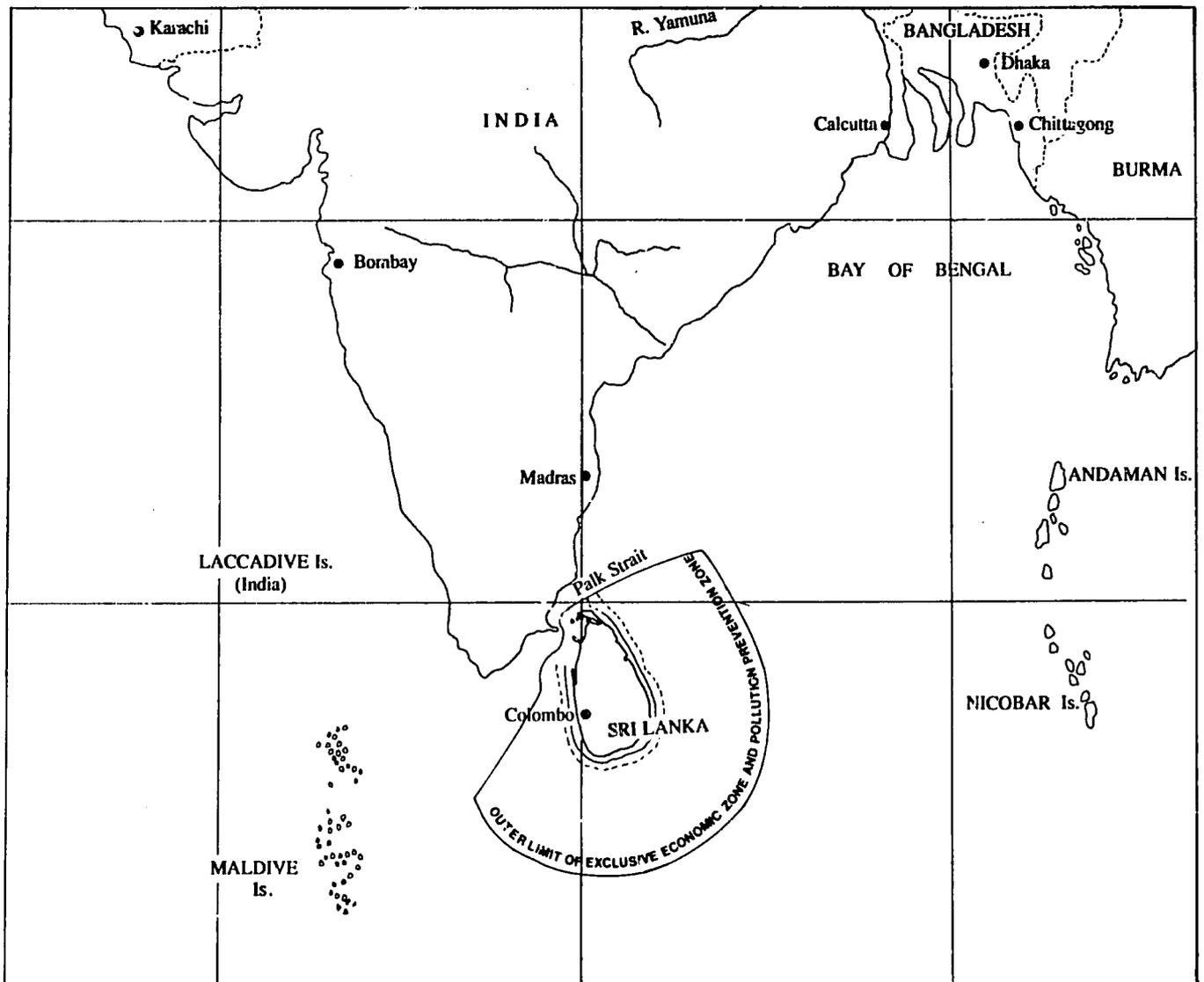
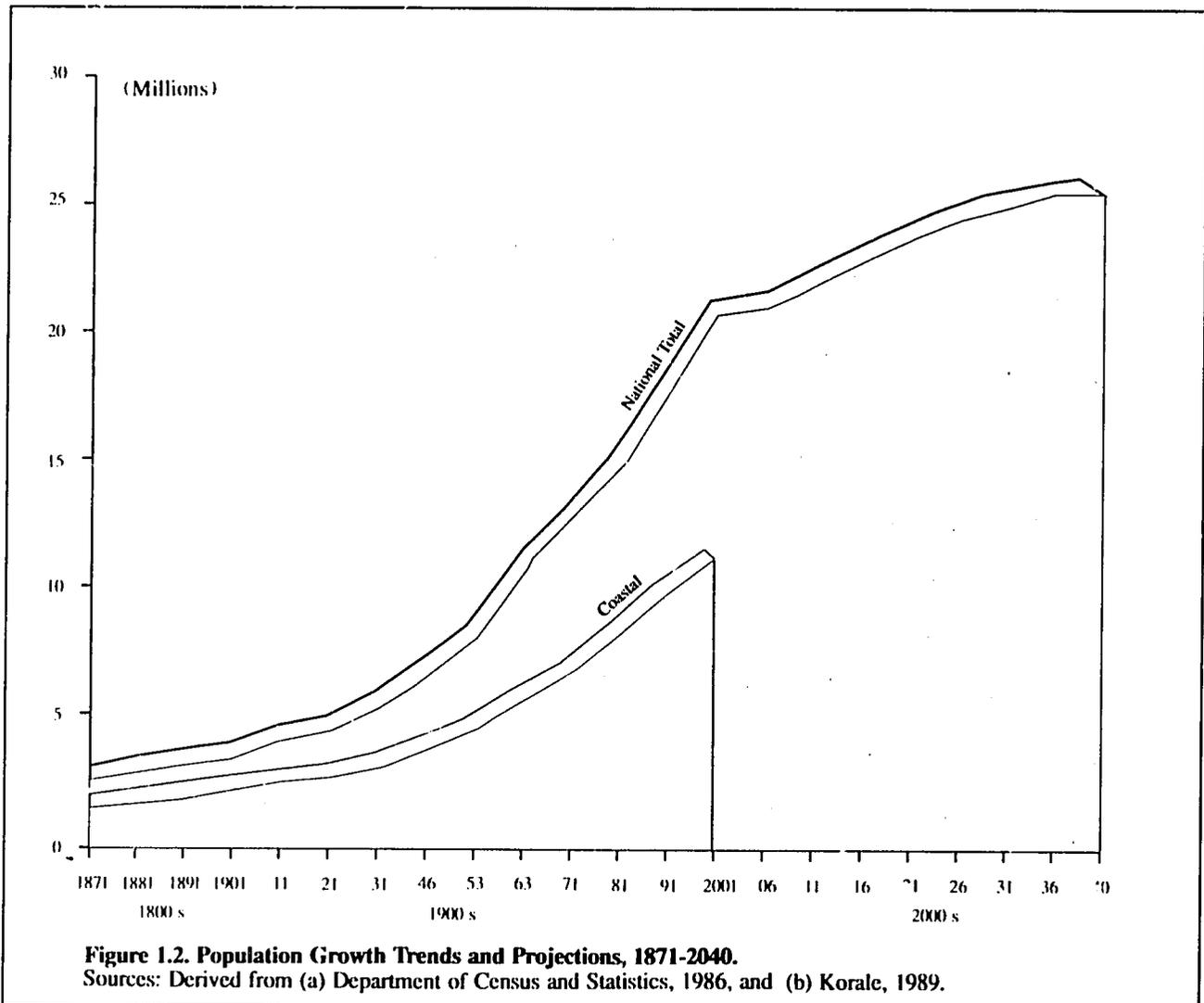


Figure 1.1. Sri Lanka Territory and Exclusive Economic Zone (Survey Department of Sri Lanka, 1988).

Section 1.

WHY A SECOND- GENERATION COASTAL RESOURCES MANAGEMENT STRATEGY IS REQUIRED



weaknesses are interrelated and require strategies involving more than one agency and a variety of management techniques.

- The narrow geographic definition of “the coastal zone” does not adequately recognize the interconnections within coastal ecosystems and resources.
- Participation by local and provincial officials and coastal communities in the formulation of plans and strategies must be strengthened.

The Problem of Boundaries

Worldwide experience suggests that boundaries of the coastal region should be pragmatically defined to include those areas and activities that are directly related to the resource management issues upon which a program will focus. Thus, the size of the region considered will vary depending upon whether the primary concern is shorefront construction, coastal habitat management or coastal water quality.

The Coastal Zone Management Program administered by the CCD has been concerned

Section 1.

WHY A SECOND-GENERATION COASTAL RESOURCES MANAGEMENT STRATEGY IS REQUIRED

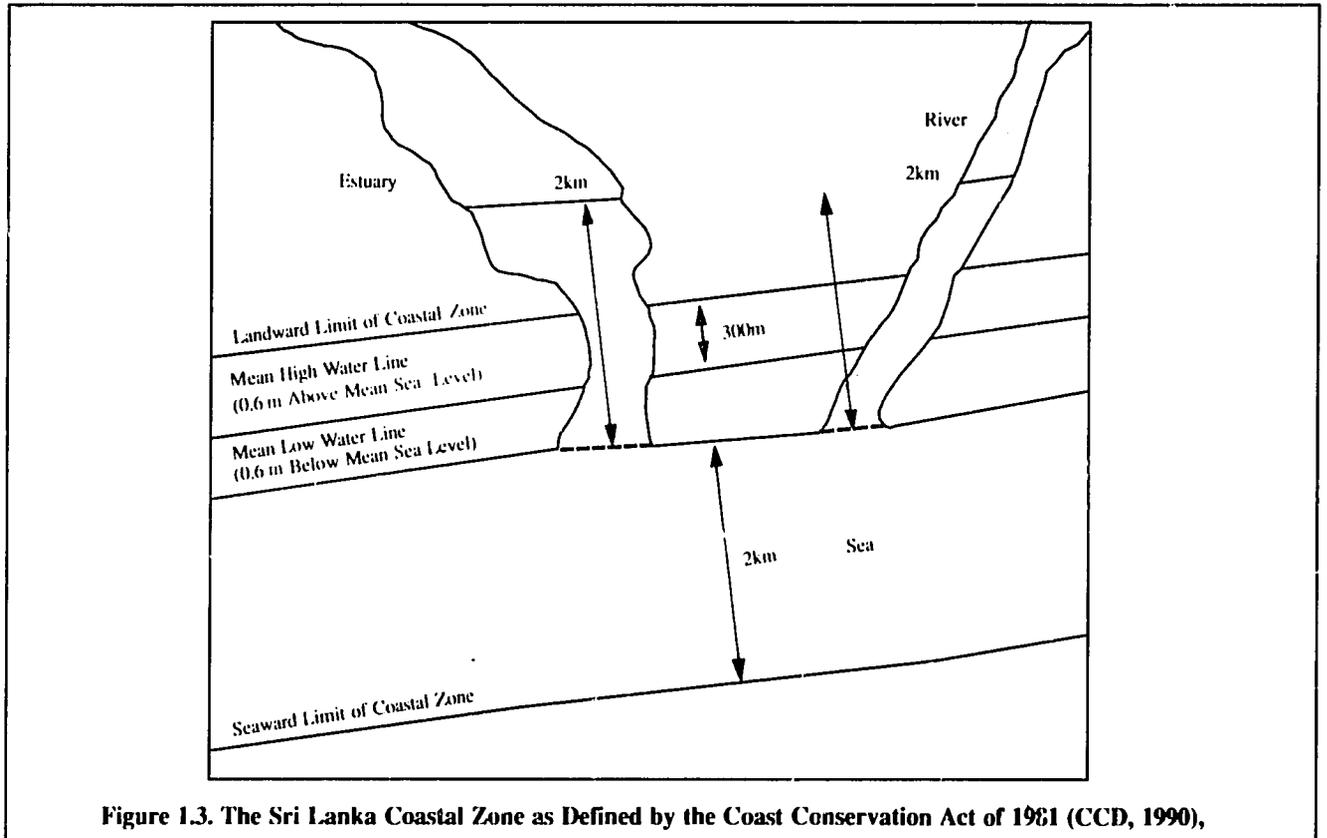


Figure 1.3. The Sri Lanka Coastal Zone as Defined by the Coast Conservation Act of 1981 (CCD, 1990),

primarily with coastal erosion and shorefront construction. For regulatory purposes, its jurisdiction is defined by the Coast Conservation Act as a 2-km band of ocean and an adjoining ribbon of land extending 300 m inland (Figure 1.3). This boundary has proved inadequate for even the effective management of shorefront erosion and construction. It is totally inadequate if integrated land-use and water-use plans for coastal ecosystems or habitat management are to be attempted. Such planning would, ideally, consider coastal watersheds which drain directly to the sea and the adjoining Exclusive Economic Zone (EEZ) (Figure 1.1).

For the purposes of this strategy, we have chosen to define the coastal region as the 67 divisions of the Assistant Government Agents (AGA) with a coastal boundary (Figure 1.4).

This provides for an inland reach of up to 50 km. This definition is the best practical option when attempting to characterize, from the available secondary information, the coastal area of the country. It is an area sufficiently large to make regional planning feasible.

So defined, Sri Lanka's coastal region (Figures 1.4 and 1.5) contains:

- 24 percent of the land area and 32 percent of the population (1981)
- approximately 65 percent of the urbanized land area
- the units producing two thirds of the total output of organized (Factory) Industry.
- the nation's principal transportation infrastructure

Section 1.

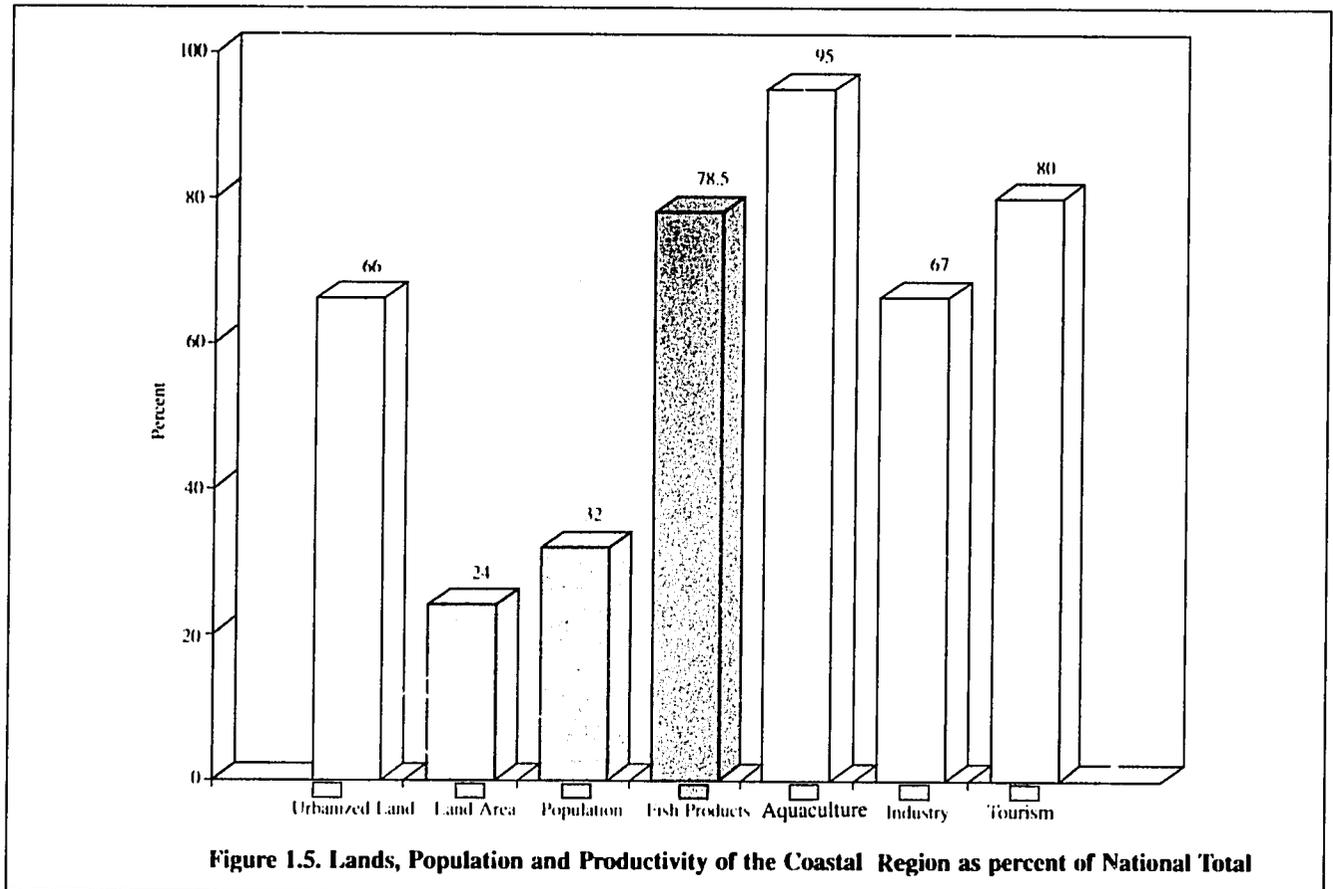
WHY A SECOND- GENERATION COASTAL RESOURCES MANAGEMENT STRATEGY IS REQUIRED



Figure 1.4. AGA Divisions in the Coastal Region and Coastal River Basins
(Survey Department of Sri Lanka, 1988).

Section 1.

WHY A SECOND-GENERATION COASTAL RESOURCES MANAGEMENT STRATEGY IS REQUIRED



- approximately 80 percent of the tourism-related infrastructure and sites
 - the most significant sources of water pollution
 - fisheries that produce about 30 percent of the animal protein crucial to the diet of the populace and nearly 80 percent of total annual fish production.
 - habitats critical to the sustained production of fisheries, the maintenance of good water quality, and the scenic values important to quality of life for both residents and tourists. These habitats include coral reefs, seagrass beds, mangroves, brackish wetlands, estuaries and lagoons (Figure 1.6) and represent:
 - some of the richest biodiversity reserves that include coral reefs, seagrass beds and mangroves
 - substantial reserves of valuable minerals
 - significant extents of agricultural lands
 - sizable areas of usable land not yet developed
- In practical terms, this coastal resources management strategy does not aim to “manage” the entire coastal region so defined. Rather, it proposes to expand the view of planners so that they will see this coastal region as the context within which coastal resources management will

Section 1.

WHY A SECOND- GENERATION COASTAL RESOURCES MANAGEMENT STRATEGY IS REQUIRED

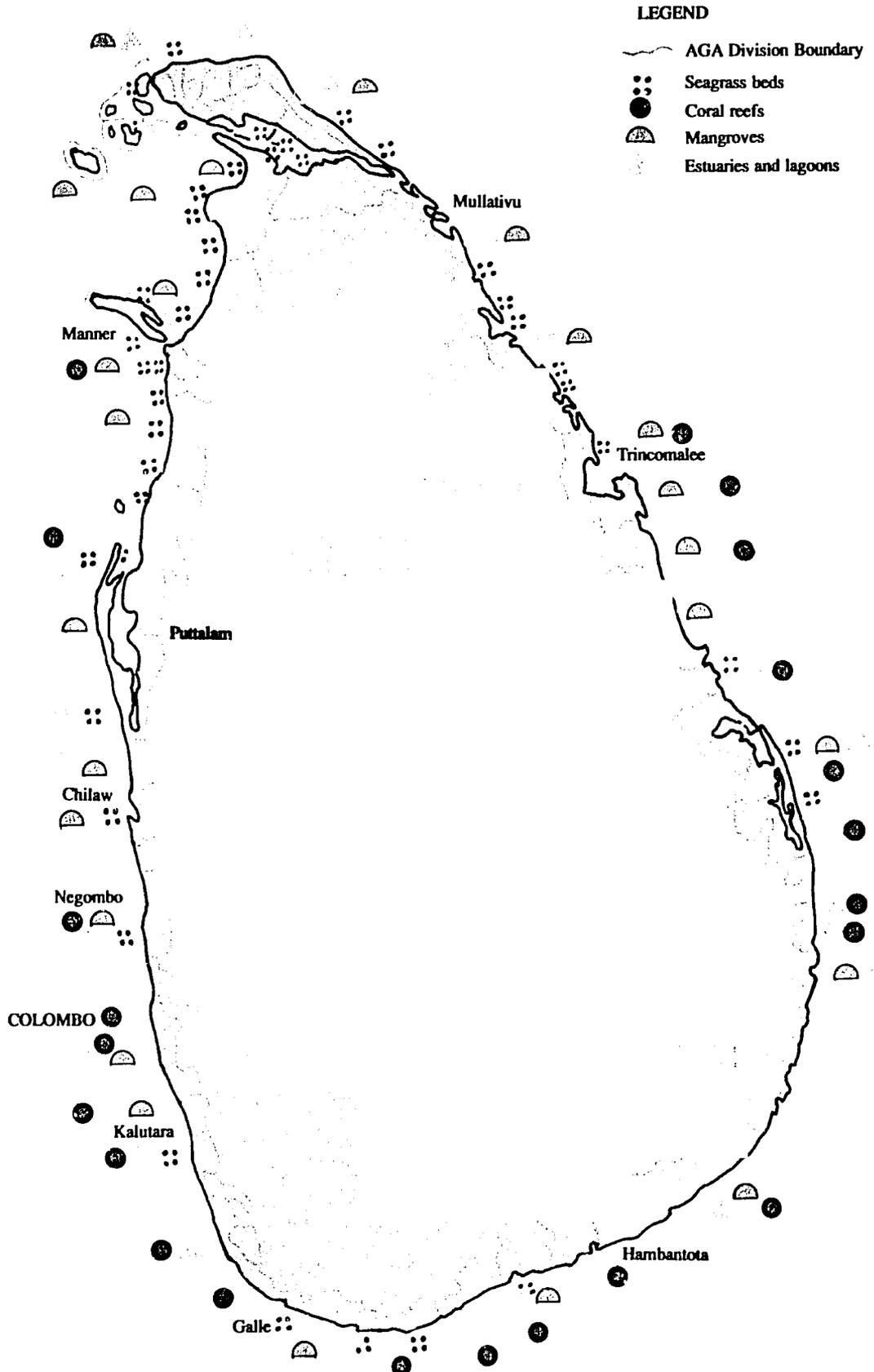


Figure 1.6. Important Coastal Habitats (Survey Department of Sri Lanka, 1988).

Section 1.

WHY A SECOND- GENERATION COASTAL RESOURCES MANAGEMENT STRATEGY IS REQUIRED

be formulated. This expanded perspective will provide for the inclusion of all critical coastal habitats and other valuable resources and, more importantly, encourage the examination of the root causes of issues which degrade, deplete or destroy coastal areas and their resources.

Responding to People's Needs

A second-generation coastal program must be designed so that it is perceived by those affected as a positive effort to sustain and improve their quality of life in tangible terms. It must address the priority issues of coastal management with necessary actions. The coastal management program should not be seen as a set of constricting regulations supplemented only by research and workshops.

In Sri Lanka, as elsewhere, the most basic needs are adequate food, shelter and meaningful employment. The central challenge in the coastal region is to maintain the quality and processes of the ecosystems that produce wealth, employment and an adequate quality of

life for a population more than 50 percent larger than it is today. The problems will be compounded by the variety and intensity of human uses that will place ever-increasing demands on coastal habitats, water quality and the environment in general.

A second-generation coastal program is needed to respond to these basic needs. It will simultaneously work to influence, and at times regulate, human behavior so that practices destructive to environmental quality are contained and conflicts among competing user groups resolved. This will require greatly expanding the scope of the regulatory and planning activities carried out by the CCD and the research of the National Aquatic Resources Agency (NARA). Many other agencies of the government must become involved and, most importantly, the coastal communities affected by the program must participate actively and must work for their own benefit. For any new coastal resources management program to succeed it must have the support of significant segments of the people it affects.

Section 2.

THE STATUS OF COASTAL RESOURCES MANAGEMENT IN SRI LANKA TODAY

Sri Lanka's coastal management program is recognized as one of the most successful and advanced among developing nations. Since 1963, coastal management has been a concern of the government, and many activities have been initiated, as summarized in Figure 2.1. Its strength and effectiveness come from the decision to focus upon a few well-defined issues at a time and to build the program incrementally as experience is gained. The policies and procedures of the program are being successfully implemented, and they have brought credibility and attracted funding for the effort. Expansion of coastal management activities will need to be carefully designed so that the early successes and the incremental approach are not compromised.

Table 2.1. Applications Approved for Coastal Permits, 1983-90 (CCD, 1991).

Year	Houses	Sand Mining	Hotels	Miscellaneous	Total
1983	4	10	1	2	17
1984	33	72	0	0	105
1985	40	103	5	14	162
1986	206	87	2	10	305
1987	100	60	3	12	175
1988	108	82	2	37	229
1989	97	63	0	18	178
1990	95	274	7	30	406
Total	683	751	20	123	1577

The Coast Conservation Act of 1981 has assigned the CCD three primary responsibilities within the designated coastal zone (Figure 1.3):

- policy formulation, planning and research
- administration of permit procedures regulating coastal development activities, and
- construction and maintenance of shoreline protection works

The permit program has been functioning since 1983, and currently processes some 500 applications each year for a variety of construction activities, as shown in Table 2.1.

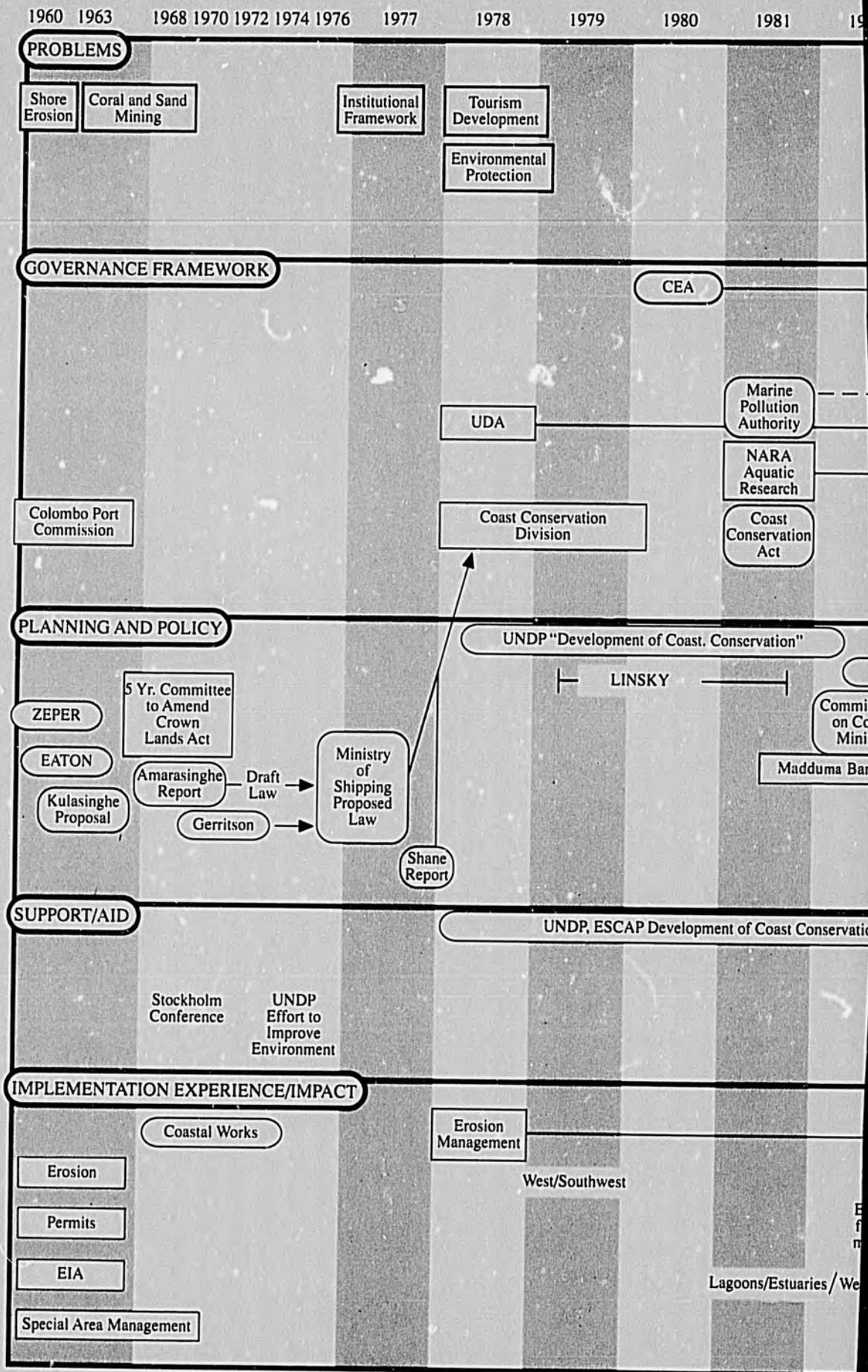
The Coast Conservation Act (CCA) calls for the preparation and implementation of comprehensive resource management plans. It also established the Coast Conservation Advisory Council (CCAC), which reviews coastal management problems of significant concern and advises the Minister of Ports and Shipping.

A national Coastal Zone Management (CZM) Plan was prepared by the CCD and approved by the Cabinet of Ministers in 1990. This first-generation plan deals with the following coastal problems: shoreline erosion, loss and degradation of natural coastal habitats, and loss and degradation of historic, cultural, recreational and scenic sites.

This first-generation CZM Plan was designed to address the most critical shorefront problems first—specifically, those problems which have resulted in significant economic and social losses and which are most amenable to management within the constraints of available funding and personnel. The Coast Conservation Act calls for periodic revisions of the national CZM Plan.

The national CZM Plan is complemented by the Coast Erosion Management Master Plan (CEMP), which is now being implemented along the southwest coast. Thus, the existing management framework consists of an interlocking set of activities in:

- planning and policy development
- regulation
- construction
- research



CEA - Central Environment Authority
 CRMP - Coastal Resources Management Project
 EIA - Environmental Impact Assessment

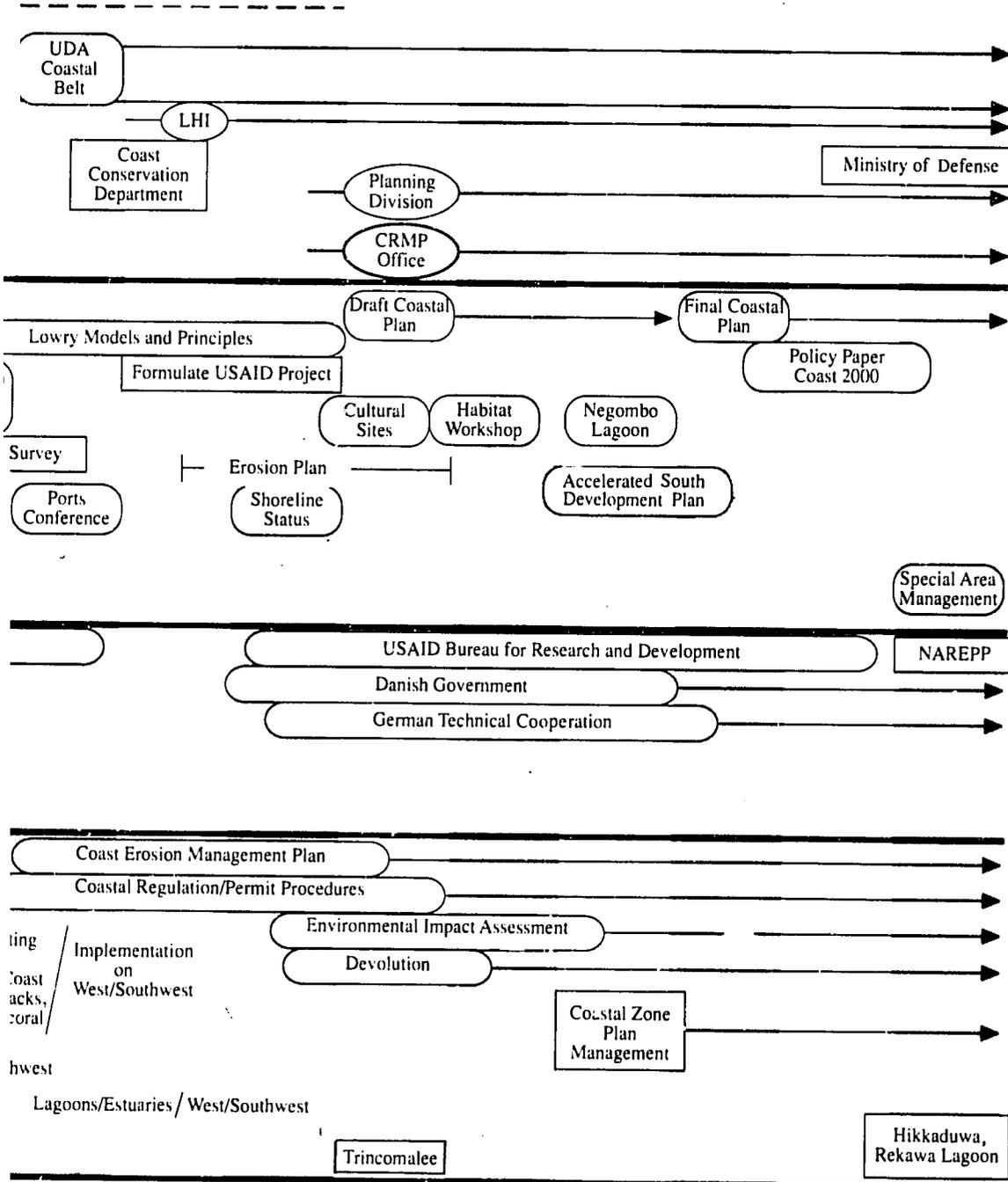
ESCAP - Economic and Social Commission for Asia and the Pacific
 LHI - Lanka Hydraulic Institute
 NARA - National Aquatics Resources Authority
 NAREPP - National Resources and Environmental Policy Plan

Figure 2.1. History of Coastal Management in Sri Lanka, 1960-91

1983 1984 1985 1986 1987 1988 1989 1990 1991



CEA Amendments



on for Asia and the Pacific
 ncy
 nment Policy Project

UDA - Urban Development Authority
 UNDP - United Nations Development Program
 USAID - United States Agency for International Development

Section 2.

THE STATUS OF COASTAL RESOURCES MANAGEMENT IN SRI LANKA TODAY

- interagency coordination
- education and training

In 1983, the engineering research unit within the CCD was transformed into a government-owned company, the Lanka Hydraulic Institute Limited (LHI); LHI undertakes the engineering studies required by the CCD as well as those required by other governmental and private entities engaged in coastal development.

The CCD has been highly successful in mobilizing donor funds in support of its programs. Foreign aid provisions in 1989 totalled 153 million rupees (US \$39 million) compared to 37 million rupees (US \$0.9 million) in government funds. The largest portion of foreign aid is for the construction of shoreline protection works. The major donors have been the Danish International Development Agency (DANIDA) and, more recently, the German Technical Cooperation Agency (GTZ). The United Nations Development Program (UNDP) supported the program substantially in its formative years. Funding by the United States Agency for International Development (USAID) has been directed primarily at policy development over the six years of The University of Rhode Island (URI)/USAID Coastal Resources Management Project (CRMP).

The CCD also initiates research on problems related to the implementation of the CZM Plan. The CCD has sponsored research on the social and economic aspects of coral mining, on how to improve permitting procedures, and how to better educate and involve the coastal communities in coastal management.

CCD's planning and regulatory program for the coastal zone is complemented by the

research and planning activities of the National Aquatic Resources Agency (NARA), created by statute in the same year as the CCD. NARA is primarily a research organization. The agency has assembled researchers who are organized into a hydrography office, an oceanographic division, a biological unit that focuses on fisheries, and a group dedicated to aquaculture. NARA maintains a library, training center and an extension unit. When closely linked, the CCD and NARA could provide the major ingredients for integrated resource management in the coastal region.

CCD's mandate is unusual among government institutions because it was designed to help coordinate the sectoral activities of many other agencies. It can do so because it exercises regulatory authority over all new coastal development. In practice, the CCD carries out its mandate through frequent and informal interagency discussion and coordination and by periodic meetings of the CCAC.

Other agencies with significant coastal jurisdiction include the following:

- The Ministry of Fisheries and Aquatic Resources (MFAR) has major responsibilities for fishery resources and their exploitation within the coastal zone and the EEZ.
- The Urban Development Authority (UDA) exercises comprehensive management authority over development in all areas designated as "urban." Detailed land-use plans have been developed for some rapidly growing urban centers (Colombo, Ambalangoda, Hikkaduwa), and others are in progress. All building construction within coastal areas requires a permit from the UDA or one of its authorized agents.

Section 2.

THE STATUS OF COASTAL RESOURCES MANAGEMENT IN SRI LANKA TODAY

- The Irrigation Department (ID) has been the pioneer in building coastal outfall structures for drainage and the prevention of sandbar formation, and has been responsible for the construction of several groynes at Wellawatta, Panadura, Madampe, Hikkaduwa and Koggala. The ID exercises authority over all interprovincial rivers.
- The Central Environmental Authority (CEA) has responsibility for maintaining environmental quality, both coastal and nationwide. This mandate is exercised through environmental standards and the implementation of a licensing system and by the formulation of policies for environmental management in general.
- Other more specialized development-oriented agencies operating in the coastal zone include the Sri Lanka Ports Authority, the Sri Lanka Land Reclamation and Development Corporation, Ceylon Fisheries Harbours Corporation, and the Greater Colombo Economic Commission (GCEC). Other agencies like the Ceylon Electricity Board (which has responsibility for establishing thermal electric generating plants) can significantly affect coastal resources.

Lessons Learned from the First-Generation Efforts in Coastal Management

Coastal management in Sri Lanka has evolved a necessary supportive national framework but has not yet focused on how to involve coastal communities and local government in the resource management process.

Coastal management currently consists mainly of coastal erosion management and regulation of development along the shorefront.

The Coast Erosion Management Master Plan has addressed many of the urgent erosion problems in populated coastal areas. The ambitious and costly construction projects for erosion control of the CCD are the best available and practical solution to past siting mistakes, when roads, railway lines and important buildings were constructed so close to the ocean that they are now threatened by natural processes of sea erosion (Figure 2.2). In some cases, structures for erosion control built before the creation of the CCD have accelerated the natural processes of coastal erosion along the southwest coast of the country.

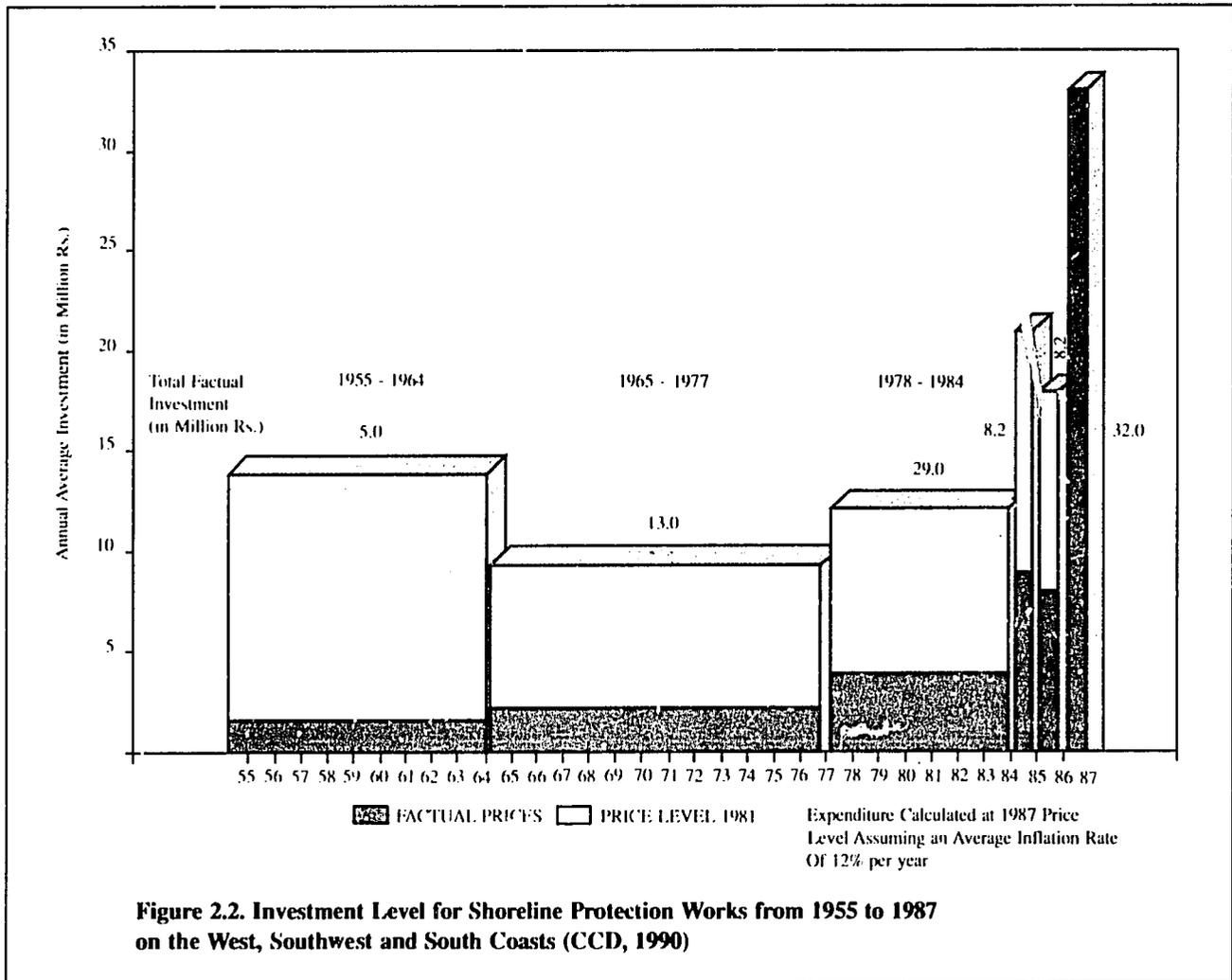
The regulatory program as administered by the CCD is essentially reactive. The program responds to proposals made by other governmental agencies and private developers for construction and alteration of the coastline. The CCD attempts to minimize the environmental and social impacts of development projects through its permit procedures, and in some cases subjects the development proposals to the environmental impact assessment requirements. It also ensures that environmentally and structurally appropriate siting decisions are made.

More than a decade of attempts to halt the destructive practices of coral mining and uncontrolled sand mining have demonstrated to the CCD that it cannot address the root causes of such problems on its own or through the imposition of regulations. It is now evident that such regulation alone does not lead to effective resource management.

In the case of sand mining, the CCD has managed to stop the large-scale removal of sand from beaches in most areas and to regulate it in the downstream sections of rivers discharging

Section 2.

THE STATUS OF COASTAL RESOURCES MANAGEMENT IN SRI LANKA TODAY



into the southwest coast. The continuing high demand for sand for construction, however, means that the objective can only be to avoid removing more sand than can be replaced by the rivers each year. This policy is nevertheless circumvented when miners move their operations upstream beyond the 2-km regulatory reach of the CCD. Thus, despite CCD's efforts, there is a net loss of sand to the coast. This circumvention again highlights the need for a

broader program and for more provincial and local involvement.

The experience with coral mining has been much more frustrating. Coral mining is a lucrative activity, and in some areas has been practised for generations. Although only a portion of the coral used is taken from living reefs, the practice of reef breaking is significant enough to have severely degraded reefs along

Section 2.

THE STATUS OF COASTAL RESOURCES MANAGEMENT IN SRI LANKA TODAY

some stretches of the coast, particularly in the vicinity of Hikkaduwa. Since this coast is prone to erosion, reef breaking removes the natural system of barriers and contributes directly to increased wave erosion and the destruction of property and infrastructure. The CCD's attempts to stop or even reduce reef breaking have been frustrated by several factors. These include lack of adequate political support, the difficulty of providing acceptable alternative livelihoods, and the inability of the CCD, with limited resources and influence, to sponsor research on the alternative sources of lime available on the island and thereby to mobilize a coordinated effort to stop the practice.

Time and again, the CCD has learned that an approach to resource management that focuses on regulation is too narrow in scope and cannot meet the complex set of needs of coastal communities. Regulation alone tends to alienate the coastal residents affected. It has proved difficult to mobilize the collaborative

effort of many agencies and levels of government to address the root problems of environmental degradation in the coastal region. The experience gained in coastal management in Sri Lanka in the 1980s has shown that the scope of the endeavor must be broadened. It indicates that a collaborative effort on the part of several governmental agencies, non-governmental organizations (NGOs) and local communities is required and that the geographic area and issues addressed must be expanded.

The CCD must transform itself from a primarily regulatory agency to a service-oriented organization. It needs to provide the leadership, the coordination, the technical assistance and the training that will be required if a successful, scientifically based coastal planning and management strategy is to be effective. It needs to facilitate locally based planning and implementation efforts. Such an expanded agency must become proactive in its approach to coastal management, and be allowed to cover a wider area and scope of coastal-related activities.



Barrier walls constructed on the beachfront of hotels often exacerbate the erosion problem when poorly designed and sited. - A White

Section 3.

THE CONTEXT FOR COASTAL MANAGEMENT: LIKELY SOCIAL, ECONOMIC AND ENVIRONMENTAL CONDITIONS WITHIN THE COASTAL REGION AFTER 2000

Projecting the future is always risky and economic projections are seldom made for more than five years. But when the conditions of the environment, and the time required to instill new modes of thinking within a society and to develop new or significantly different institutions are considered, a decade is a minimal time frame. The following projections for Sri Lanka for the 1990s are based upon a set of conservative assumptions:

- Provincial government will evolve and provide for a more decentralized allocation of authority and responsibility.
- Population growth will continue at a moderate rate, and an unusually literate and well-educated populace will continue to be the nation's largest asset.
- Ethnic tensions will subside but not disappear, making it unlikely that large-scale redistribution of the population will occur.
- Civil unrest will decrease; this will pave the way for a surge of development that will produce new nodes of industrial and tourism activity, particularly along the north and east coasts.
- No large-scale natural disturbances will significantly alter the environment; it is expected, however, that environmental degradation due to human activities that cause deforestation, erosion, water pollution and loss of habitat and biological diversity will continue and increase.
- Concern for environmental quality and the need to improve the management of ecosystems will continue to rise worldwide, making international funds available for innovative resource management strategies that address the root causes of environmental degradation.

These assumptions suggest that existing trends in the population, the economy and the environment of Sri Lanka will continue during the next decade along their present trajectories. This means, however, that environmental degradation will increase and produce ever-greater burdens on life support systems and on the coastal economy.

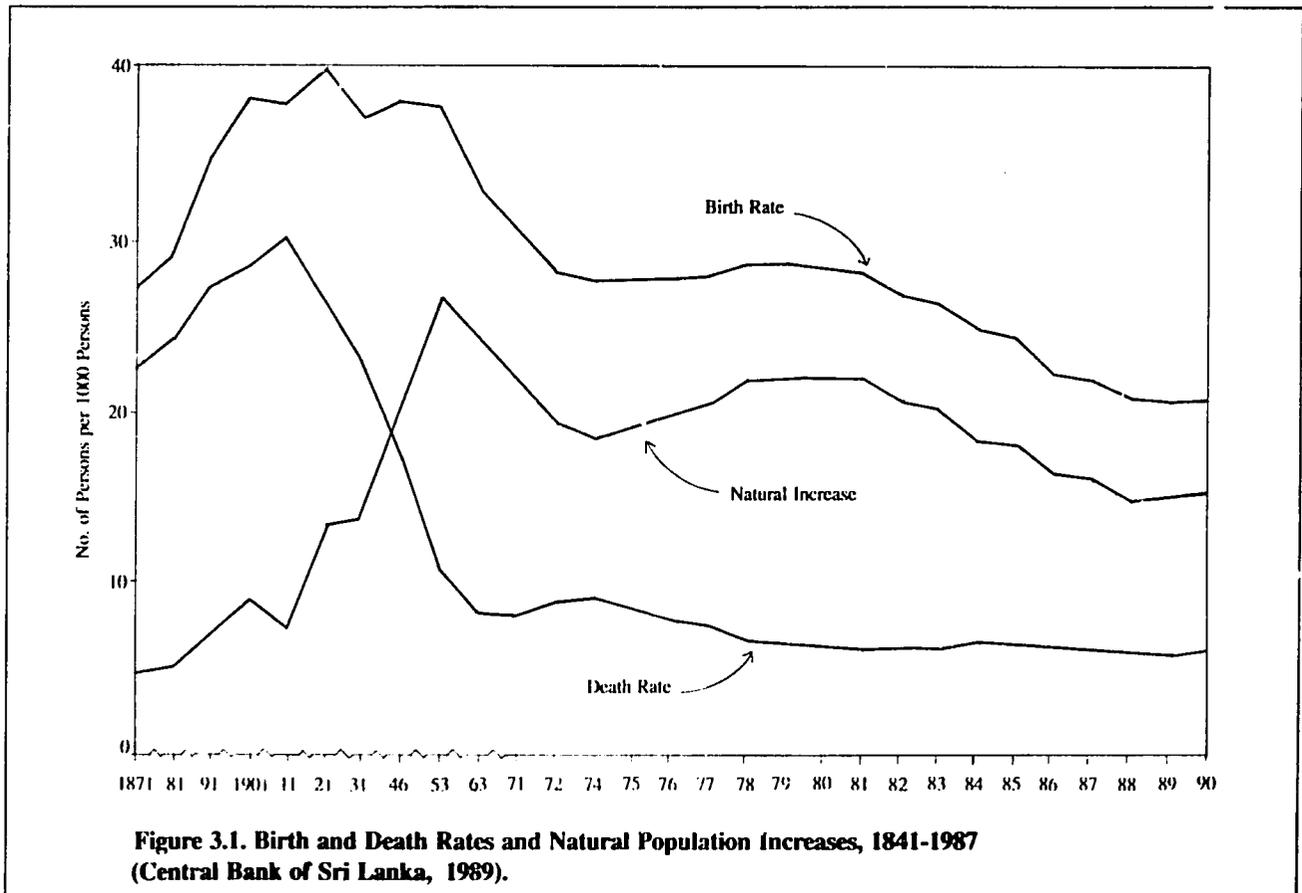
The People

To quote from *Sri Lanka National Conservation Strategy*, "The resources of a country can sustain only a certain size of population at a given standard of living using a given level of technology. This population is referred to as the carrying capacity of the country" (CEA, 1988). In Sri Lanka, the annual rate of population increase has been reduced from a high of over 2.0 percent in the 1970s to less than 1.5 percent by 1990 (Figure 3.1). If the current lower rate of growth is maintained, the nation's population will still increase by 31 percent, from 14.8 million in 1981 to 19.3 million in 2001 (Figure 1.2). Even at such a seemingly low rate of growth the population will double every 46 years. Estimates vary somewhat, but demographers believe that the nation's population will stabilize at 23 to 25 million by the middle of the next century. This means that the ecosystems and economy of Sri Lanka will have to support 50 percent more people. Yet, the attainment and maintenance of high standards of health and education are known to be the prerequisites for low rates of population growth.

Today, the population is concentrated in the coastal region but is much more dense in some provinces than in others (Figure 3.2). Two-thirds of the country's land areas in the north and east provinces currently support only 13 percent of the people but include 60 percent of

Section 3.

THE CONTEXT FOR COASTAL MANAGEMENT: LIKELY SOCIAL, ECONOMIC AND ENVIRONMENTAL CONDITIONS WITHIN THE COASTAL REGION AFTER 2000



the nation's coastline. In all cases the trend is for the population to concentrate along the coast and increase in urban areas (Table 3.1).

Despite a very low per capita income of US \$465 in 1991, Sri Lanka rates high in several physical quality-of-life indicators such as life expectancy. Educational attainment in Sri Lanka is also relatively high (Figure 3.3). The major problems faced by the society are unemployment and poverty, communal violence and environmental degradation. Violence and political turmoil were the overriding concerns during the 1980s.

Table 3.1. Population Trends in Urban Environments, 1891-2001 (Department of Census and Statistics, 1986).

Census Year	Percent Share Urban Population in National Population
1891	10.6
1901	11.6
1911	13.1
1921	14.2
1946	15.4
1953	15.3
1971	22.4
1981	21.5
2001	30.0*

* Estimated from current trends.

Section 3.

THE CONTEXT FOR COASTAL MANAGEMENT: LIKELY SOCIAL, ECONOMIC AND ENVIRONMENTAL CONDITIONS WITHIN THE COASTAL REGION AFTER 2000

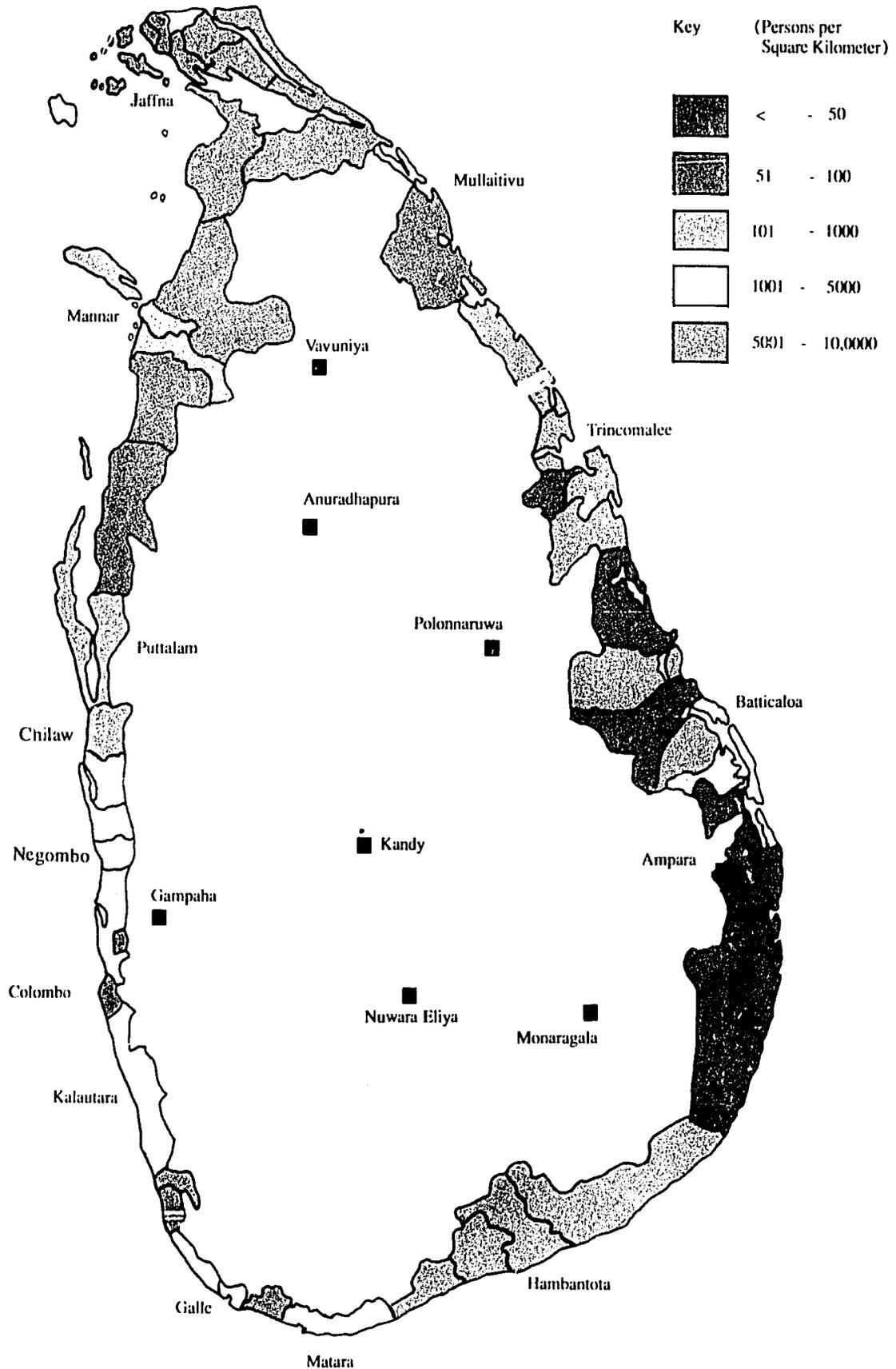
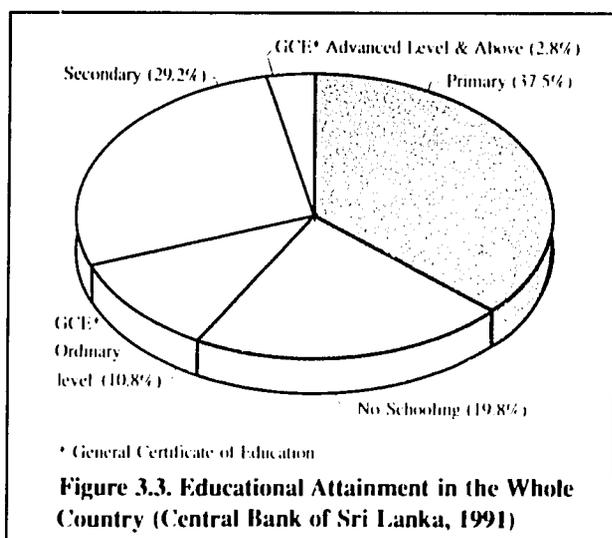


Figure 3.2. Population Density in Coastal AGA Divisions, 1981 (Survey Department of Sri Lanka, 1988).

157

Section 3.

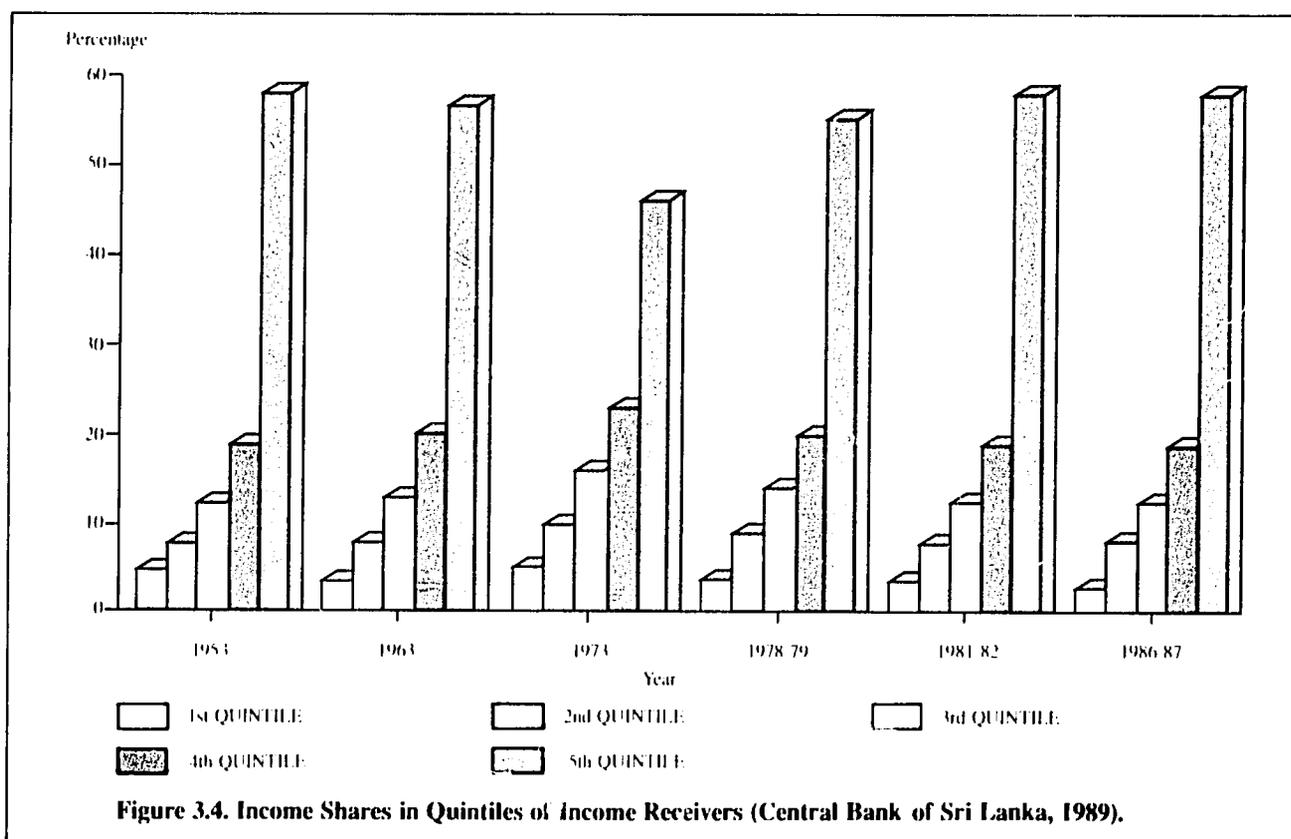
THE CONTEXT FOR COASTAL MANAGEMENT: LIKELY SOCIAL, ECONOMIC AND ENVIRONMENTAL CONDITIONS WITHIN THE COASTAL REGION AFTER 2000



The distribution of wealth is skewed, with the wealthiest 20 percent of the population enjoying more than half of the nation's income (Figure 3.4). The wealthy have maintained this share for thirty years. This contrasts with the poorer 40 percent of the population, which has steadily lost ground during the same period.

This situation, when combined with the chronic problems of high unemployment and underemployment, is widely recognized to be a major cause of the unrest that has prevailed in the country during the past five years (Figure 3.5). Levels of overall employment have increased in recent years but not sufficiently to reduce the proportion of the total population without work. A government program for poverty alleviation, which began in 1989, aims at lowering the unemployment level significantly.

As long as Sri Lanka remains primarily an agricultural economy, the growing number of people will threaten social stability. The land-man ratio is projected to fall from about 2.5 ha in 1871 to 0.3 ha in 2000 (Figure 3.6). The number of landless poor in rural areas has grown sharply. Making a livelihood as a farmer is no longer an option for an increasing segment of the rural populace. This problem is



Section 3.

THE CONTEXT FOR COASTAL MANAGEMENT: LIKELY SOCIAL, ECONOMIC AND ENVIRONMENTAL CONDITIONS WITHIN THE COASTAL REGION AFTER 2000

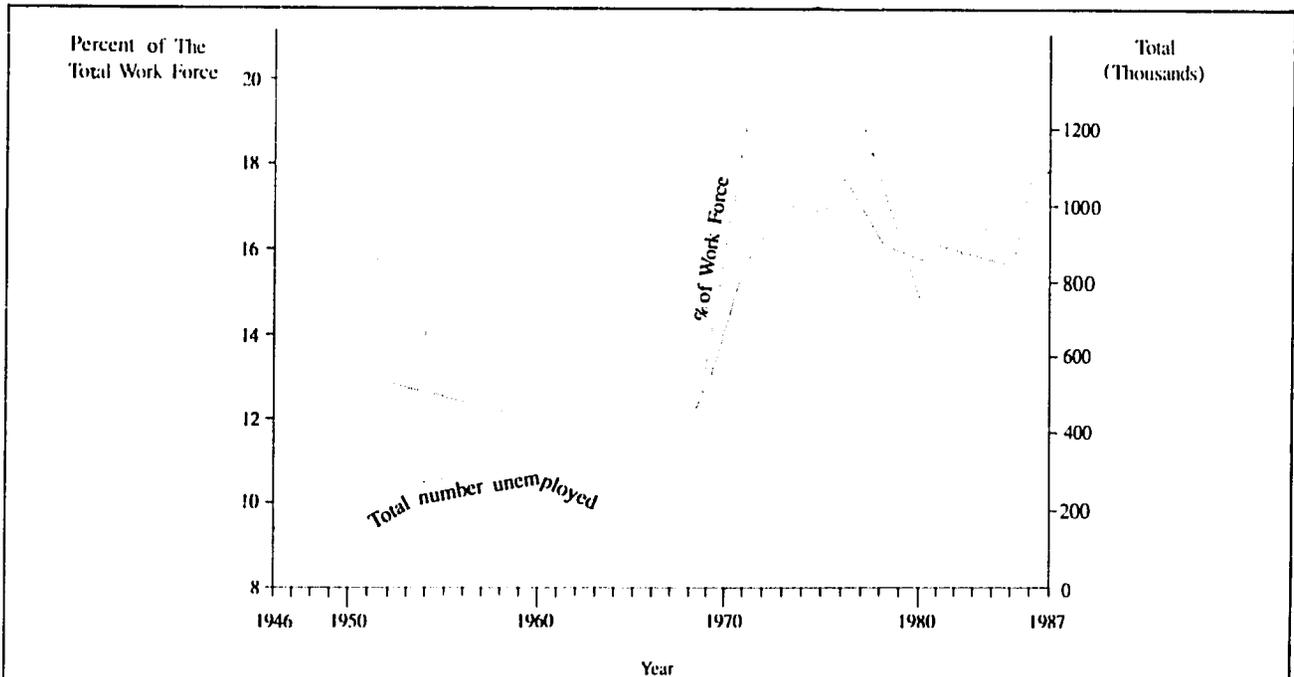


Figure 3.5. Total Unemployed and as Percent of Work Force, 1952-86 (Rodrigo and Attanayake, 1989).

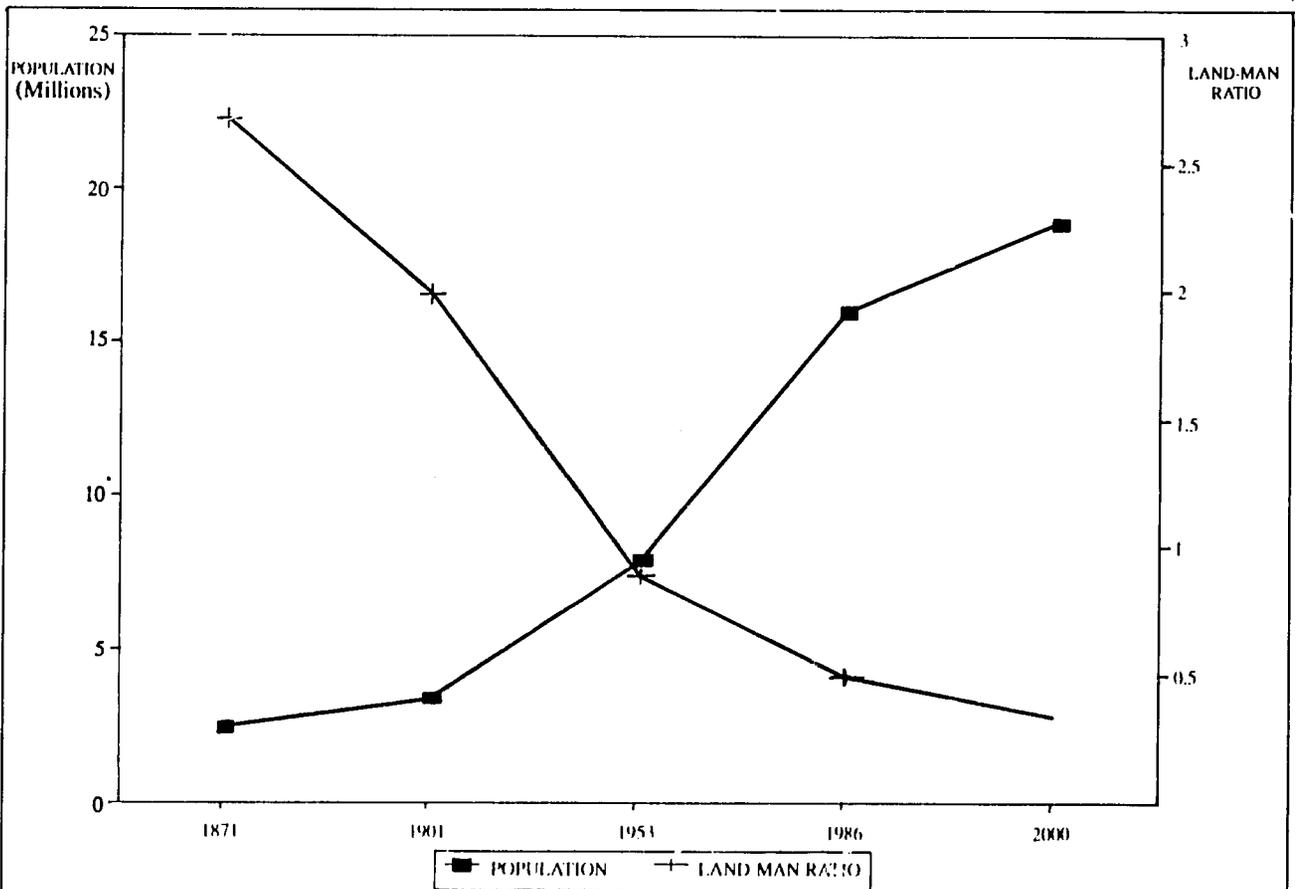


Figure 3.6. Trends in Population and Land Area per Person, 1871-2000 (NARESA/USAID, 1991).

Section 3.

THE CONTEXT FOR COASTAL MANAGEMENT: LIKELY SOCIAL, ECONOMIC AND ENVIRONMENTAL CONDITIONS WITHIN THE COASTAL REGION AFTER 2000

exemplified by the results of the Mahaweli irrigation and population resettlement schemes, which suggest that agriculture will not be able to provide employment for significantly more people. This has led the government to push hard for industrial and tourism development in order to generate employment and income.

By 2001, the number of people attempting to make a livelihood in the coastal region is likely to increase by at least 10 percent, and by mid-century by more than 50 percent. Population density in the coastal region is projected to be 446 persons/sq km and along portions of the south coast more than 1,000/sq km. It is reasonable to assume that conditions of poverty and unemployment will not disappear. Rather, the increases in the size of the population are likely to maintain or even enlarge the proportion that have lived in poverty

during the past two decades. It is also reasonable to expect that growth in the industrial sector and the inability of the rural economy to support more people will result in an accelerated growth in the proportion of the population living in urban areas (Table 3.1).

The Economy

The coastal region, which comprises 24 percent of the land area of Sri Lanka, contributes about 40 percent of the nation's gross domestic product (Figure 3.7 and Table 3.2). The western coastal region is the center of most development efforts. Since 1983, economic sectors of manufacturing, construction, utilities, retail, trade, banking and land ownership have increased more in the coastal region than in the country as a whole (Figure 3.7).

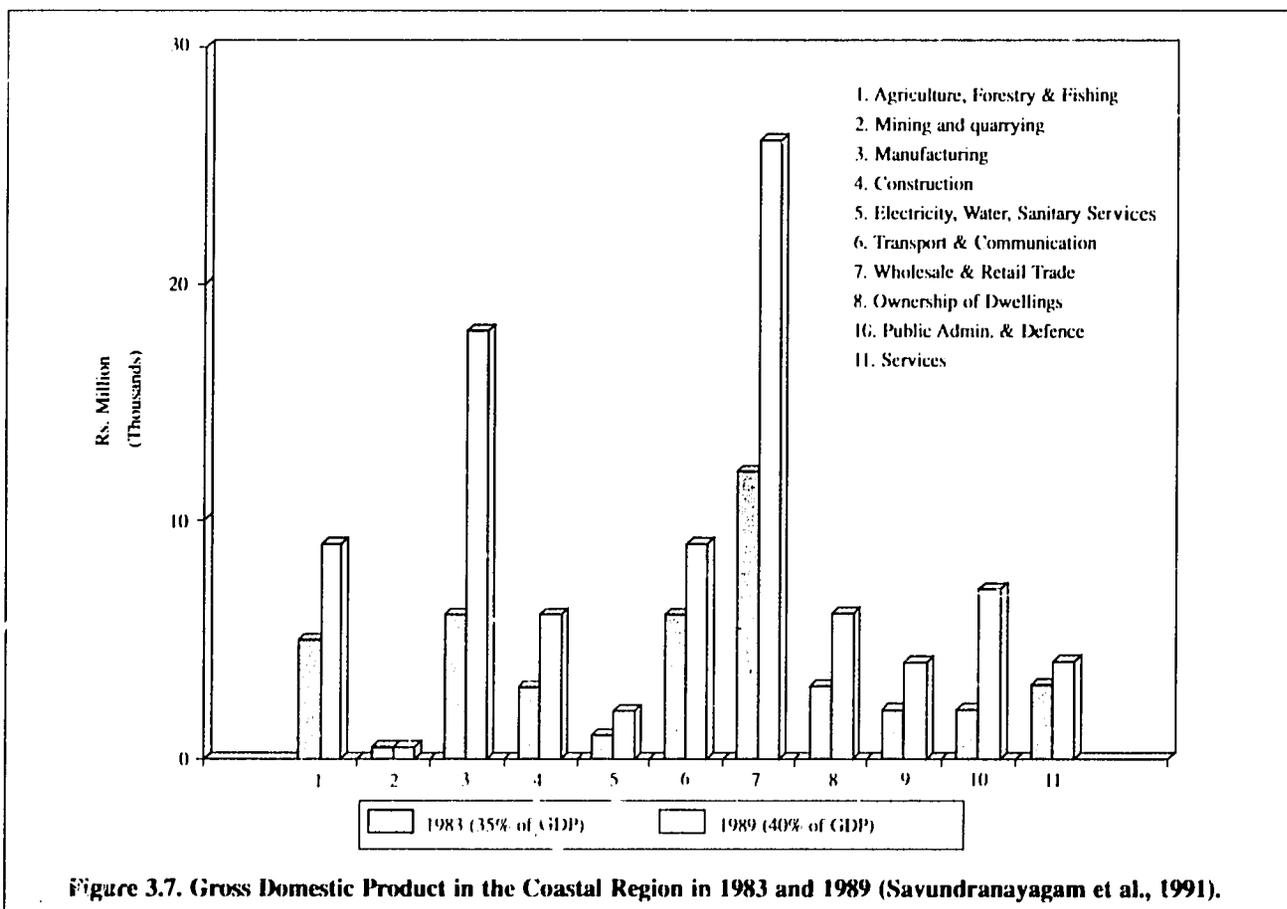


Figure 3.7. Gross Domestic Product in the Coastal Region in 1983 and 1989 (Savundranayagam et al., 1991).

Section 3.

THE CONTEXT FOR COASTAL MANAGEMENT: LIKELY SOCIAL, ECONOMIC AND ENVIRONMENTAL CONDITIONS WITHIN THE COASTAL REGION AFTER 2000

Table 3.2. Industrial and Agricultural Gross Domestic Product National and Coastal Region, 1989

	National (Rs. Million)	Coastal Region (Rs. Million)
Agriculture, Forestry & Fishing	59,388	8,958
Mining & Quarrying	6,157	654
Manufacturing:	34,941	18,150
Processing of Tea, Rubber and Coconut	6,825	1,621
Factory Industry	24,106	16,083
Small Industry	1,632	327
Other	2,378	119
Construction	17,332	6,586
Electricity, Water & Sanitary Services	2,788	1,588
Transport & Communication	23,109	9,320
Wholesale & Retail Trade	46,625	25,310
Banking, Insurance & Real Estate	10,496	6,402
Ownership & Dwellings	5,850	3,217
Public Administration & Defence	13,039	7,171
Services	8,648	4,341
Gross Domestic Production	228,373	91,697
Percent	100	40

* The Coastal Region comprises all the AGA divisions which have maritime boundaries.

Sources: (a) National estimates from the Central Bank of Sri Lanka, and (b) Savundranayagam et al., 1991.

Agriculture is much less important than fisheries and industry in coastal areas in its contribution to the national economy. Ninety percent of all large industrial units lie within the coastal region, most of them in the Greater Colombo area (Figure 1.5). In contrast, only 17 percent of the gross domestic agriculture product comes from the coastal region (Figure 3.8).

Since colonial times, Sri Lanka's economy has been based on two types of activities: (1) extracting wealth from the land and sea through resource-based activities such as agriculture, fishing, forestry and mining; and (2) public service. This economy was sufficient to support

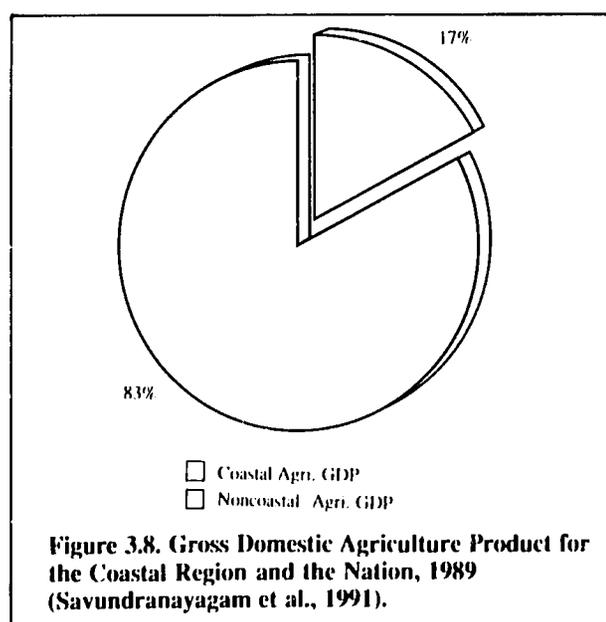
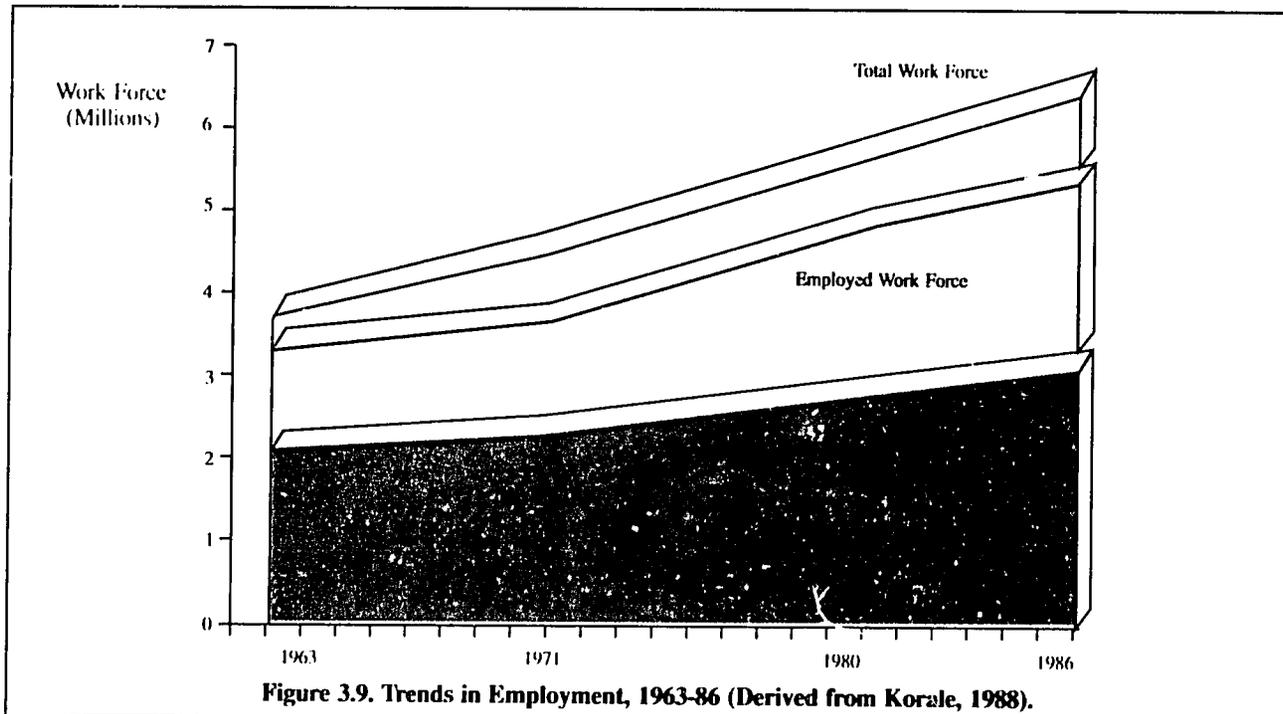


Figure 3.8. Gross Domestic Agriculture Product for the Coastal Region and the Nation, 1989 (Savundranayagam et al., 1991).

Section 3.

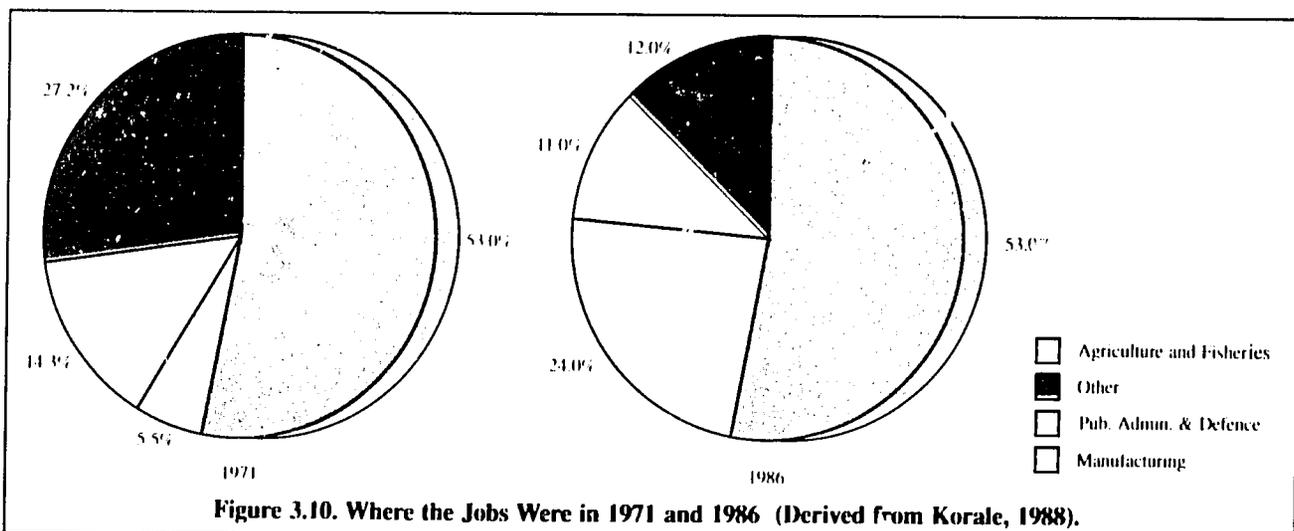
THE CONTEXT FOR COASTAL MANAGEMENT: LIKELY SOCIAL, ECONOMIC AND ENVIRONMENTAL CONDITIONS WITHIN THE COASTAL REGION AFTER 2000



the population with an acceptable (10 percent) unemployment rate through the 1960s. During the last years of the 1960s, the population outgrew its economy, which was based on land, sea and government, and unemployment rates increased. There is a limit to wealth and employment that can be directly built upon the natural resource base and a limit to the number of jobs that can be absorbed within government.

the creation of new jobs an overriding priority for government. Since 1963, Sri Lanka's labour force has nearly doubled, requiring the creation of nearly 3 million new jobs. While employment in the land, sea and public administration sectors grew throughout the 1960s and 1970s, the work force grew faster than the rate of new jobs, a trend that continues today (Figure 3.9). Agriculture and sea-related jobs are nevertheless still significant sources of employment (Figure 3.10).

Sri Lanka's expanding population has made



Section 3.

THE CONTEXT FOR COASTAL MANAGEMENT: LIKELY SOCIAL, ECONOMIC AND ENVIRONMENTAL CONDITIONS WITHIN THE COASTAL REGION AFTER 2000

Despite poverty, high literacy rates and educational levels have been maintained. The educational system, however, falls short in producing individuals trained to deal with the pressing resource management issues facing the nation. The system of free education introduced in 1945 has led to the present national average literacy rate of 87 percent and a school attendance rate of 74 percent among compulsory school-age children of 5 to 14 years. Despite these achievements, there is a growing perception that this system is not providing the needed skills and attitudes the nation needs as it enters the twenty-first century. Outside the big cities, many schools have inadequate facilities and teaching staff. Although only a small portion of those attending primary and secondary school enter universities, the entire school curriculum is geared towards university admission. There is little emphasis upon practical and technical subjects which many need for gainful employment.

The urgency of attracting industry to Sri Lanka has produced manufacturing industries that are drawn primarily by the abundance of cheap labour. In 1985, as much as 90 percent of the raw materials required by manufacturing were imported. Consequently, the benefits in value added and in building a diversified national industry were small.

During the decade beginning in 1978, the major change in the industrial sector was the rapid growth of the "textiles, wearing apparel and leather" industries. This group of industries tripled production and increased its share in value added from 7 percent to 24 percent. In 1985, government-owned industries contributed 40 percent of the value of industrial production and employed 26 percent of the industrial work force. Realizing the constraints on government manufacturing operations, the government is

actively divesting itself of ownership of industrial ventures.

By 2001, the magnitude and distribution of industry is likely to be very different from today. Decentralization of power to the provincial councils combined with new development projects will produce more nodes of industry and urbanization along the coastline. The Accelerated Southern Province Development Program has commenced construction of a free-trade zone and plans to expand and upgrade ports, highways and railroad infrastructure, as well as provide a diversified industrial base to that region. A transportation and industrial corridor is being planned from Colombo to Trincomalee. Trincomalee is one of the world's magnificent natural harbors, and is expected to become a significant center of industry and commerce. Each province will be looking to spur development. In most cases, the priority sites are coastal.

Increasing industrialization and tourism in the western coastal belt have implications for environmental and coastal resources management. Agriculture is projected to decline further, changing patterns of employment. Urbanization will continue to increase in areas adjacent to Colombo, creating demands for social services and land-use planning. Development in the free-trade zone on the southwest coast will displace traditional residents while also creating new jobs. Although the economy will grow creating new employment in the area of the free-trade zone, pressures on the natural resource base and on traditional society will also increase.

The Environment

Sri Lanka has a coastline of 1,585 km, probably more than 2000 km if the shoreline of lagoons, bays and inlets are added. The country's land area is 65,610 sq km, and its

Section 3.

THE CONTEXT FOR COASTAL MANAGEMENT: LIKELY SOCIAL, ECONOMIC AND ENVIRONMENTAL CONDITIONS WITHIN THE COASTAL REGION AFTER 2000

maritime area is more than three times larger, with 230,000 sq km within the EEZ (Figure 1.1). It is surrounded by a continental shelf about 22 km wide, except along the northwest and northern coasts opposite the Indian subcontinent, where it is much wider. There are fringing coral reefs and seagrass beds of varying condition along the southwest, southeast and northwest coasts (Figure 3.11). Numerous river basin estuaries and lagoons, many of which are lined with mangroves, cover about 160,000 ha; the more important basin estuaries and lagoons are shown in Figure 3.12. The open coast has over 300 km of beaches and sand dunes used by tourists, fishermen and local residents.

The coastal region as defined by the AGA divisions having a maritime boundary includes about 15,000 sq km, or 24 percent of the country's land area. Shorelands along the

south and southwest coast are increasingly allocated to residential and industrial types of land use. If urbanization reaches 30 percent by the end of the century, shorelands in these areas will be converted largely to non-agricultural uses. Growing urbanization will put increasing pressure on the natural coastal habitats and water quality.

The important coastal habitats of Sri Lanka are small and vulnerable to degradation (Table 3.3). The areal extent of biologically productive mangrove systems, estuaries, coral reefs and seagrasses is decreasing. Mangroves, estimated to cover about 12,000 ha in 1986, are quickly being depleted at the same time as some important estuaries become polluted. Mangroves are cut for timber and fuelwood, and the habitat converted into aquaculture sites or human settlements. Current rates of

Table 3.3. Extent of Coastal Habitats by District (ha) (CCD, 1986).

DISTRICT	HABITAT TYPES							
	Mangroves	Salt Marshes	Dunes	Beaches	Barriers & Spits	Lagoons	Other Water Bodies	Marshes
Colombo	39	-	-	112	-	-	412	15
Gampaha	313	497	-	207	-	3,442	205	1,604
Puttalam	3,210	3,461	2,689	2,770	2	39,119	3,428	2,515
Mannar	874	5,179	1,458	912	-	3,828	2,371	308
Kilinochchi	770	4,975	509	420	-	11,917	1,256	1,046
Jaffna	2,276	4,963	2,145	1,100	3	45,525	1,862	149
Mullaitivu	428	517	-	864	-	9,233	507	194
Trincomalee	2,043	1,401	-	671	-	18,317	2,180	1,129
Batticaloa	1,303	2,196	-	1,489	-	13,682	2,365	968
Ampara	100	127	357	1,398	-	7,235	1,171	894
Hambantota	576	318	444	1,099	-	4,488	1,526	200
Matara	7	-	-	184	7	-	234	80
Galle	238	185	-	485	-	1,144	783	561
Kalutara	12	-	4	77	-	87	476	91
Total Extent (Ha)	12,189	23,819	7,606	11,788	12	158,017	18,839	9,754

Section 3.

THE CONTEXT FOR COASTAL MANAGEMENT: LIKELY SOCIAL, ECONOMIC AND ENVIRONMENTAL CONDITIONS WITHIN THE COASTAL REGION AFTER 2000

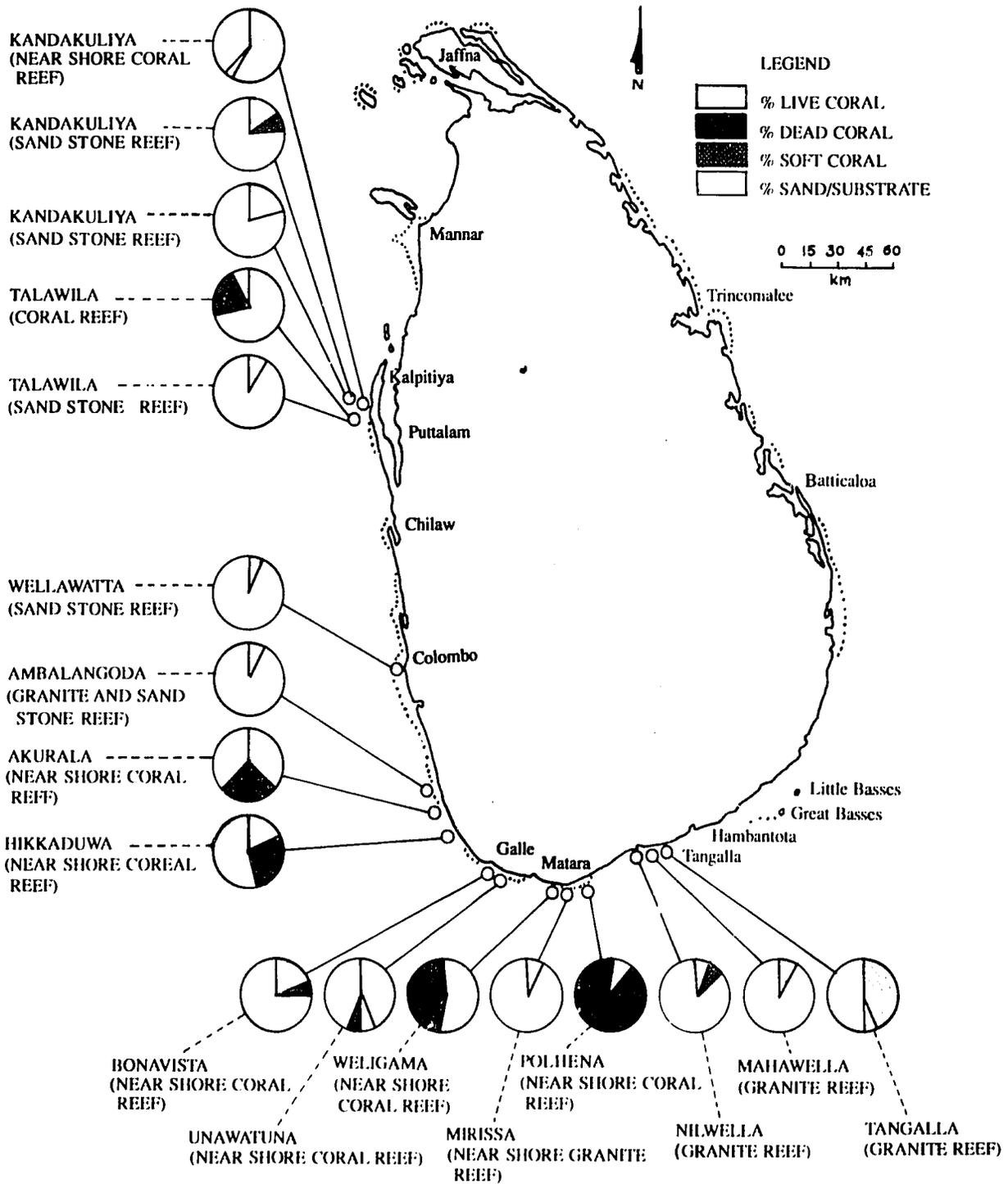


Figure 3.11. Distribution and Condition of Coral Reefs (NARESA/USAID, 1991).

Section 3.

THE CONTEXT FOR COASTAL MANAGEMENT: LIKELY SOCIAL, ECONOMIC AND ENVIRONMENTAL CONDITIONS WITHIN THE COASTAL REGION AFTER 2000

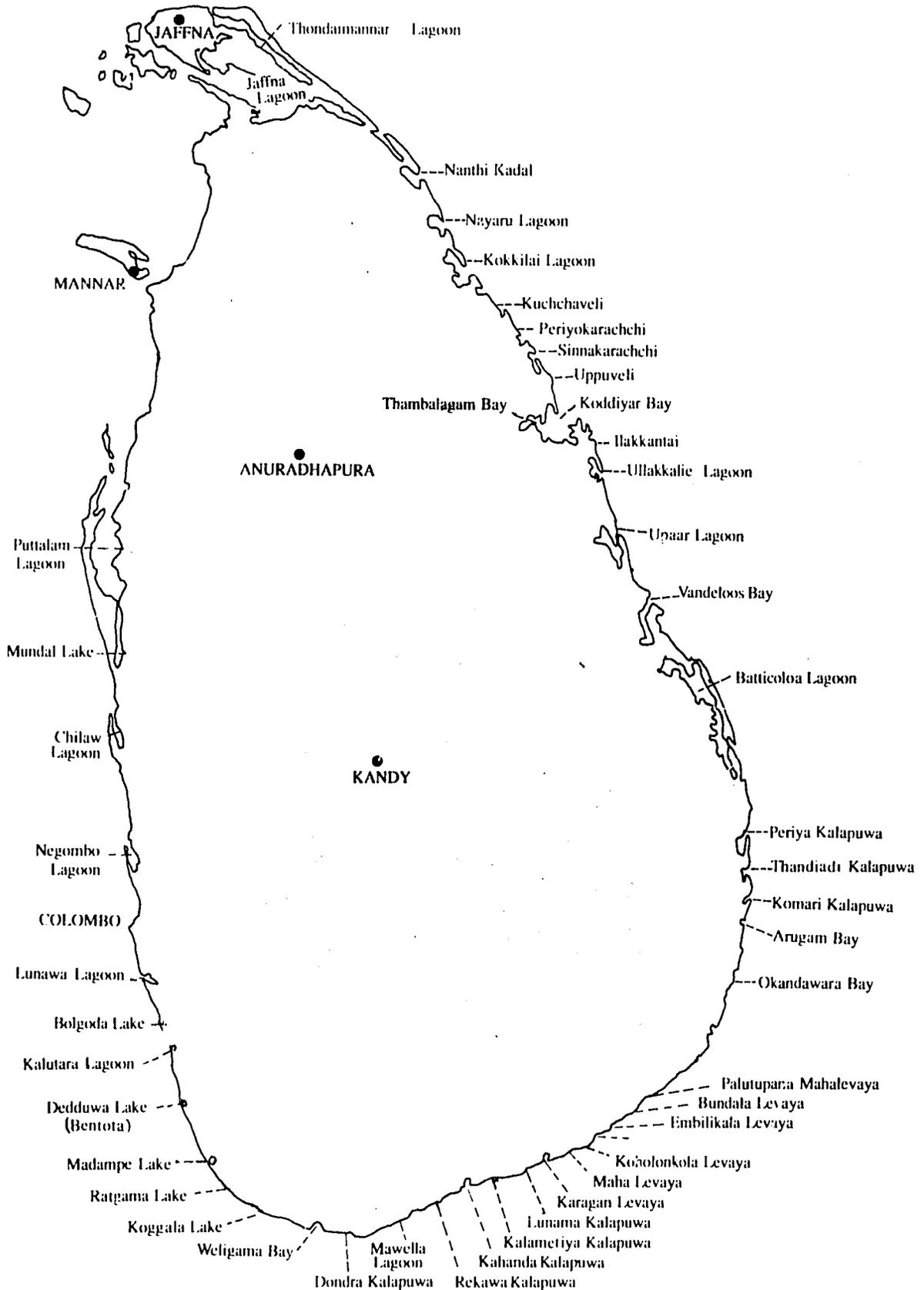


Figure 3.12. Basin Estuaries and Coastal Lagoons (CCD, 1990).

Section 3.

THE CONTEXT FOR COASTAL MANAGEMENT: LIKELY SOCIAL, ECONOMIC AND ENVIRONMENTAL CONDITIONS WITHIN THE COASTAL REGION AFTER 2000

depletion will reduce mangrove habitat by up to 50 percent by 2001. Coral reefs are still being mined for lime in several nearshore areas along the south, southwest and east coasts (Figure 3.13). Destructive fishing methods are also

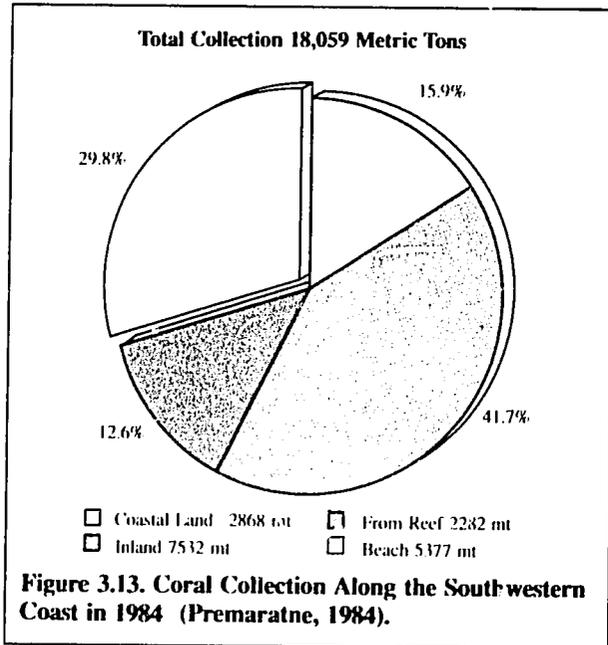


Figure 3.13. Coral Collection Along the South-western Coast in 1984 (Premaratne, 1984).

diminishing coral reefs and seagrass beds. By the turn of the century most reefs, except those specially protected for tourism and parks, will have been degraded and will not be as productive of fisheries, or as habitat for vulnerable species such as sea turtles and less effective in wave reduction and erosion mitigation.

Sri Lanka's beaches cover more than 11,000 ha and vary greatly in size and type. Most are sandy and have potential for tourism, but erosion along the southwest coast is affecting increasingly larger areas where protective structures are not in place. This erosion reflects the dynamic nature of the coastal system, which continuously readjusts itself in response to a variety of forces of nature as well as human activities (Table 3.4).

Sea level has risen over the last century, at an average rate of about 0.6 mm per year. The effect of global warming may cause the sea level to rise significantly during the early part of the twenty-first century. On the average, the Sri Lankan coast naturally recedes by about one meter every year, while accretion restores only about 0.5 m. The rates of erosion and accretion vary significantly in different areas, but overall it is likely that Sri Lanka's coasts will recede about 5 m by 2001 (Figure 3.14). Thus, the land area of the coastal region will be smaller

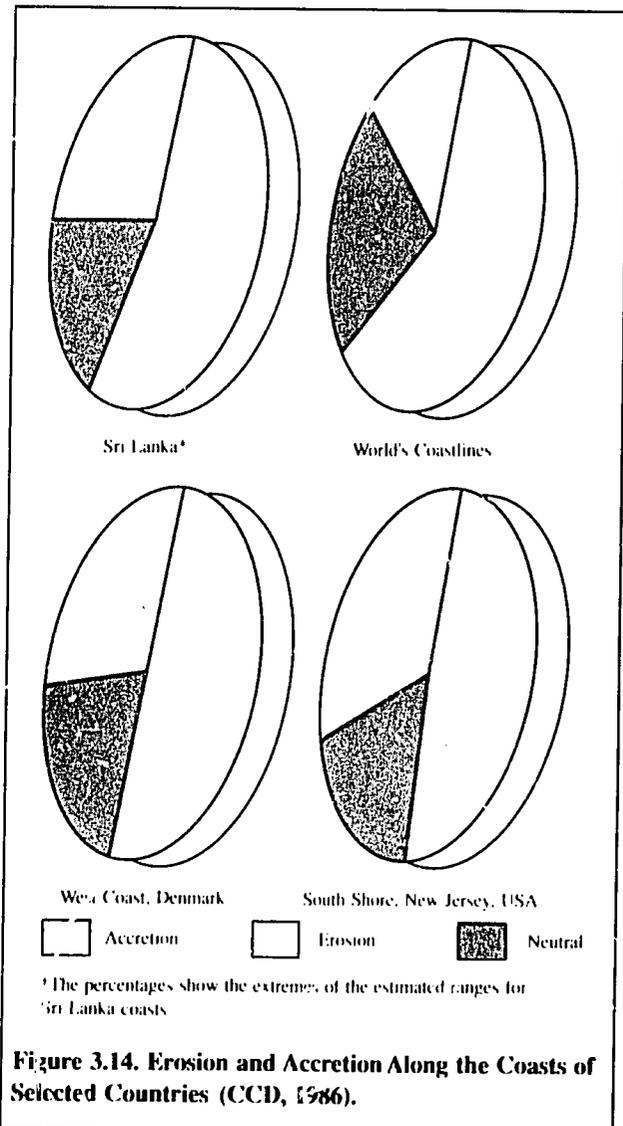


Figure 3.14. Erosion and Accretion Along the Coasts of Selected Countries (CCD, 1986).

Section 3.

THE CONTEXT FOR COASTAL MANAGEMENT: LIKELY SOCIAL, ECONOMIC AND ENVIRONMENTAL CONDITIONS WITHIN THE COASTAL REGION AFTER 2000

Table 3.4. Activities Contributing to Coastal Erosion (CCD, 1990).

Causal Agent	Process	Effect	Examples
Beach sand mining	reduction of sand in beach maintenance system posing possible threats to renewal	increased erosion	Panadura, Lunawa, Angulana, Palliyawatta
River sand mining	reduction of sand in beach maintenance system posing possible threats to renewal	increased erosion of adjacent beaches, erosion of river banks	Kalu Ganga, Kelani Ganga, Maha Oya
Inland coral mining	conversion of productive land into waterlogged areas	development of inland waste dumps and abandoned pits, reduction of coastal stability by creation of low-lying areas	Akurala, Kahawa, Ahangama, Midigama
Collection of coral from beaches	reduction of beach nourishment material	increased erosion	Ambalangoda to Hikkaduwa, Midigama, Ahangama and Polhena
Reef breaking	reduction of reef size, creation of gaps in reef	increased wave energy on beaches resulting in erosion	Ambalangoda to Hikkaduwa, Koggala, Midigama, Polhena, Rekawa, Pasikudah, Kuchchaveli, Nilaveli
Improperly sited groynes, harbors, revetments, jetties	interference with natural sand transport processes	erosion in some places, accretion in others	Beruwala Fishery Harbor, Kirinde Fishery Harbor
Improperly sited coastal buildings	interference with dynamics of coastal processes	loss of structures, other property due to retreat	Hikkaduwa, Bentota, Beruwela Negombo
Improper removal of coastal vegetation	exposed area subject to more rapid rates of wind erosion	erosion, retreat	Palliyawatte, Koggala, Polhena, Negombo

Section 3.

THE CONTEXT FOR COASTAL MANAGEMENT: LIKELY SOCIAL, ECONOMIC AND ENVIRONMENTAL CONDITIONS WITHIN THE COASTAL REGION AFTER 2000

by at least 8 sq km in ten years, with some areas of the southwest coast being affected much more than others.

The natural supply of sand to nourish the beaches will be reduced significantly by the extraction of river sand for the building industry and by the damming of rivers to create reservoirs (Table 3.5). Data on sand mining show that beach nourishment along the southwest coast in particular, will be affected by increased extraction. Major dam projects, old and new, decrease the contribution of sand by major rivers to the coastal system. This concern about sand use is being studied by the CEA with technical support from the Netherlands.

The combined effects of sea level rise, decreasing supply of sand and the destruction of coral reefs caused by reef mining along parts of the coast will result in higher coastal erosion rates. The scenario for coastline stabilization is bleak when these factors are considered. Another factor that makes this especially true is that the already high cost of building shoreline revetments and breakwaters is always increasing.

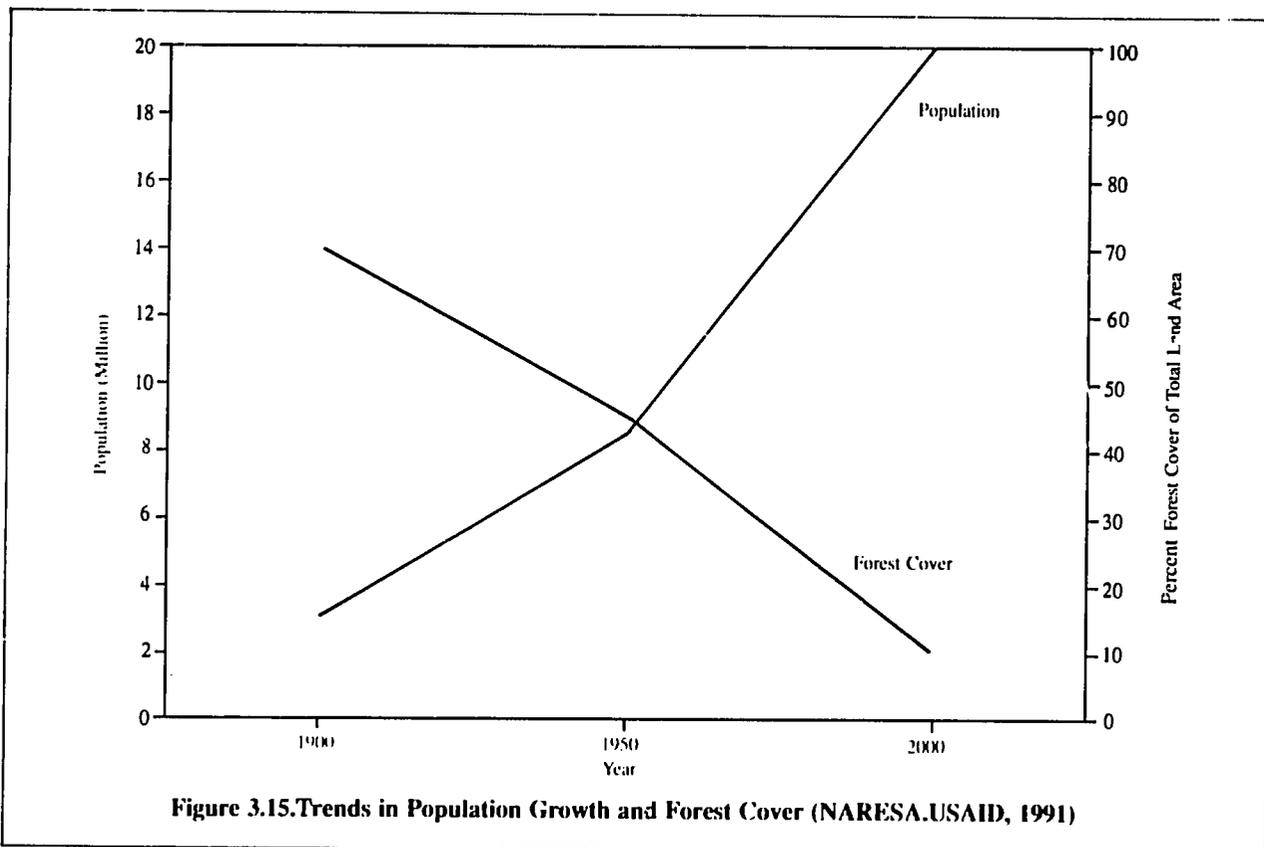
Ad hoc land reclamation projects in the coastal region have also aggravated the coastal management problem. One such project is the development on Crow Island in Mattakkuliya. This project destroyed a 22-ha mangrove forest

Table 3.5 Location and Estimated Volume of Sand Mining, 1984 and 1991 (CCD).

SOURCE	VOLUME OF SAND REMOVED (CUBIC METERS)			
	1984	Percent	1991	Percent
Kelani Ganga	631,000	43	633,000	37
Maha Oya	316,000	21	619,000	36
Gin Oya	225,000	15	13,000	1
Kalu Ganga	132,000	9	129,000	7
Deduru Oya	65,000	4	8,000	-
Gin Ganga	61,000	4	198,000	11
Nilwala Ganga	6,000	1	3,000	-
Madu Ganga	2,000		12,000	1
Sub Total (Rivers)	1,436,000	97	1,615,000	93
Sea Shore	41,000	3	118,000	7
GRAND TOTAL	1,477,000	100	1,733,000	100

Section 3.

THE CONTEXT FOR COASTAL MANAGEMENT: LIKELY SOCIAL, ECONOMIC AND ENVIRONMENTAL CONDITIONS WITHIN THE COASTAL REGION AFTER 2000

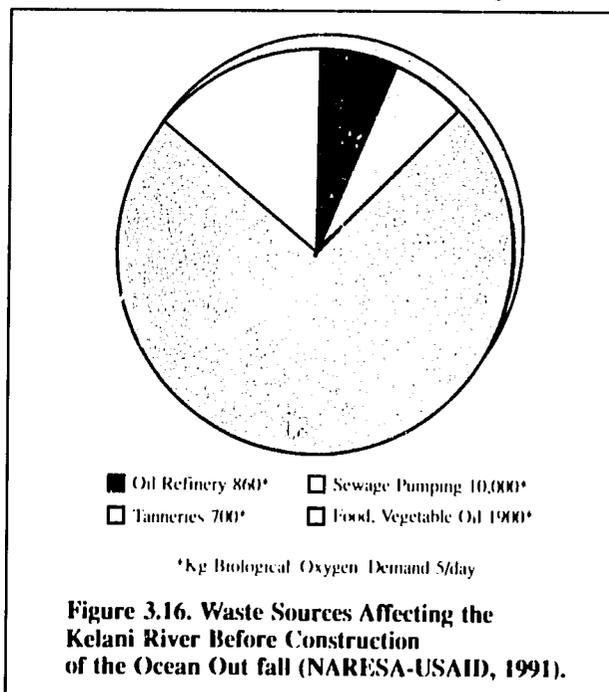


at the mouth of the Kelani River to reclaim land for housing. Its impact on fisheries has not been studied and the land's usefulness for housing over the long term is doubtful.

Annual deforestation of about 40,000 ha as a result of land clearing for agriculture, shifting agriculture on hillsides and logging is contributing more silt and fine sediments to river systems every year (Figure 3.15). Such soil erosion does not contribute to the budget of large-grained sand, but is causing sedimentation of inshore marine and lagoonal habitats. In all cases, the sedimentation has an adverse effect on these systems. Coral reefs are smothered; mangroves, estuaries and lagoons become filled with silt; beaches and the nearshore waters become dirty, and fisheries dependent on clear water decline. Activities contributing to sedimentation include gem mining, other mineral mining and poor agricultural practices.

Water pollution reduces the quality of the

environment, impairs ground and surface water, and reduces food supply (Figure 3.16). Periodic fish kills in the Kelani River are among the



Section 3.

THE CONTEXT FOR COASTAL MANAGEMENT: LIKELY SOCIAL, ECONOMIC AND ENVIRONMENTAL CONDITIONS WITHIN THE COASTAL REGION AFTER 2000

many results. The bright green of Colombo's Beira Lake is caused by algae thriving on the nutrients in the domestic and industrial wastes flowing into it. This phenomenon will become more common in urban lakes and streams by the end of this century. Treatment of domestic waste is expensive and will probably be ignored in favor of more urgent issues in the years to come if the trends follow the pattern of other Asian cities.

Most industrial wastes in Sri Lanka are not treated before being discharged into rivers, lagoons and the ocean. Textile dyeing and printing industries are causing widespread pollution in Ratmalana and Moratuwa. In Colombo, the total waste from industry discharged into the city's canal network is estimated at 70,000 person equivalents, or 3,900 kg Biological Oxygen Demand 5/day (Figure 3.17). Most of this pollution comes from point sources, which could be addressed site by site. If control measures were put into effect, these sources probably would not increase significantly over the next decade.

More pervasive are agricultural wastes from non-point sources. Some farming districts are using more than 120 kg/ha of fertilizer, a rate higher than that used in other Asian countries, and a significant increase over ten years before. Pesticide use has also risen, with the largest applications in rice farming and tea growing. Runoff with agrochemicals is draining into rivers, estuaries and lagoons, and is ultimately dispersed in the ocean. The impacts of this pollution have not been adequately studied, but it is known that some marine organisms such as mollusks and crustaceans are particularly susceptible to pollution from pesticides.

There is a growing need for a master plan for the improvement of water bodies that are

already highly polluted. Some proposed contradictory policies or plans point out the need for better institutional linkages and agency coordination:

a. The Sri Lanka Land Reclamation and Development Corporation will launch a massive canal development and shanty resettlement program. Salient features of this program are:

- protection from canal flooding
- no guarantee of water quality improvement
- surplus water to be diverted to the Kelani River at Madiwela
- a declared boundary that excludes the controversial Beira Lake
- treatment of Beira Lake in isolation, which has altered the pattern of rehabilitation of the canal system
- a sea level rise that has not been adequately accounted for

b. The Ministry of Policy Planning and Implementation is launching a Metropolitan Environmental Improvement Program (MEIP) which includes Beira lake, Lunawa Lake and others. Such a program will require large quantities of water, which may not be available in the system after the proposed canal system rehabilitation. In addition, a scheme for pumping water from the Kelani River to Beira could conflict with current plans.

c. Colombo's present supply of drinking water could be inadequate by 2000. This may prompt the need for an additional reservoir in the upper Madiwela catchment. Such a venture will go counter to the proposed diversion to the Kelani River.

Section 3.

THE CONTEXT FOR COASTAL MANAGEMENT: LIKELY SOCIAL, ECONOMIC AND ENVIRONMENTAL CONDITIONS WITHIN THE COASTAL REGION AFTER 2000

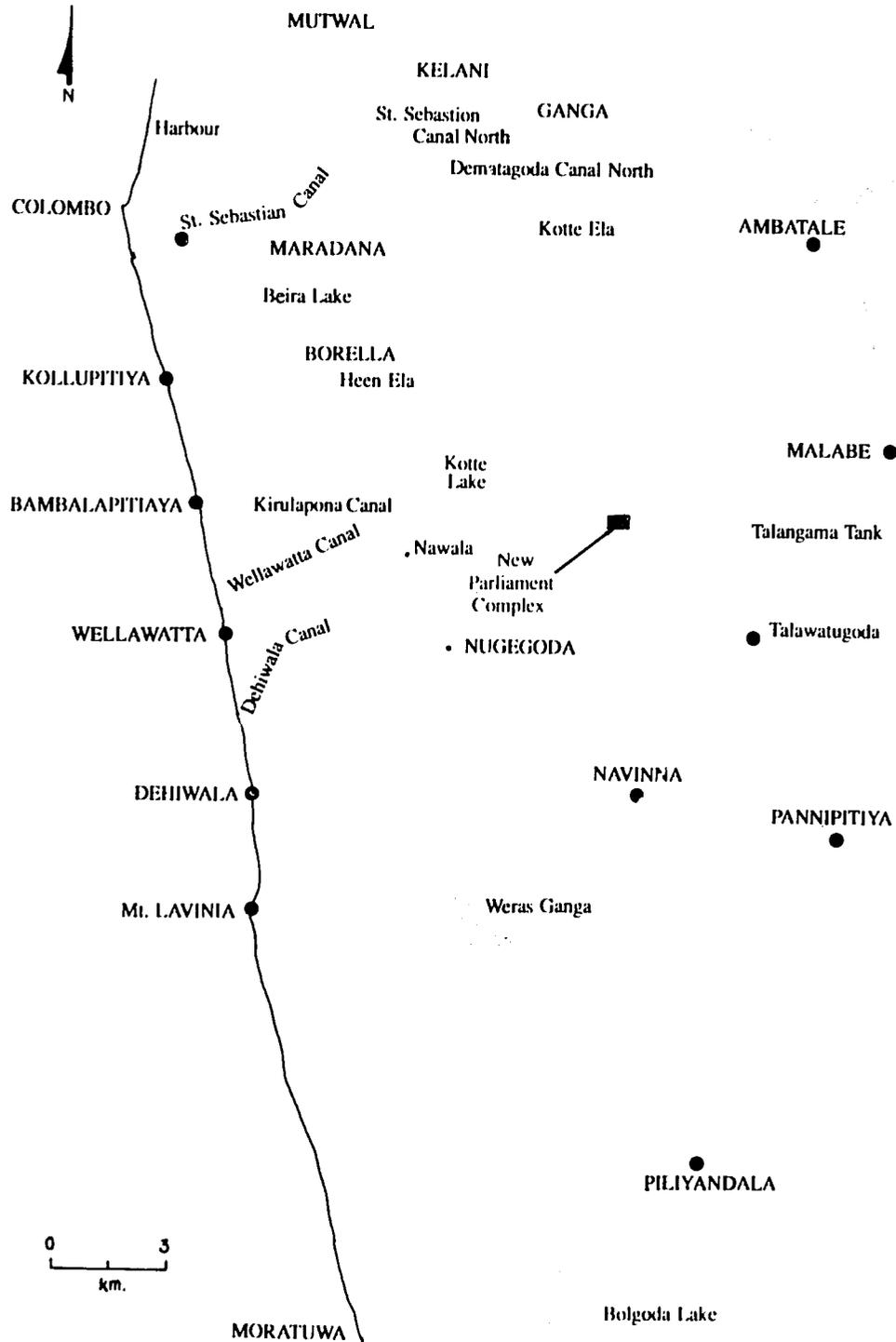


Figure 3.17. Drainage Canals and Water Bodies in North and South Colombo (NARESA/USAID, 1991).

Section 3.

THE CONTEXT FOR COASTAL MANAGEMENT: LIKELY SOCIAL, ECONOMIC AND ENVIRONMENTAL CONDITIONS WITHIN THE COASTAL REGION AFTER 2000

d. Simultaneously, the Greater Colombo Economic Commission has a proposal to reclaim 162 ha of marshes from the upper Muthurajawela by pumping sand from the sea. Impacts on mangroves, fisheries, aquaculture and freshwater wells are not known.

Irrigation schemes along the coast that began as drainage or saltwater exclusion schemes have altered the salinity levels in several southern lagoons so that fisheries have been adversely affected or totally destroyed. In several cases, deterioration of groynes and floodgates has allowed salt water to enter once again and adversely affect the expanded cropland.

The prognosis for the condition of the coastal environment in Sri Lanka by 2001 is bleak if the trends of environmental

deterioration continue at their present rates. Water pollution in estuaries and lagoons will be more severe. Mangrove forests will be reduced by more than half their original cover. Coral reefs will be depleted except in small protected areas, and beaches will erode at accelerated rates.

Such deterioration is occurring because the coastal environments are part of a much larger ecosystem, which includes uplands, agricultural areas and the many human activities in the coastal zone (Figure 3.18). Resources and their supporting environment are already being exploited beyond their natural carrying capacity. The very foundation of the coastal ecosystem is, in many cases, being destroyed. It is clear that these trends will not subside unless major efforts are made to develop environmental planning, protection and resource management over the next ten years.

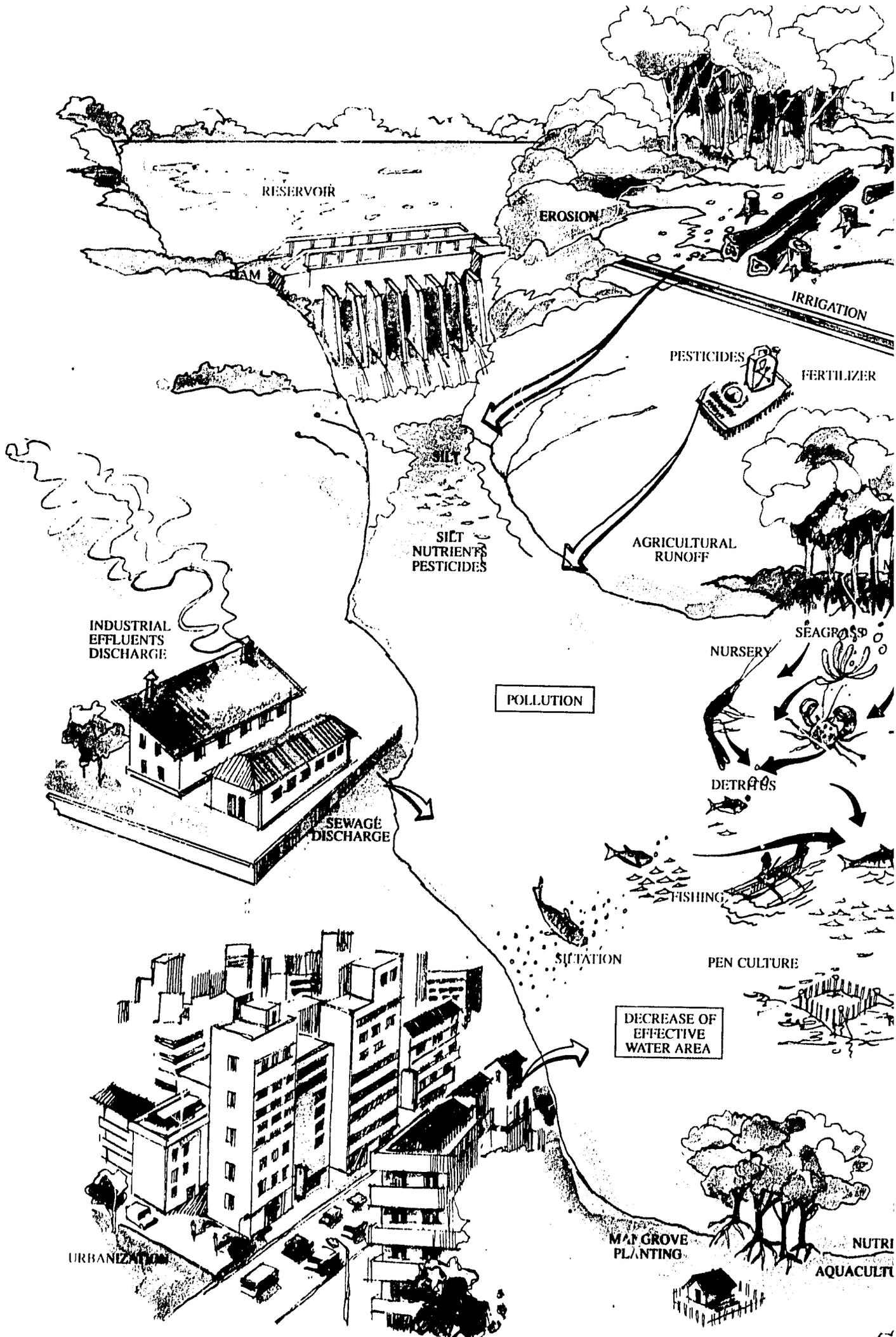


Figure 3.18. Some Linkages Among Coastal Habitats and the Activities Influencing Them (CCD, 1989)



Coral mining has been difficult to stop because it provides a lucrative livelihood to some coastal residents. — A. White

Section 4.

MAJOR ISSUES AND OPPORTUNITIES TO BE ADDRESSED IN THE COASTAL REGION

A second-generation coastal resources management program must provide tangible benefits to the coastal communities. Such a program needs to recognize the importance of enhancing food production through

- (a) agriculture, aquaculture and fisheries, and
- (b) the protection and management of coastal and marine habitats;

and of the need to create opportunities for the improvement of local economies through appropriate industrial development and the promotion of tourism. The program must ensure that local communities understand, support and believe in the planning and implementation process for coastal resources management so that the program becomes self-sustaining.

Issue A. Enhancing Food Production Through Environmental Management and Habitat Protection

- The capacity to produce food must be expanded to feed the country's growing population.
- Environmental degradation must be minimized to ensure a sustainable natural resource base for agriculture and fisheries.

The Food Supply

In Sri Lanka, chronic malnutrition is a reality for many people. Thus, sustaining and, where possible, improving the capacity of the country to produce food is of the utmost

importance. Even though Sri Lankans consume an average of 2,300 calories per day, a caloric intake considered adequate, significant nutritional problems exist. Malnutrition (especially protein deficiency) among poor rural populations that directly depend on the local resource base is acute among 6.6 percent and chronic among 34.7 percent of Sri Lankan children in the age group of six months to six years. Low birth-weight babies (estimated at between 21 and 30 percent of live births) is a national problem and is attributed to poor maternal nutrition.

Rice is Sri Lanka's staple food, providing 45 percent of the calories and 33 percent of the protein consumed (Figure 4.1). Twenty-one percent of the nation's paddy lands lie within the coastal region. Coconut and fish, both

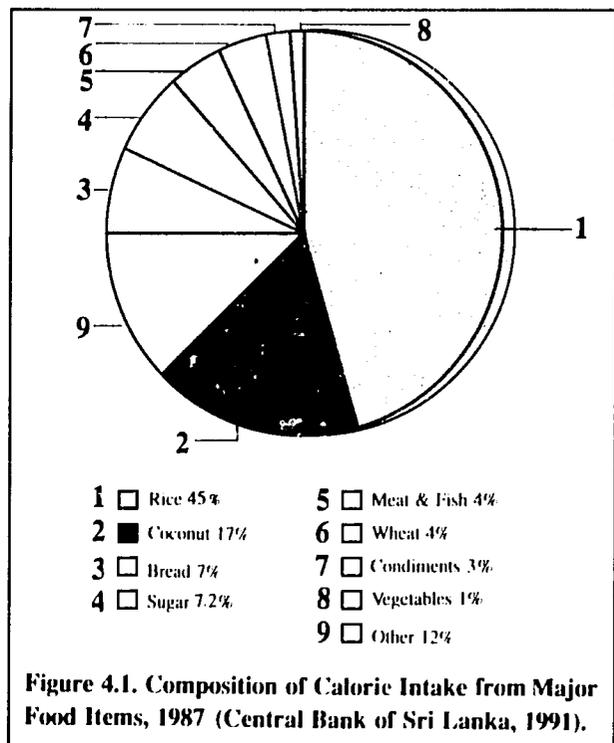


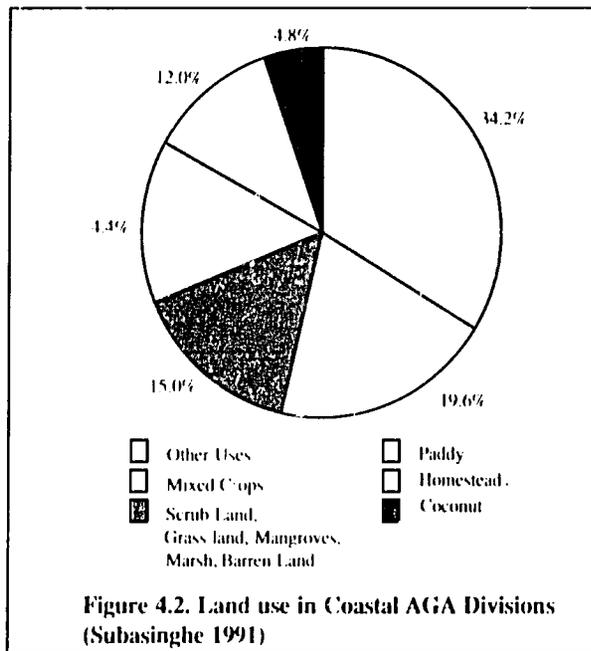
Figure 4.1. Composition of Calorie Intake from Major Food Items, 1987 (Central Bank of Sri Lanka, 1991).

Section 4.

MAJOR ISSUES AND OPPORTUNITIES TO BE ADDRESSED IN THE COASTAL REGION

coastal products, are also important to the diet, with fish providing more than 50 percent of the animal protein consumed. Per capita consumption of fish was about 18 kg in 1991, up from 10.5 kg/person in 1977 (Table 4.1).

Food production in the coastal region includes coastal and marine fisheries, aquaculture and agriculture. Almost all the nation's fish and aquaculture production occurs in the coastal region. Agriculture, however, is less important than other land uses (Figure 4.2).



It would appear that food production in the coastal region, utilizing current technologies and practices, has reached a natural limit. The actual productive capacity of the coastal region may in fact be decreasing owing to overexploitation and degradation of productive resources and habitat. Competition and conflicts are increasing between food production and other coastal activities. Industrial development, urbanization and tourism are competing with traditional productive activities such as agriculture and fisheries for space and access to resources in the coastal region. Urbanization is increasingly using more coastal space (Table 3.1). At the same time, agricultural intensification—with accompanying changes in freshwater regimes through increased use of chemical fertilizers and pesticides—can seriously impair fisheries production and aquaculture activities. Unless clear policies are enunciated and implemented, the coastal region's ability to produce food will decrease.

A1. Agriculture

- The environmental impacts of agricultural practices need to be considered more fully.

Table 4.1. Fish Supply and per Capita Consumption, 1977-89 (FAO/ADB, 1991).

Unit	1977	1980	1983	1986	1987	1988	1989	1990	1991
Domestic Production	tons 138,770	187,680	220,810	183,060	190,000	197,540	205,290	177,063	198,159
Imports	tons 13,050	55,360	41,950	81,000	95,340	114,050	89,990	60,203	83,371
SUBTOTAL	tons 151,820	243,040	262,760	264,060	285,340	331,590	295,280	237,266	281,530
Less Exports	tons 5,280	6,090	6,540	8,530	6,040	8,740	9,960	5,059	5,533
Availability	tons 146,540	236,950	256,220	255,530	279,300	302,850	285,320	232,207	275,997
Mid-Year Population*	millions 13.9	14.7	15.4	16.15	16.4	16.7	16.9	17.6	17.9
Per Capita Consumption	kg 10.54	16.11	16.63	15.87	17.13	18.13	16.88	13.19	15.42

*Population growth assumed at 1.6 percent/year (actual average 1976-86).

Section 4.

MAJOR ISSUES AND OPPORTUNITIES TO BE ADDRESSED IN THE COASTAL REGION

Significance and Trends

Sri Lanka's agriculture feeds the nation, employs the majority of its labor force and contributed about 20 percent to the gross domestic product in 1991. In 1990, agriculture provided employment for 45 percent of the national labor force and accounted for 36 percent of all export earnings.

Agriculture is, however, less dominant in the coastal region than in the nation as a whole. The average employment in agriculture for the whole of the coastal region was only about 24 percent, varying from 1.1 percent in the Colombo region to nearly 80 percent in the AGA divisions of Batticaloa, Mullaitivu and Kilinochchi. While the coastal region contains about 25 percent of the country's total croplands, it produces only about 17 percent of the national gross domestic agricultural product (Figure 3.8).

Nevertheless, coastal agriculture is important for speciality crops like coconut, red onion, cinnamon and chillies. Of perhaps greater significance are the large numbers of home and small market gardens that are important sources of food for the poor. Food from these gardens is used for home consumption or is sold in local markets. Sri Lanka's growing population, its poverty, and the perceived limit to further large-scale agricultural expansion in coastal areas make maintenance and improvement of home and small-garden enterprises of crucial importance.

The coastal region has over 420,000 agricultural holdings with an average size of 0.65 ha. About one-third of these holdings contain both crops and livestock and about 6 percent have only livestock. The majority (61 percent, or 257,000 plots) grow only crops.

Homesteads account for about 24 percent of all croplands. The trend in coastal areas is towards smaller land holdings and, thus, more intensive farming.

Current Government Policies

The government's major national goals for the agriculture sector are to:

- move towards a higher degree of self-reliance in basic food commodities such as rice, fish, sugar, pulses and milk
- raise the productivity of tree crops to increase export earnings
- promote crop diversification and encourage agro-industries
- increase incomes and employment opportunities in the rural areas

Given the decreasing land area per capita in coastal areas, a higher degree of self-reliance in basic foods will come only through more intensive and diversified small farms and gardens. This is viable in some parts of the coastal region. The wet zone of the southwest coastal belt contains stretches of flat land with potential for group or cooperative farming for the large-scale production of crops. With an adequate water supply most of the year, these areas lend themselves to intensive agriculture, animal husbandry and poultry farming, which could help fill the nation's gap in food production.

The key elements in the government's strategies are:

- rehabilitation of existing irrigation schemes
- improving land, water, forestry, fishery and other resources management

Section 4.

MAJOR ISSUES AND OPPORTUNITIES TO BE ADDRESSED IN THE COASTAL REGION

- strengthening of agricultural support services, especially in extension and research
- focusing development efforts on a well-delineated regional basis
- ensuring the adequacy of producer incentives and marketing infrastructure for agricultural commodities
- restructuring and improving the capacity of key institutions in the agricultural sector which provide basic services
- encouraging employment generating, local enterprise and joint-venture projects in agriculture and animal husbandry and home gardens and cottage industries.

Issues and Opportunities

1. Maintenance of agricultural lands. With ever-increasing demands for use of coastal lands, important agricultural lands must be designated and protected if they are not to be lost to other uses through urbanization and development projects. Such lands should be reserved for intensive agriculture and high-value crops.

2. Maintenance of home gardens and homesteads. Ultimately, the most significant feature of agriculture in the coastal region may prove to be the low cost of food produced in home gardens and small farms for local consumption. Maintenance of and support for such small holdings to encourage efficiency and diversity could increase production from this sector. This production will be important to help provide food and income to people living in poverty.

3. New crop production. Expansion of commercial crop cultivation is possible in some areas of the wet zone and likely on the coasts of the dry zone along the eastern coast (such as in the districts of Puttalam, Mannar, Kilinochchi, Mullaitivu, Trincomalee and Batticaloa). Prospects are good for the further expansion of the cultivation of cashew, palmyra, sunflower and other crops that can withstand arid conditions. There is also likely to be expansion in the cultivation of high-value crops such as cabbage, cauliflower, beet, big onions and potatoes. There are opportunities to expand production of export crops such as gherkins and asparagus in dry-zone areas, like the Kalpitiya Peninsula, that have an abundant supply of groundwater.

4. Impacts of agricultural practices. Agriculture impacts upon, and is in turn impacted by, other activities in the coastal region. For example:

- Excess use of fertilizers in some coastal areas such as the Jaffna Peninsula has adversely affected the quality of ground and coastal waters. High nitrate levels in drinking water and phosphate in fresh water have been reported.
- Agriculture often leads to soil erosion; the extent of erosion depends on the agricultural methods used. Eroded soil ends up in estuaries, lagoons and the sea, leading to increased turbidity of coastal waters and losses in the productivity of important habitats such as coral reefs.
- The deposition of sediment on the beds of hydroelectric and irrigation water reservoirs reduces the normal load of sediment carried into the sea by rivers and streams. This sediment is normally available for beach nourishment and

Section 4.

MAJOR ISSUES AND OPPORTUNITIES TO BE ADDRESSED IN THE COASTAL REGION

for the enrichment of critical coastal habitats such as estuaries, lagoons and mangroves. Sediment "starvation" can result in increased erosion and be a significant problem.

- Irrigation systems often alter salinity levels of estuaries, lagoons, marshes and mangroves. Irrigation projects can either increase salinity of brackish-water habitats because of water diversion or reduce salinity by increasing freshwater inflow. The ecology of lagoons etc. and their fisheries therefore needs to be considered when irrigation projects are planned.

A2. Fisheries

- Coastal habitats must be protected and managed.
- Exploitation of fish stocks must be limited to sustainable levels.

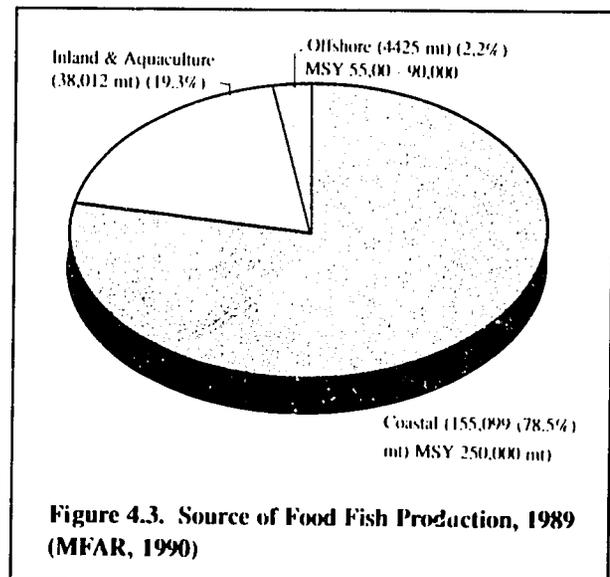
The important fisheries of Sri Lanka are derived from lagoons and estuaries, coral reefs, nearshore shallow coastal waters and deeper offshore waters. Fisheries are dependent upon habitats, especially in lagoon, estuarine and nearshore areas. Thus, the management of fisheries requires the maintenance and protection of their associated habitats as well as the management of human effort and the methods used to capture fish.

Significance and Trends

Sri Lanka's fisheries are significant to the nation as a source of (a) food, (b) employment, and (c) foreign exchange earnings. During the 1980s, average annual fish consumption was 16.3 kg, providing more than 50 percent of the animal protein and 13 percent of the total protein in the Sri Lanka diet (Table 4.1). In that decade, approximately 80,000 Sri Lankans were employed as fishermen; another 30,000 were

employed in ancillary industries. Together these jobs supported approximately half a million people. Coastal artisanal fishery production is largely for internal consumption, but foreign exchange is earned through exports of shrimp, tuna and ornamental aquarium fish.

Of Sri Lanka's total fisheries production, marine fisheries accounted for 81 percent of the total in 1989 and 88% in 1991 (Figure 4.3). While freshwater



inland fisheries have increased significantly during the past two decades, any further growth is expected to be overshadowed by increased landings from new offshore fisheries for pelagic species and some demersal species. The recent termination of state patronage of freshwater fisheries and aquaculture on religious and cultural grounds will probably slow expansion of inland fisheries (Table 4.2).

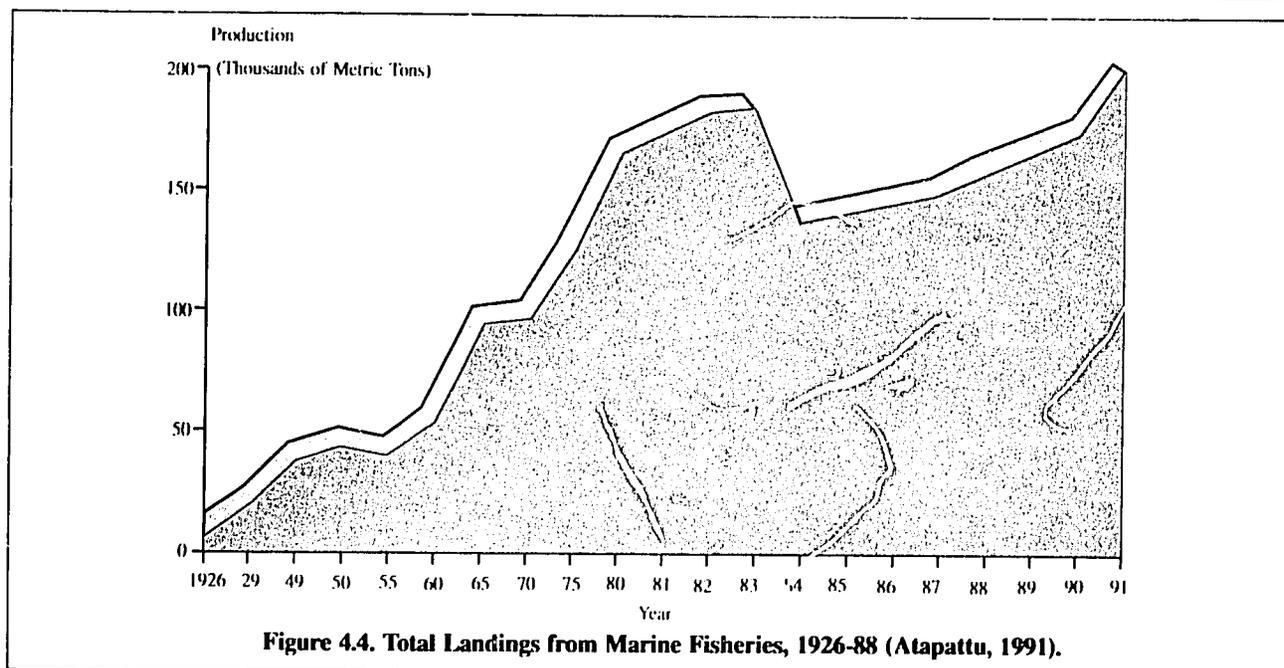
Coastal Fisheries have grown rapidly since the decline of the lucrative pearl and window pane oyster fisheries of the early 1920s. The discovery of new fishing grounds (Wadge Bank) in the late 1920s began the trend to general fisheries development (Figures 4.4, 4.5 and Table 4.2). Concerted government efforts

Section 4.

MAJOR ISSUES AND OPPORTUNITIES TO BE ADDRESSED IN THE COASTAL REGION

Table 4.2. Overall Fish Production (mt), 1980-89 (MFAR, 1990).

	Offshore/Deep Sea	Coastal	Inland Fisheries	Total
1980	2,100	165,300	20,300	187,770
1981	2,200	175,100	29,600	202,900
1982	1,100	182,500	33,300	216,800
1983	700	184,000	36,100	220,800
1984	800	136,600	31,900	169,300
1985	2,400	140,300	32,700	175,400
1986	3,400	144,300	35,400	183,100
1987	4,300	149,300	36,500	190,100
1988	4,400	155,100	38,000	197,500
1989	8,200	157,400	39,700	205,300
1990	11,700	134,100	31,300	177,100
1991	15,100	159,200	23,800	198,100



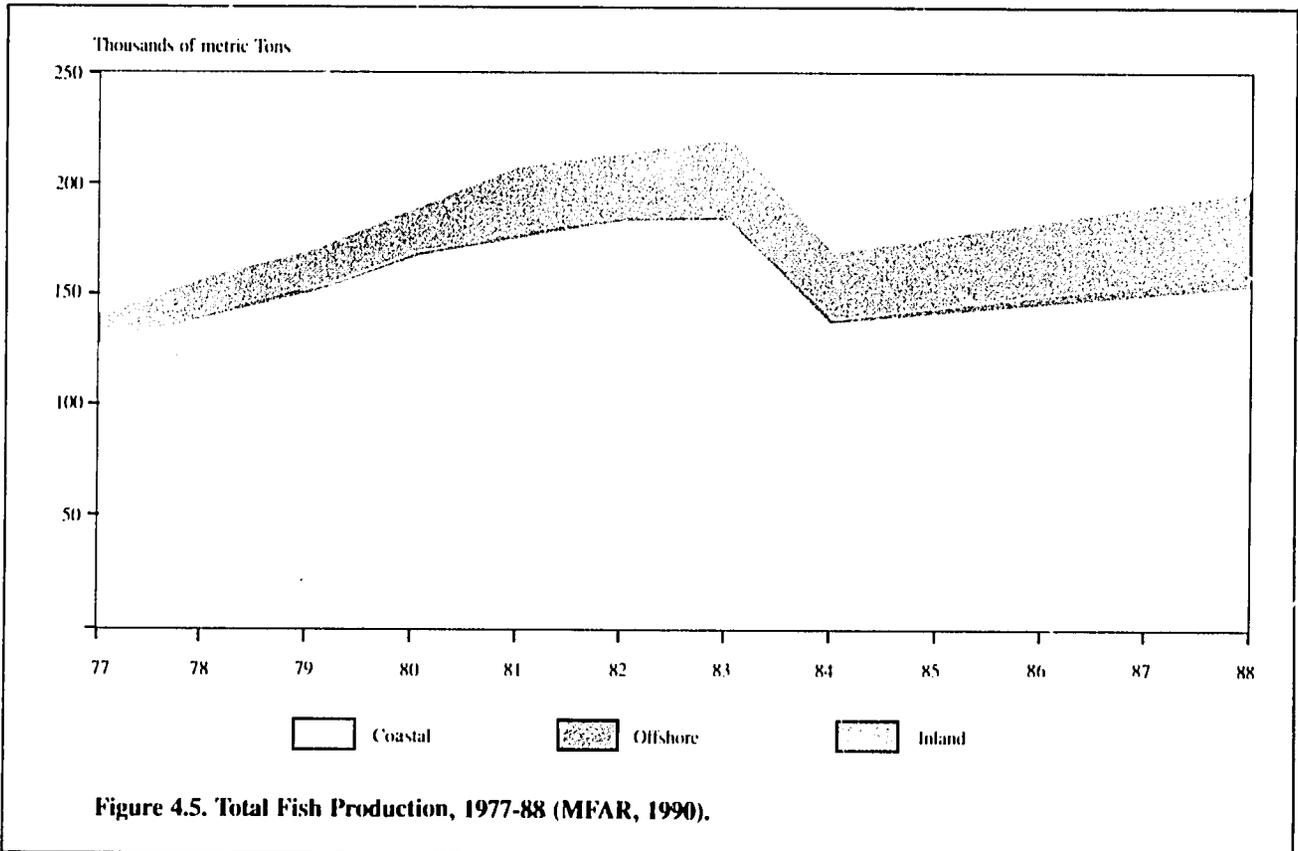
to promote rapid expansion of marine fisheries proceeded through the establishment of Fisheries Cooperative Societies (1941) and a series of programs that have provided fishermen with boats, vessels, gear and training at heavily subsidized rates. The Ministry of Fisheries was formed in 1970—it became the Ministry of Fisheries and Aquatic Resources (MFAR) in 1989—and a network of fishery harbors and other forms of infrastructure were built in the 1960s, 1970s and 1980s. The Department of

Fisheries was re-established in 1991. The first five-year National Fisheries Development Plan was prepared in 1978. Investments were mainly in the mechanisation of fishing craft and in increasing institutional sophistication.

Fisheries production peaked in 1983 at 221,000 mt. Subsequent declines to 177,000 mt and 198,000 mt are attributed to the civil disturbances and to poor reporting. Assessments of the magnitude of coastal fish stocks, the

Section 4.

MAJOR ISSUES AND OPPORTUNITIES TO BE ADDRESSED IN THE COASTAL REGION



impacts of fishing pressure and, therefore, estimates of sustainable exploitation rates have consistently lagged behind the enthusiasm for investment in vessels and gear. The most heavily exploited fisheries are in the nearshore, within 40 km of the coast. Most of these areas cannot sustain increases in effort and many are already overexploited, as indicated by a decline in catch per unit effort for many inshore stocks.

Offshore marine fisheries can possibly be expanded for the deep-sea demersal and migratory pelagic stocks. Accordingly, the government's current policy is to develop offshore/deep-sea fisheries, although caution is in order, since some migratory tuna stocks are reaching the limits of sustainable exploitation and the stock assessments are far from conclusive. This is complicated by the transnational movements of pelagic tuna stocks,

which are fished by several countries.

Aquarium fish capture has increased dramatically in the 1980s (Figure 4.6). There is a good export market for species of coral reef fish that command high prices abroad. Current trends in the fishery are not sustainable due to overfishing and habitat destruction. Valuable species will rapidly decline without management.

The fishing fleet used for capture of coastal and marine fish is a mix of unmechanized traditional craft and more modern motorized boats (Table 4.3). In 1987, 33 percent of the total marine fisheries harvest was caught by non-motorized traditional craft. An estimated 60 percent of the small-scale inshore catch was taken with small drift gill nets. This contrasts with the situation in the 1940s, when 75 percent of the catch was harvested with beach seines.

Section 4.

MAJOR ISSUES AND OPPORTUNITIES TO BE ADDRESSED IN THE COASTAL REGION

Table 4.3. Fishing Fleet and Levels of Production (Atapattu, 1989).

Year	1979	1980	1981	1982	1983	1984	1985	1986	1987
1. Inboard Motorized Craft									
Catch per boat per year (tons)	16.2	23.8	25.5	18.0	20.0	16.7	17.5	17.8	19.2
No. of operating crafts	3,109	2,305	2,209	3,347	2,861	2,781	2,727	2,766	2,657
Output (tons)	50,105	54,825	56,454	60,379	57,375	46,625	47,862	49,249	50,960
2. Outboard Motorized Craft									
Catch per boat per year (tons)	4.2	7.2	7.4	6.8	7.0	4.5	4.3	4.2	4.7
No. of operating craft	9,723	8,020	8,865	9,745	10,086	10,800	11,515	10,340	10,543
Output (tons)	43,848	57,432	65,512	66,727	70,539	48,660	49,950	47,684	49,341
3. Traditional Artisanal Craft									
Catch per boat per year (tons)	3.6	3.4	4.1	3.9	3.9	2.9	3.2	3.5	3.5
No. of operating craft	15,330	15,722	12,855	14,101	14,312	14,404	13,303	13,412	13,865
Output (tons)	54,598	53,007	53,109	55,426	56,135	41,454	42,454	47,333	48,977
Total output (tons)	148,851	165,264	175,075	182,532	181,049	136,642	140,266	144,266	149,210
Percent by artisanal fisheries	37	32	30	30	31	30	30	33	33

Section 4.

MAJOR ISSUES AND OPPORTUNITIES TO BE ADDRESSED IN THE COASTAL REGION

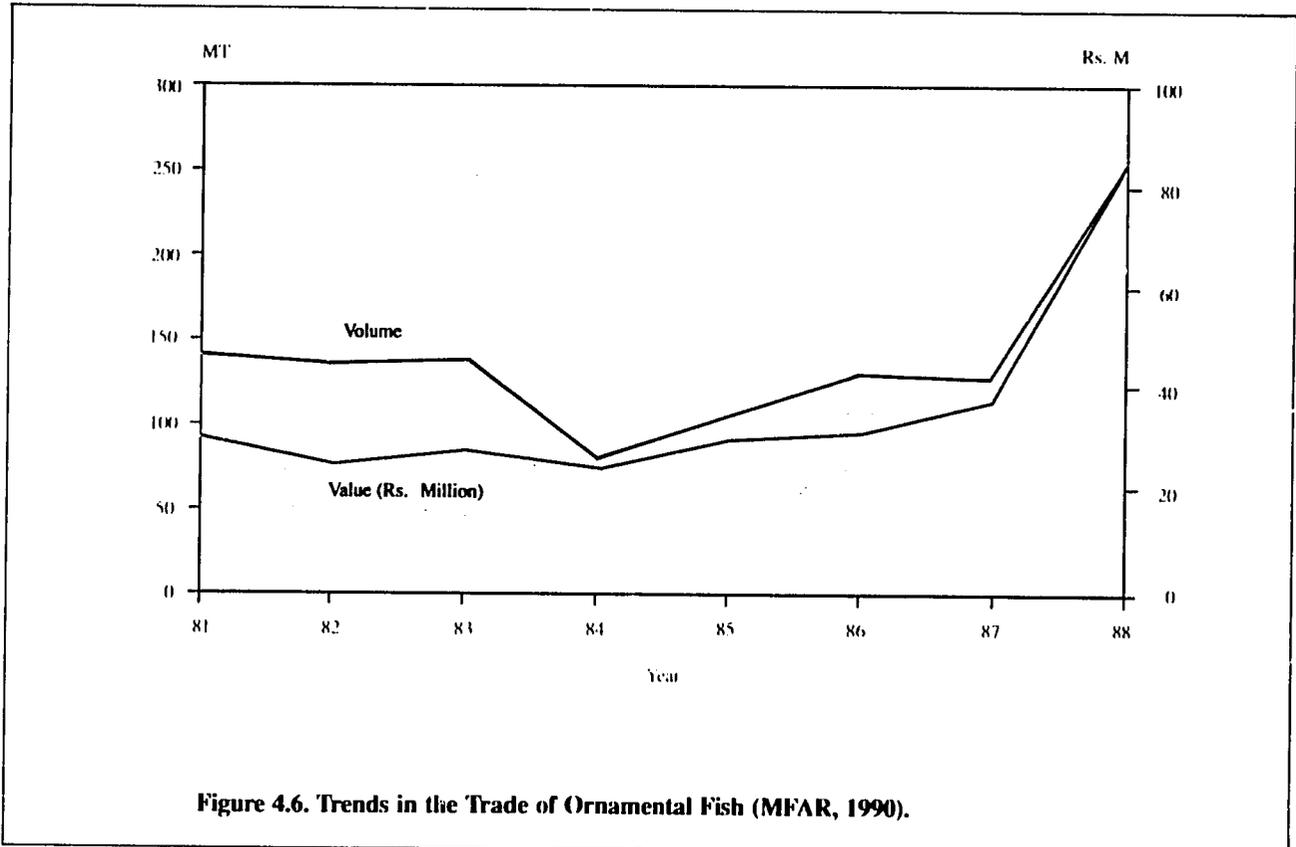


Figure 4.6. Trends in the Trade of Ornamental Fish (MFAR, 1990).

As for the status of the fisheries stocks, most nearshore and small pelagic stocks are fully or overexploited, with a very few inshore areas still underfished. According to a series of surveys made in the late 1970s, the annual sustainable yield within the continental shelf was estimated to be 250,000 mt—170,000 mt of pelagic and 80,000 mt of demersal and semi-demersal species. This estimate would suggest that coastal fisheries in 1988 (124,000 mt of pelagic and 31 mt of demersal) took 62 percent of the marine fishery resources available on a sustainable basis. Based mainly on commercial fishing operations, there are various estimates for maximum sustainable yield (MSY) in the area beyond the continental shelf. These vary

from 55,000 to 90,000 mt per annum.

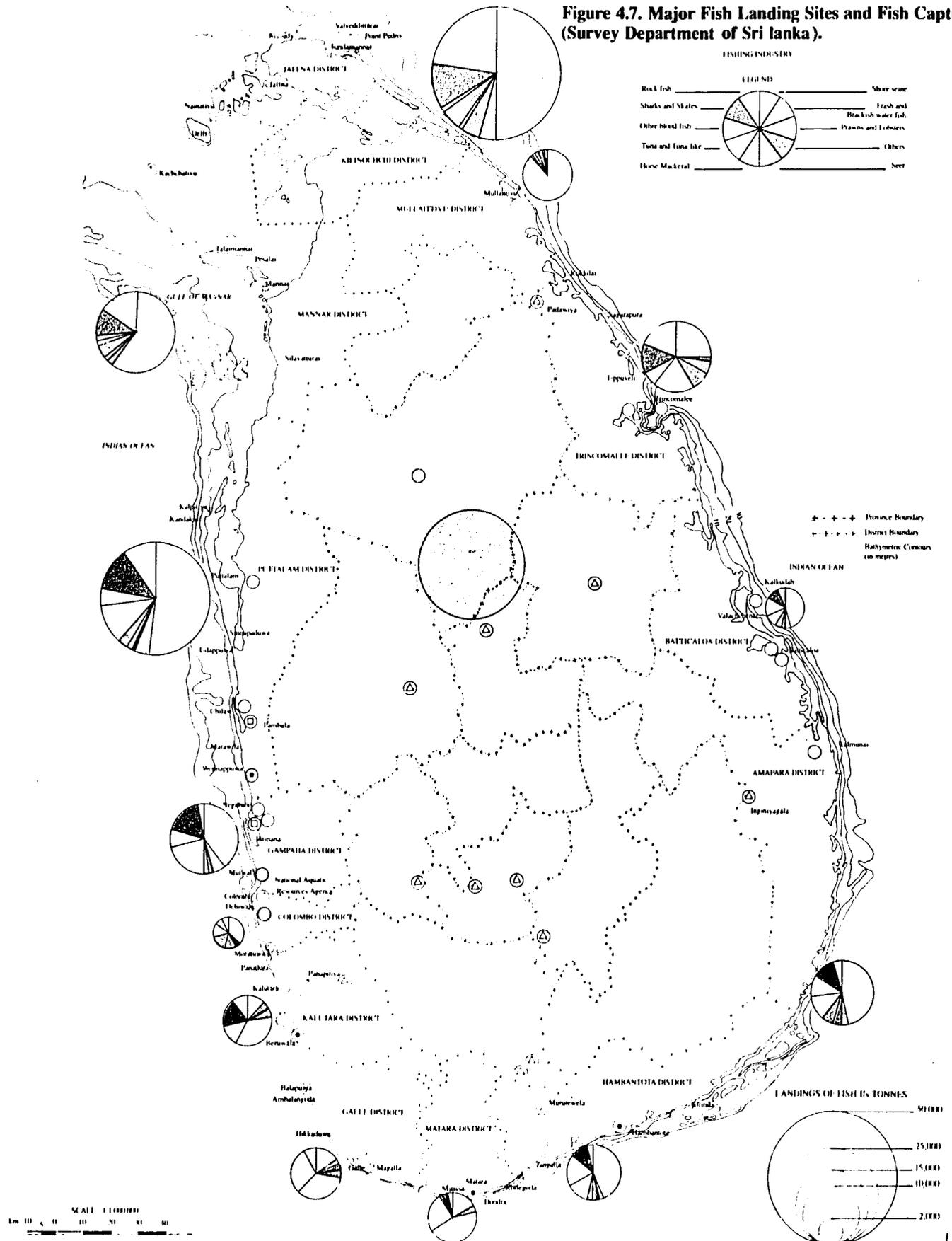
The distribution of Sri Lanka's fishing centers shows that the most productive fishing grounds are in the north, northwest and northeast, reflecting the large landings at Jaffna, Trincomalee, Mannar and Puttalam (Figure 4.7).

Domestic fish production meets over 70 percent of the national demand for fish. Maintenance of this proportion of total fish required will require annual increments in production of 5 or 6 percent, with growth from all sectors of the fisheries industry. Such growth is projected in the National Fisheries Development Plan, but it cannot meet the total

Section 4.

MAJOR ISSUES AND OPPORTUNITIES TO BE ADDRESSED IN THE COASTAL REGION

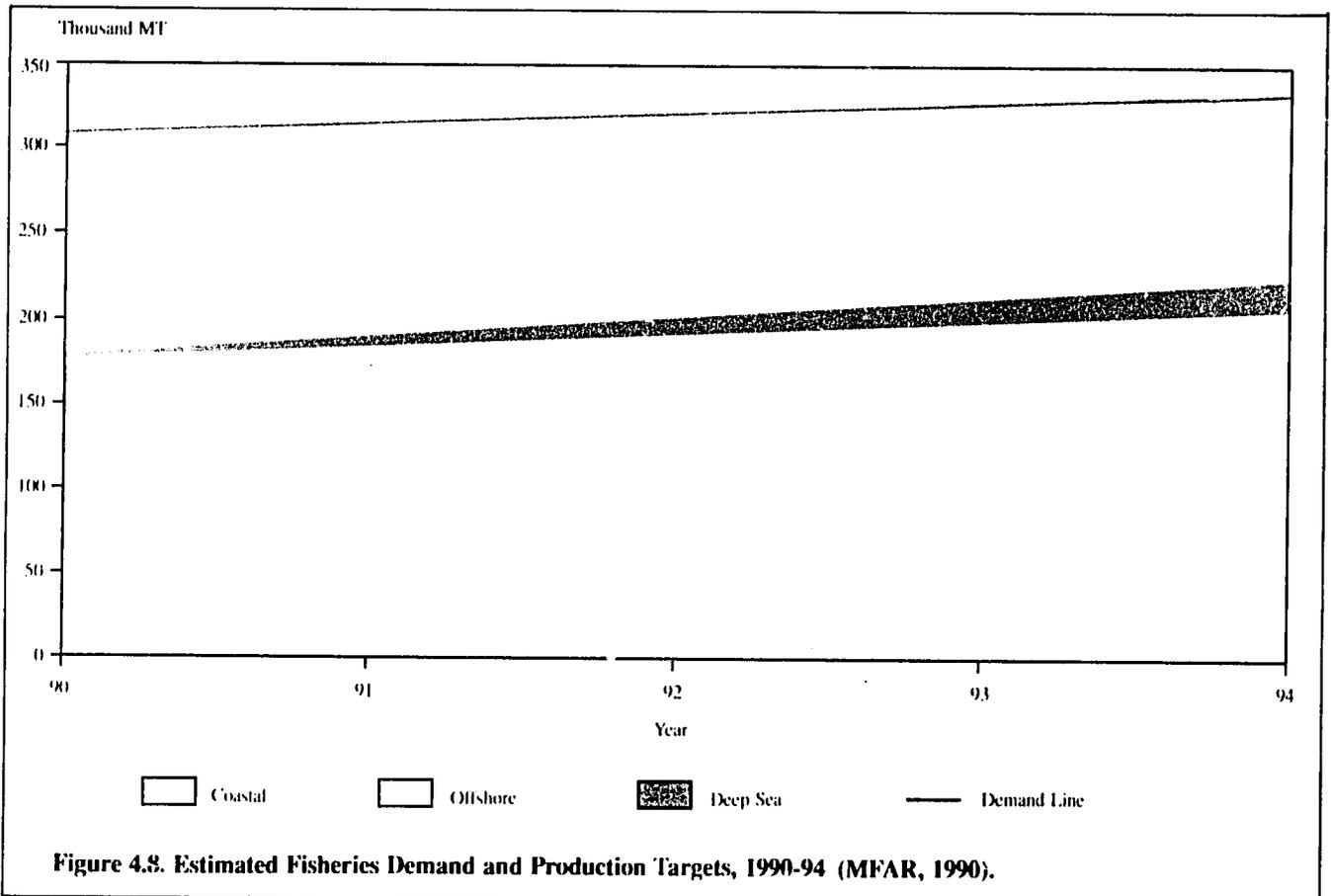
Figure 4.7. Major Fish Landing Sites and Fish Captured (Survey Department of Sri Lanka).



62

Section 4.

MAJOR ISSUES AND OPPORTUNITIES TO BE ADDRESSED IN THE COASTAL REGION



demand (Figure 4.8). The anticipated growth in marine coastal and marine offshore fisheries is assumed by the plan to come largely from expansion of the mechanized fleet. It also assumes that substantial growth in the marine deep-sea fisheries is possible and economically viable.

Current Government Policies

1. Present policies reflect the need to limit nearshore fishery effort except in a few underexploited fisheries. The government is attempting to determine sustainable limits for specific fisheries and to move away from total open-access regimes. There is increasing awareness that limited access, territorial-use rights in fisheries and permit systems are needed to manage effort and access, although none of these have yet been formalized.

2. Licensing is being introduced for trawlers and purse-seiners and is being considered for all motorized boats. The importance of protecting coastal habitats is a priority for management. Policies also support income distribution, in contrast to income maximization.

Issues and Opportunities

Government support and subsidies to the fishing fleet need re-examination. Despite great efforts to modernize and mechanize fisheries, it is remarkable that 30 to 40 percent of the total landings are still taken by the traditional unmechanized craft that make up half of Sri Lanka's fishing fleet. This suggests that benefits, in terms of employment and production, can be obtained by supporting and assisting these efficient, traditional fisheries.

Section 4.

MAJOR ISSUES AND OPPORTUNITIES TO BE ADDRESSED IN THE COASTAL REGION

Experience worldwide, and increasingly in Sri Lanka, demonstrates that modern technology makes it all too easy to overexploit a stock. It has also been demonstrated that efficient high-technology vessels and gear produce fewer jobs and compete with traditional fisheries, which produce harvests that can be sold at low prices, thereby directly benefiting local populations. Also, traditional fishing gear is usually less damaging to habitat than is large, mechanized gear such as bottom trawls.

The traditional unmechanized fishing craft, however, operate mainly in the nearshore area. The operation of inboard motorized "multi-day" boats has proved economically feasible for offshore areas without government subsidies, and many of these boats are therefore purchased outside subsidy schemes. The operation of these multi-day boats should be encouraged in the offshore fishery area (40 to 100 km), where they do not compete with traditional artisanal craft.

Critical fish habitats are not protected and are being destroyed and degraded at an accelerating pace. Critical fish habitats have not been specifically identified or protected (Table 4.4). Some have already been lost, with unestimated but significant impacts on the coastal fisheries. It is not known what proportion of the coastal stocks of fish and shellfish are dependent on coastal habitats such as estuaries, mangroves and seagrass beds. There are specific examples of declines in once-important species that are known to be associated with such habitats. An example is the increasing scarcity of coral reef fish collected both for food and for the aquarium trade.

Management of fisheries is difficult and currently inadequate. This is exemplified by the

poor management of the lucrative fishery for the aquarium trade. Although estimates are that exports of aquarium fish have been very high and that the industry employs as many as 50,000 people, no effort has been made to assemble adequate statistics for a management scheme. Several once-important species, such as clown fish, have almost disappeared from significant stretches of the coast. Such unregulated, and unsustainable, levels of exploitation have negative impacts on tourism as well as on fishing communities.

A lack of support exists for management among fishermen. Enforcement of regulatory measures in fisheries is possible only when a critical mass of fishermen accepts and supports management schemes. The most effective management occurs when it is self-imposed. An example is the success of fisheries societies in Galle, Puttalam and Trincomalee, which have stopped unscrupulous fishermen from overexploiting fisheries within their areas of operation.

There is a lack of a sustainable-use strategy for management. The top priority must be to identify and sustain coastal fisheries that currently provide significant harvests and employment and are most threatened by overfishing and/or by losses in habitat. Accepting management strategies designed to sustain such threatened species and fisheries will require a major change in the attitudes of both government and fishermen after four decades of unquestioned, largely unregulated growth. Equal attention must be given to sustaining key habitats and to regulating fishing efforts. A strategy should be formulated in close consultation with the fishermen themselves that would:

- explore how access could be limited within specific areas and/or to specific fisheries

Section 4.

MAJOR ISSUES AND OPPORTUNITIES TO BE ADDRESSED IN THE COASTAL REGION

Table 4.4 Impacts on Coastal Habitats of Particular Concern to the CCD (CCD1990)

Coastal Habitat	Impacts of Particular Concern to the CCD
1. Coral Reefs	Physical damage to coral reefs and collection of reef organisms beyond sustainable limits Increases in freshwater runoff and sediments Introduction of waterborne pollutants
2. Estuaries/Lagoons	Encroachment Changes in sedimentation patterns Changes to the salinity regime Destruction of submerged and fringing vegetation Inlet modifications Loss of fishery habitat
3. Mangroves	Changes in freshwater runoff, salinity regime and tidal flow patterns Excessive siltation Introduction of pollutants Conversion of mangrove habitat and overharvesting of resources
4. Seagrass beds	Physical alterations Excessive sedimentation or siltation Introduction of excessive nutrients or pesticides
5. Salt marshes (tidal flats)	Degradation of bird habitat or seed fish collection sites Obstruction of storm water runoff
6. Barrier Beaches, Sand Dunes and Spits	Sand mining Erosion Dune migration

Section 4.

MAJOR ISSUES AND OPPORTUNITIES TO BE ADDRESSED IN THE COASTAL REGION

through reactivating the former traditions of territorial-use rights that were once a vital part of the dominant beach seine fisheries. Other procedures for limiting access, such as licensing of all motorized vessels, must be explored and tested.

- explore means to apply limits for fish catch through self-regulation, community organization and fishermen groups, with an effort to educate the fishermen in resource management and benefits to be derived therefrom
- establish a research program to augment the work of NARA that will yield improved and more detailed estimates of the sustainable yields of selected important species within defined geographic areas

A3. Aquaculture

- Aquaculture has the potential to supplement the national food supply and to increase exports.
- Coastal land use and habitat protection must be carefully considered in aquaculture development.

Significance and Trends

Aquaculture is the cultivation of plants or the breeding and culturing of animals in water for subsequent harvesting. Mariculture is the subset of culture techniques that utilizes seawater as the culture medium.

Aquaculture in Sri Lanka is just becoming established at a time when it has grown explosively in several Southeast Asian and Latin American countries. Mariculture holds the promise of replacing hunting and gathering with culture techniques, in the manner that agriculture did many centuries ago on land. Sri

Lanka has no tradition of aquaculture. The government has been promoting interest and attempting to adapt existing technologies to Sri Lankan conditions through research, demonstration projects and the offer of an attractive package of incentives.

It has been estimated that there are 12,000 ha of water bodies suitable for pen culture and 6,400 ha of wetlands for pond culture. The greatest development potential for aquaculture in Sri Lanka is in estuaries, lagoons and brackish-water wetlands within the coastal region (Figure 4.9). There is freshwater aquaculture of species for local consumption primarily inland of the coastal region; in 1988 aquaculture accounted for only 0.13 percent of the total national fisheries production.

Coastal mariculture is primarily seen as an export industry and not as a potentially important source of food for local consumption. While shrimp mariculture can be highly profitable so long as world prices remain high, milkfish and mollusks produced for domestic consumption have been only marginally profitable. Hence, mariculture of food fish for local consumption is small. There are experimental operations underway for milkfish, mussels and oysters, and interest in seaweed culture and brine shrimp production is growing.

Expansion of brackish-water shrimp and prawn mariculture is the focus of government development efforts. Shrimp mariculture first appeared in Sri Lanka in the early 1980's. By 1989, brackish-water shrimp culture had become the dominant form of aquaculture. In that year, 52 entrepreneurs, 20 of whom operate on a significant scale, produced 779 mt of black tiger prawn for export. A total of 243 ha of ponds were in operation, utilizing shrimp postlarvae

Section 4.

MAJOR ISSUES AND OPPORTUNITIES TO BE ADDRESSSED IN THE COASTAL REGION

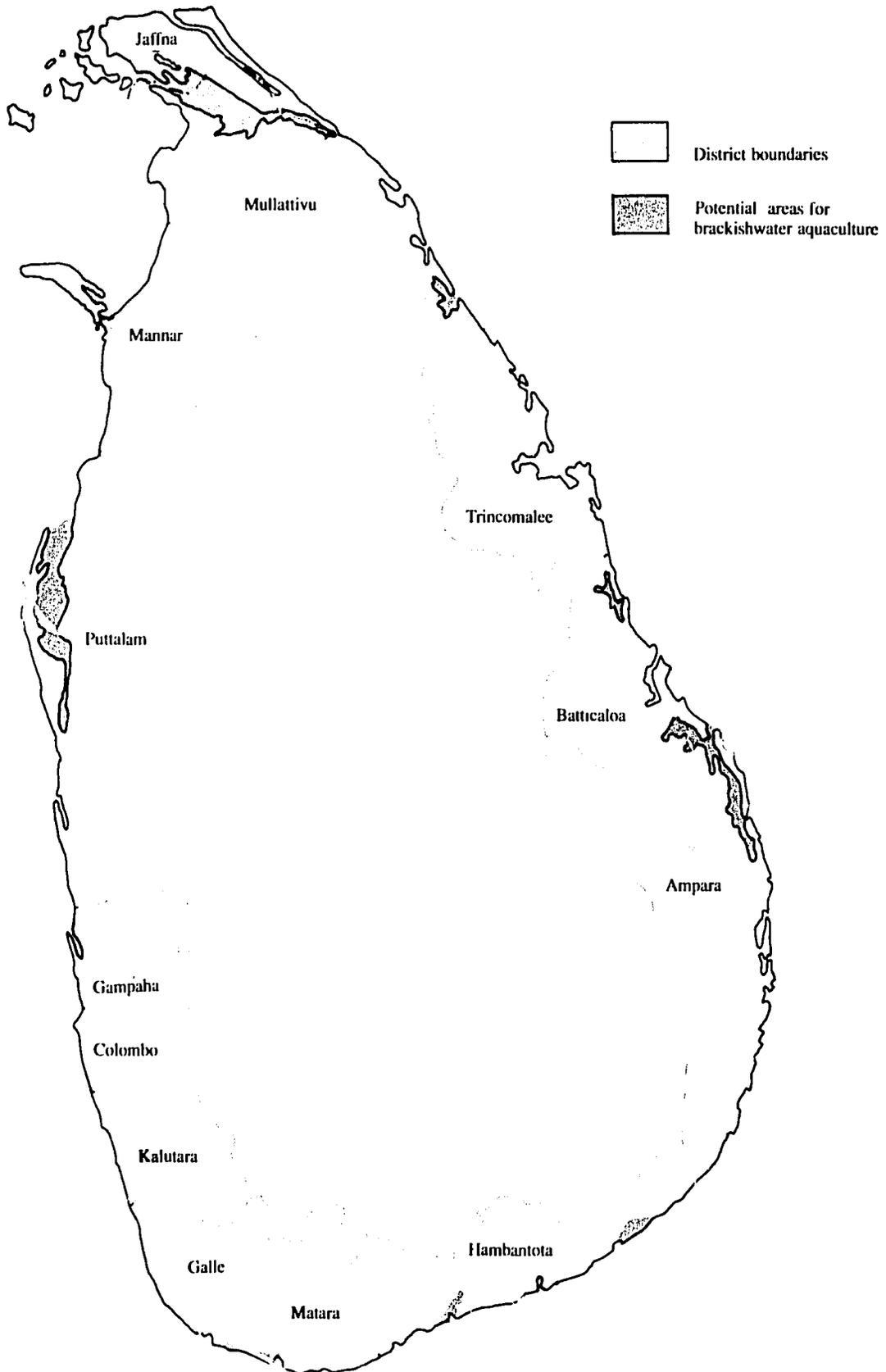


Figure 4.9. Potential Areas for Coastal Aquaculture Development (MFAR, 1990).

Section 4.

MAJOR ISSUES AND OPPORTUNITIES TO BE ADDRESSED IN THE COASTAL REGION

produced by five hatcheries. The increasing share of cultured shrimp in the total shrimp catch is shown in Figure 4.10 and Table 4.5.

Expansion of this industry is a high priority of the Ministry of Fisheries and Aquatic Resources, the state banks and the Export Development Board. The strategy for expansion is as follows:

- expanding the area under brackish-water prawn culture by extending this activity, which

is now concentrated in the Northwest Province to the southern, northern and eastern areas. NARA has carried out a survey of land suitable for shrimp mariculture.

- promoting small clustered ponds (1 to 5 ha) under the Janasaviya Program. The GCEC will approve larger farms only if such farms agree to assist a few smaller farmers.

- providing better scientific and research services for the prevention of diseases

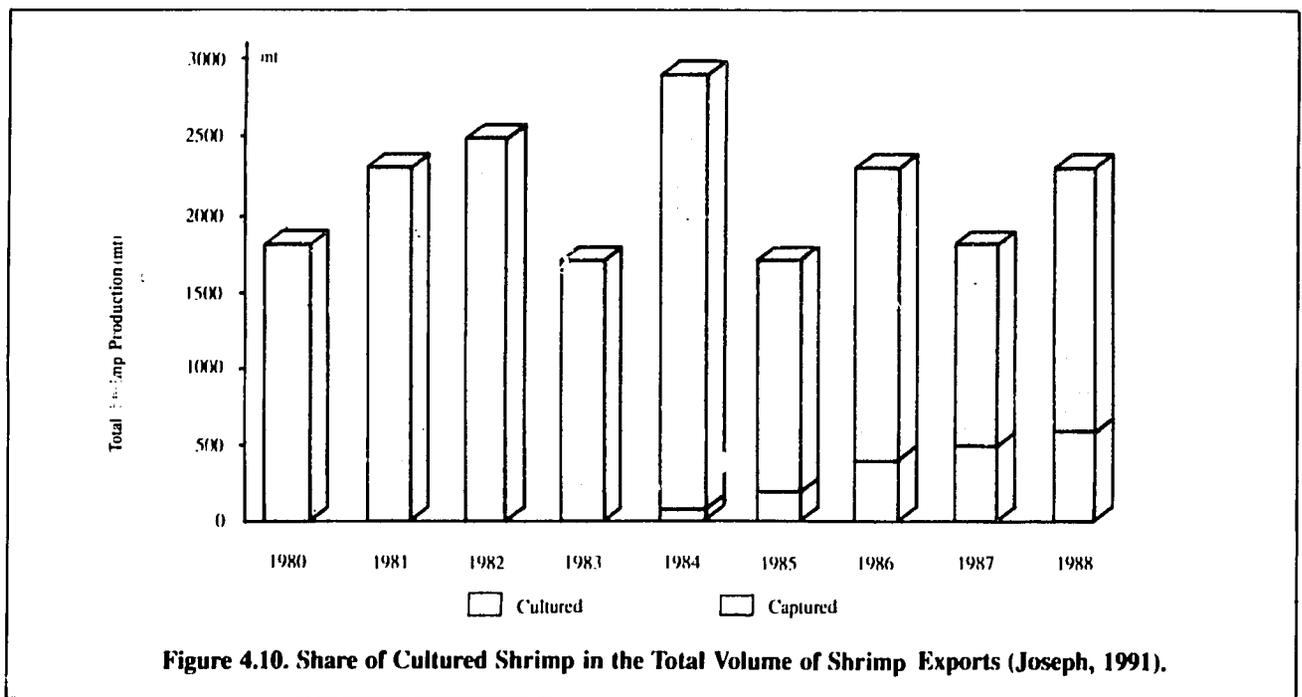


Figure 4.10. Share of Cultured Shrimp in the Total Volume of Shrimp Exports (Joseph, 1991).

Table 4.5 Shrimp Production, 1985-90 (FAO/ADB, 1991.)

Year	Wild Catch	Farmed Prawns*	Total (mt)	% Farmed Prawns
1985	4,190	100	4,290	3
1986	4,310	200	4,510	6
1987	4,460	380	4,840	12
1988	4,640	500	5,140	17
1989	4,700	600	5,300	22
1990	n.a.	500	—	—

* Quantities processed.

Section 4.

MAJOR ISSUES AND OPPORTUNITIES TO BE ADDRESSED IN THE COASTAL REGION

- reducing the cost of prawn feed by the local development of cost-efficient feed
- providing better quality seed in sufficient quantities

3. Technological and socioeconomic constraints are impeding the further expansion of aquaculture in Sri Lanka.

- Shortages in the supply of juvenile stocks for culture operations are a major problem for shrimp growers and fish culturists. There are no significant sources of wild shrimp postlarvae, and the spawners—particularly the black tiger prawn spawners required for shrimp hatcheries—are very scarce.
- There is a shortage of trained support personnel for fish breeding centers.
- A low-cost, locally available fish meal of constant chemical composition is not available. The absence of feeds at affordable prices is a major constraint to growth in cage culture operations for such carnivorous species as the sea bass and groupers.
- Disease has troubled both hatcheries and shrimp ponds, and is related to poor water quality. There is a lack of trained pathologists for fish and shrimp. There is also no regular monitoring program of disease incidence.

Socioeconomic constraints include:

- The Sri Lankans lack experience in aquaculture. Rearing of animals for food consumption conflicts with religious precepts of a large segment of the population and has affected government policy on inland fisheries.
- Competition between aquaculturists and other users of nearshore waters and lands is a

problem. Conflicts are most severe where large areas of land suitable for aquaculture have been leased by government to large private companies. The local communities affected argue that they have more rights to state land in their area than outside companies which can dispossess them of their privileges, and they protest losses of mangroves, grazing land, salinization of groundwater and the small numbers of jobs made available to them.

- Low demand levels and depressed consumer prices for varieties of freshwater fish on local markets are a major constraint to the development of culture operations for the national or local market.
- Poaching has become a serious problem on several shrimp farms.

4. Mariculture activities can have major consequences for coastal habitats. Among them are (a) the destruction of mangroves and other wetlands, both by clearing of vegetation and by the diversion of fresh water into ponds and away from such wetlands; (b) destruction of lagoons through channelization; (c) saltwater intrusion into agricultural lands and domestic wells; and (d) increasing eutrophication in the water sources caused by leaching of acidic substances during pond construction and by the effluents released during aquaculture operations.

Current Government Policies

Sri Lanka is attempting to plan mariculture siting and operation prior to what is expected to be a period of rapid development. Specific targets for aquaculture production and related research are contained in the *National Fisheries Development Plan, 1990-94* (MFAR, 1990). The CEA has set guidelines for the construction and operation of ponds. In addition, the procedures for applications for carrying out mariculture operations have been set.

Section 4.

MAJOR ISSUES AND OPPORTUNITIES TO BE ADDRESSED IN THE COASTAL REGION

Amendments are being drafted to the Fisheries Act to provide for leasing public lands and waters for aquaculture projects whereby the license holder will have exclusive rights to harvest the organisms that are cultured. These amendments may also include guidelines on the location and construction of aquaculture operations and facilities.

Considerable effort has been expended on a research program carried out primarily by NARA with funding from a number of donors. The emphasis in this program has been upon the development of new culture systems and upon the training of personnel. By far the largest foreign-funded fisheries project is the \$22 million Asian Development Bank effort, which places major emphasis on shrimp pond culture on the production of fish and shrimp seed and on strengthening the institutional infrastructure.

Issues and Opportunities

1. Poorly planned expansion in aquaculture.

Experience has demonstrated that poorly planned and inadequately regulated mariculture development can have severe adverse impacts on habitats and coastal communities. At the same time, the farming of marine organisms has a very high potential to produce wealth, new employment and food. Steps should therefore be taken quickly to:

- identify sites where pond culture and technologies that utilize intertidal areas should be (a) encouraged, or (b) discouraged. Since the technology is still young, it would be unwise to use rigid criteria in preselecting suitable sites at this time.
- require that any proposal to commence mariculture operations be presented as an element of an integrated development plan for the area and for the communities affected

- ensure that lands and subtidal areas are allocated for mariculture purposes only after consultation with the communities affected. Such consultation should be arranged by the CCD in consultation with NARA, the MFAR, the local AGA and other agencies.

2. Production of locally acceptable and affordable fish. Since it is unlikely that marine fisheries alone will be able to supply the demand generated by an increasing population for inexpensive fish, the priority should be to promote mariculture techniques that can produce fish at a price that lies within the purchasing power of the local populace. Research and extension services provided by NARA in support of mariculture should emphasize the slogan "Food for the People."

3. Siting of aquaculture ponds. Any developer proposing a mariculture operation within the designated coastal zone or one that involves water intake and/or discharges across the coastal zone should be required to apply to the CCD for a permit. In the granting of such permits, the operation should be considered in its entirety and not merely in that portion of the operation which lies within the designated coastal zone.

4. Scale of operation. Government should structure its incentives so as to favor small-scale operations that maximize employment opportunities and benefit coastal communities in other ways.

5. Feeds. A top research priority is to develop feeds at a competitive price that allows them to be used in small-scale operations. The small, bony, freshwater fish available in reservoirs are one promising source of protein for these feeds.

6. Water quality. A water quality monitoring system should be adopted in the areas where shrimp farms are concentrated.

Section 4.

MAJOR ISSUES AND OPPORTUNITIES TO BE ADDRESSED IN THE COASTAL REGION

Issue B. Increasing Income and Generating Employment While Maintaining Environmental Quality

- National and local economies must be expanded to employ an increasing population and to raise per capita income.
- Increasing industrialization and tourism must be attentive to the environment to avoid long-term pollution costs and environmental degradation.

Sri Lanka is embarking on an aggressive program to expand its national and local economies through industrialization and tourism. The thrust to generate employment, raise per capita income and improve national export earnings is a high priority among policy makers. The question that must be continually asked and put in perspective is: What are the short- and long-term environmental costs in such policies? Excessive environmental costs will be avoided if preventive planning is part of an economic expansion program.

B1. Industry

- Industrial development plans must consider all environmental and social impacts on coastal areas.
- Appropriately scaled industry can generate needed employment for coastal residents.

Significant Trends

The manufacturing industry in Sri Lanka is generally recognized to be of three types: (1) tree crop processing (mainly, tea, rubber and coconut); (2) factory industry; and (3) small and cottage industries.

Industry, like tourism, has a large potential for growth. The percentage of people employed in the country by manufacturing industry more than doubled between 1971 and 1986 (Figure 3.10). The monetary contribution to GDP increased 2.5 times between 1983 and 1989 (Figure 3.7). Industry's share of gross national product increased from 14.6 percent in 1983 to 18 percent in 1991 (Table 4.6). In addition, the share of small and cottage industries is expected to increase significantly with the implementation of the Janasaviya Poverty Alleviation Program.

Industry employs about 1 million people. In 1983, there were 600,000 employed in all industry, with about 210,000 in well-organized operations. Industry is expected to provide an increasing number of jobs and to ease the balance of payments through effective import substitution and export expansion. It is expected to provide an improved technical base for agriculture and other sectors of the economy.

Table 4.6 Percent Gross National Product Contributed by the Manufacturing Industry, 1982-91
(Central Bank Annual Reports)

Industry	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Tree Crop Processing	3.1	2.9	2.9	3.0	2.9	2.9	2.9	2.7	2.7	2.5
Factory Industry	9.7	9.5	10.2	10.1	10.8	11.6	12.1	13.0	13.5	14.1
Small and Other Industry	2.2	2.2	2.1	2.0	2.0	2.0	2.0	1.5	1.5	1.5
Total Manufacturing Industry	15.0	14.6	15.2	15.1	15.7	16.5	17.0	17.2	17.7	18.1

Section 4.

MAJOR ISSUES AND OPPORTUNITIES TO BE ADDRESSED IN THE COASTAL REGION

Industrial development is heavily concentrated in the Western Province, which accounted for 76 percent of total industrial output in 1989. Ninety percent of industrial units are located in the coastal region. Colombo is a main center because of its infrastructure facilities, the supply of skilled personnel and its proximity to the country's principal markets.

Three product groups accounted for 83 percent of the total industrial output and 72 percent of total industrial employment in 1989. These groups are: (1) food, beverages and tobacco; (2) clothing and leather products; and (3) chemicals, petroleum, coal and plastic products. The share of engineering-based industries, the core of sound industrial development, is low at only 5 percent of total output. This reflects a dependence on imported technology hardware and the low level of technology software development in the industrial sector. Ninety percent of the raw materials for manufacturing were imported in 1985.

The proportion of manufactured products in exports has risen substantially from 13.3 percent in 1977 to 48.7 percent in 1987. This has contributed to an improved balance of payments and improved foreign monetary reserves.

The average size of an industrial unit is very small in Sri Lanka. In 1983, 86 percent of the industrial units in the country had less than five employees. They engaged only 30 percent of the industrial labor force and produced 8 percent of the output by value and provided only 9 percent of total industrial wages. Thus, most of the economic contribution of industry comes from the few larger units.

Some industries are more responsible than others for environmental pollution. The largest

environmental problem associated with factories is waste effluent, which is increasingly polluting the inland waterways of Colombo, coastal lagoons, estuaries and some nearshore ocean sites. The heaviest pollution loads come from:

- tanneries that dump effluent with high organic matter and salt content. Toxic chromium compounds are found in the effluents from tanneries practising chrome tanning.
- paper mills that release black liquor effluent into waters such as the Valachchenai Lagoon (threatening its fishery and tourism) and the Walawe Ganga, the source of Hambantota town water supply
- rubber processing units, especially those processing latex
- lime kilns based on coral, some of it obtained by mining coral reefs
- textile factories and batik printing units that discharge effluents containing alkalis, oils and dyes that are toxic to aquatic life
- arrack distilleries, which pollute ground and surface water
- asbestos-cement plants, which release fibers that have been proven to be highly carcinogenic

Current Government Policies

A top priority of the government is to generate employment. Industrialization is seen as a major source of future jobs, and labor-intensive industries are being promoted.

Export expansion is necessary to ease the balance of payments. Export-oriented industry is therefore being encouraged through the upgrading of labor skills and by improvements in production organization. The GCEC has

Section 4.

MAJOR ISSUES AND OPPORTUNITIES TO BE ADDRESSED IN THE COASTAL REGION

Investment Promotion Zones (IPZs) at Katunayake and Biyagama, and is establishing a third at Koggala, near Galle. At the end of December 1991, 153 GCEC projects were in commercial production, employing over 85,000 persons and bringing in gross export earnings of Rs. 22,800 million.

The government is actively divesting itself of industrial production units under its program of "peoplization." This program will increase private ownership of industry and will encourage small self-help industrial ventures.

Issues and Opportunities

1. Reconciling increased industrialization with the conservation of natural resources. The policy of promoting industry to stimulate economic growth and employment does not have to be at odds with the conservation of natural resources. There are many industries which are relatively clean and non-polluting and are not dependent on scarce natural resources for raw materials. Technologies are now available which ensure minimum water and air pollution. Sources of raw materials need to be scrutinized so that overexploitation is avoided.

2. Minimizing industrial pollution. Environmental impact assessments are a prerequisite to reducing the potential for pollution before industrial plants are constructed. However, pollution control measures, if they are to be implemented, need to be practical and affordable.

3. Monitoring of industrial effluents. The implementation of a pollution monitoring system for industrial effluents needs to provide more information for management planning. Such monitoring may encourage industry to be more careful about dumping effluents which do not conform to acceptable standards.

4. Generating incentives for existing industries to help pay for pollution control. Other actions that need to be explored in order to discourage pollution are monitoring, dialogue with industry, assistance with technology for mitigation of pollution, legal action, fines and the closure of units that are a public nuisance.

B2. Tourism

- Tourism can boost coastal economies and support environmental conservation.
- Environmental impacts need to be considered in tourism development plans and actions.

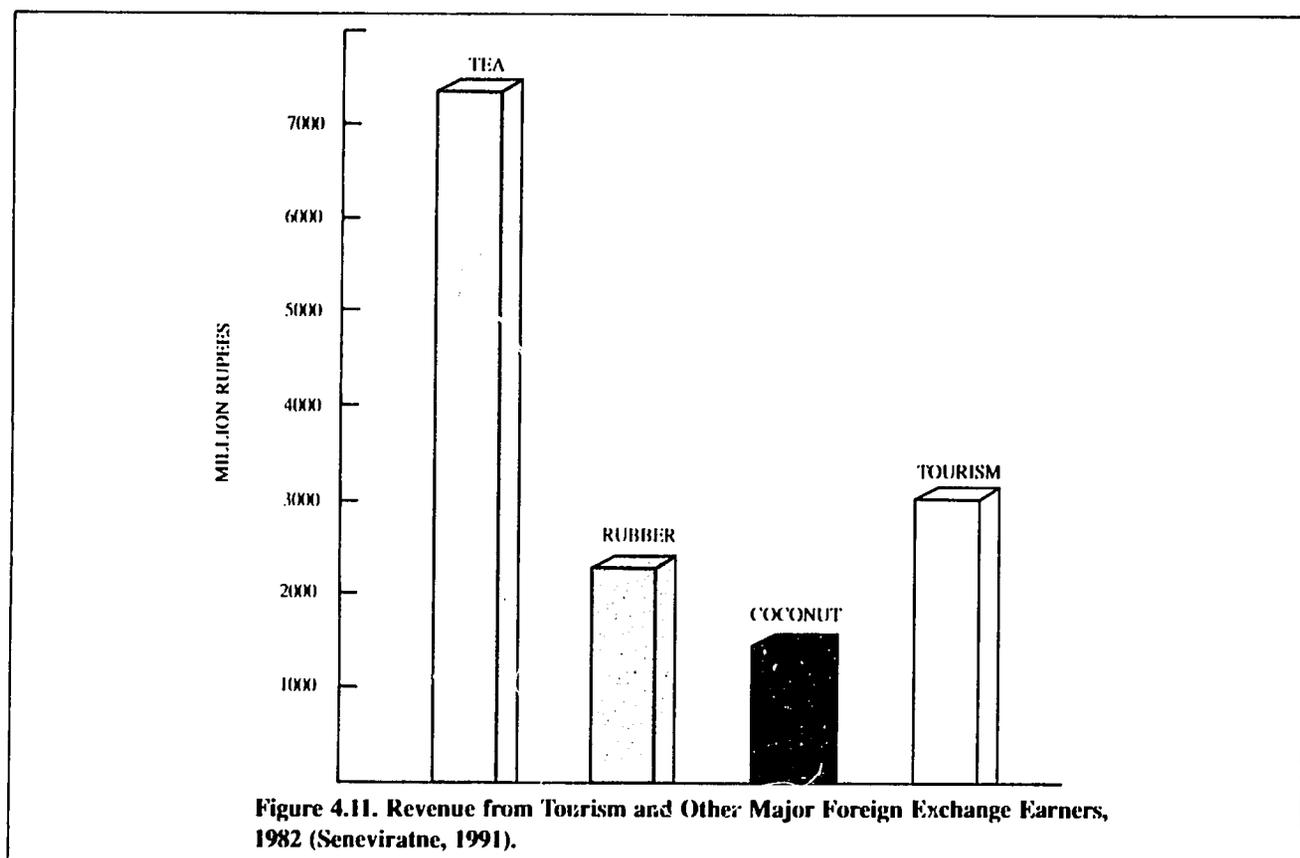
Significant Trends

The tourism industry is widely recognized in Sri Lanka as having significant growth potential. Tourism provides the opportunity for the country to earn foreign exchange and to provide employment. In 1982, the last "normal" and peak year for tourism, foreign exchange earnings totaled US \$147 million (Rs. 3,000 million), making tourism the second largest foreign exchange earner (Figure 4.11). The tourism industry is a major employer, ranking in line with the fishing industry. In 1981, it was estimated to employ over 100,000 people—30,000 direct jobs, 35,000 indirect jobs, and another 35,000 in spill-over activities.

Most of Sri Lanka's formal tourism industry is in the coastal region, with 82 percent of the "resort" hotel rooms in coastal districts. There is also an informal sector, estimated in 1982 to include 3,000 establishments that provide accommodation, food, transport, shopping and recreational services to tourists. In 1982, this sector had earnings of about \$38

Section 4.

MAJOR ISSUES AND OPPORTUNITIES TO BE ADDRESSED IN THE COASTAL REGION



million (Rs. 800 million). Of this amount, more than 90 percent accrued to the populace of the areas where informal tourism activities are concentrated such as Hikkaduwa, Negombo, Kalkudah and Arugam Bay (Figure 4.12). In Hikkaduwa, tourism has made a major change in the income levels and the standard of living of the people, while at Koggala, Negombo, Mt. Lavina, Kalutara, Beruwala and Bentota it has provided new avenues of employment.

The tourism industry can and often does have direct and significant impacts on other coastal activities and the use of the shoreline. Impacts may include space conflicts with fishing activities (i.e., beach seine haul-out areas, boat landings, access points) and lead to loss of local recreation opportunities and loss of access to the shore. Tourist facilities, when incorrectly sited or constructed, have resulted in

beach and water pollution and increased requests and need for shoreline protection works. The social interactions between the local population and tourists can be both positive (increased literacy, wider world view) and negative (narcotics, prostitution, crime).

International tourism to Sri Lanka began during the 1930s during the British period. After Sri Lanka gained independence, tourism declined and remained at a low level in the 1950s and early 1960s. A government-sponsored tourism development program started in 1966, and by 1975 arrivals had climbed to over one hundred thousand per annum. Tourist arrivals continued to increase through 1982. European arrivals subsequently declined due to a recession in Europe. Civil disturbances in 1983 resulted in a steady decline in tourist arrivals and earnings, which continued through

Section 4.

MAJOR ISSUES AND OPPORTUNITIES TO BE ADDRESSED IN THE COASTAL REGION

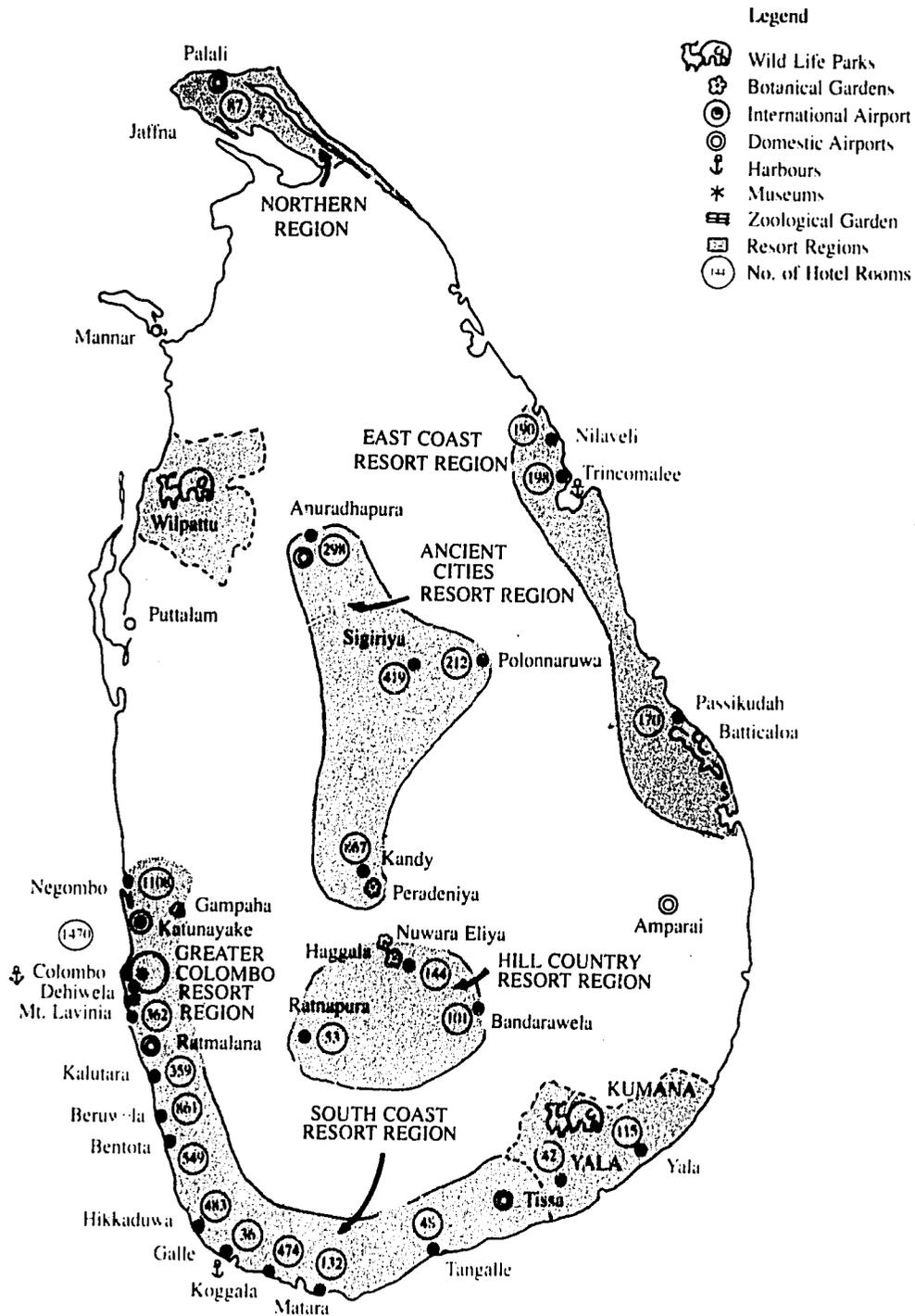


Figure 4.12. Major Tourist Areas and Hotel Room Capacities in 1983 (Seneviratne, 1991).

Section 4.

MAJOR ISSUES AND OPPORTUNITIES TO BE ADDRESSED IN THE COASTAL REGION

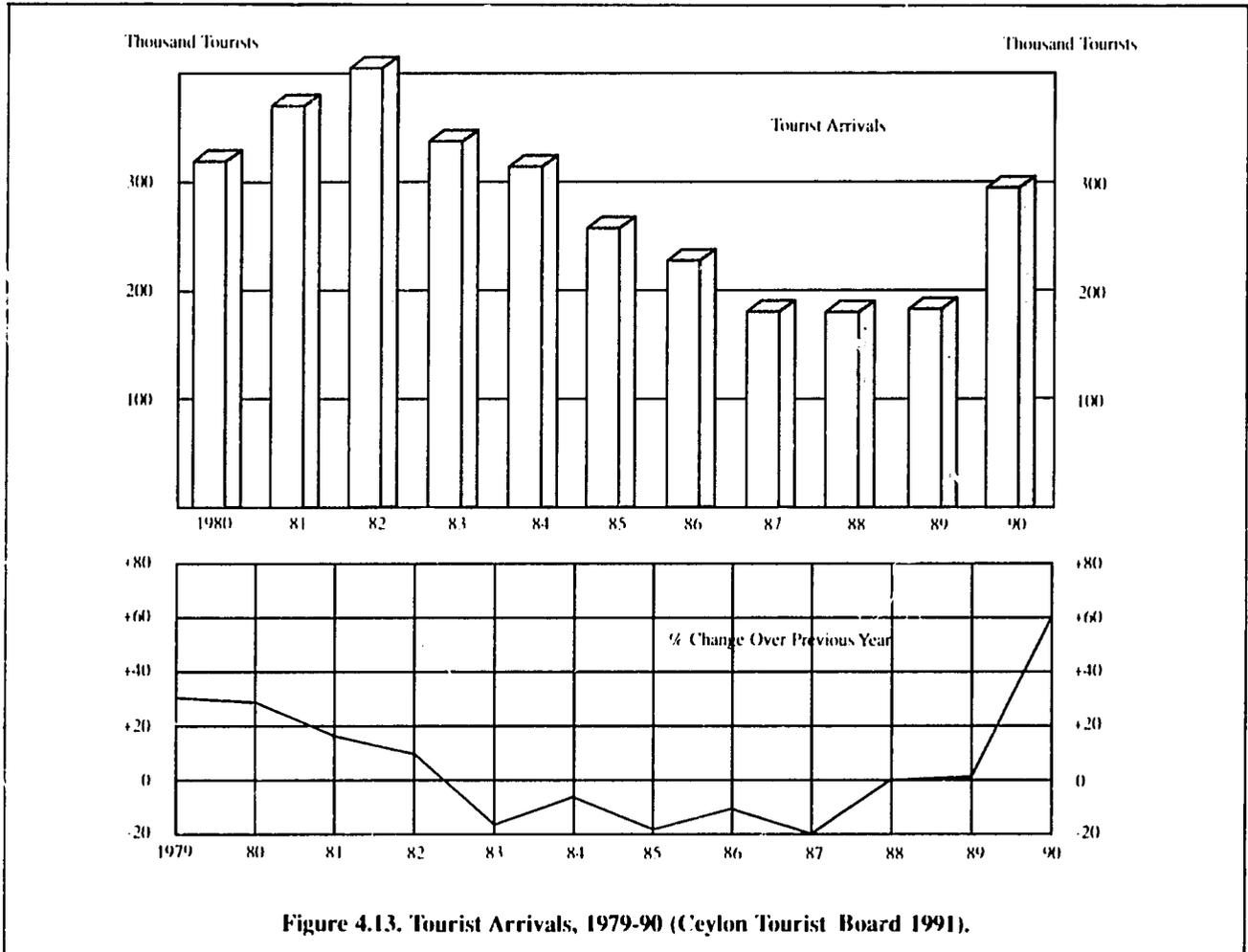


Figure 4.13. Tourist Arrivals, 1979-90 (Ceylon Tourist Board 1991).

early 1990. With the return of greater stability to the nation, tourism is again increasing (Figure 4.13).

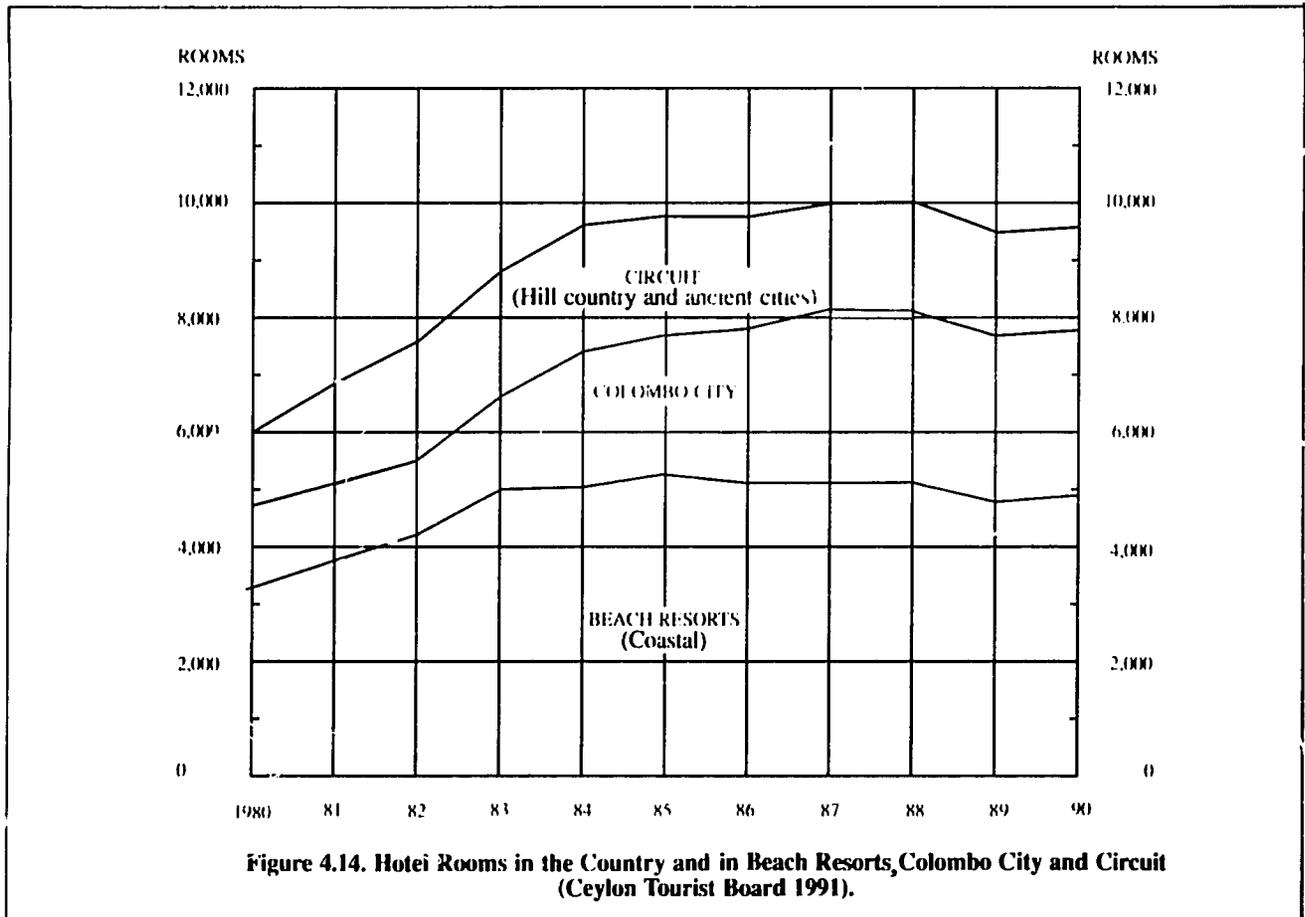
Tourist facilities are concentrated in the coastal region, primarily in the Colombo and Negombo regions and along the south coast (Figure 4.14). Tourism development on the east and north coasts is more limited, and during the past five years has dwindled to almost nothing. The hotels and tourist facilities now in the country can accommodate approximately 650,000 tourists annually. This is more than twice the number of tourist arrivals in the peak year of 1982. Tourist facilities have been maintained with government assistance through options such as the rescheduling of loans.

With stability returning to the nation, the large investment in tourism by the government and private sectors should ensure an increase in tourism. Additional development is planned along the east coast areas of Trincomalee and the Batticaloa to the vicinity of Arugam Bay. By 2001, an additional 300,000 tourists per annum could be accommodated there. It is projected that about 950,000 tourists will visit Sri Lanka by the year 2001.

Tourists differ in their spending habits and facility requirements and in the types of activities/attractions they enjoy. Thus, the type of tourist a country attracts has much to do with the impacts of tourism on that country.

Section 4.

MAJOR ISSUES AND OPPORTUNITIES TO BE ADDRESSED IN THE COASTAL REGION



Sri Lanka caters mostly to tourists from Western Europe (Table 4.7). During 1982, almost three-quarters of the tourists visiting Sri Lanka were 20 to 30 years old, a relatively low-budget travel group.

Table 4.7. Origin of Tourists by Region (Ceylon Tourist Board 1991).

Region	Number of Tourists	Percent
North America	6,534	3.6
Western Europe	111,426	62.0
Asia	53,712	29.4
Australia	3,992	2.2
Other	6,998	3.8
TOTAL	182,667	100.0

Current Government Policies

The Ceylon Tourist Board sets policy for and regulates the development and activities of the tourism industry. In 1982, the Tourist Board adopted guidelines and administrative procedures for tourism development in the coastal areas so as to avoid environmental damage. Guidelines were set for siting, architectural design, infrastructure and zoning schemes.

The effectiveness of this management structure has yet to be tested, as there had been virtually no demand for new tourist facilities since 1983. These guidelines are also not applied to the informal sector—Hikkaduwa, Ettukala and Arugam Bay, where unplanned development has proliferated.

Section 4.

MAJOR ISSUES AND OPPORTUNITIES TO BE ADDRESSED IN THE COASTAL REGION

The CCD has designated for protection important historic, archaeological and cultural sites as well as recreation and scenic sites in the coastal zone.

Issues and Opportunities

1. The volatile nature of the industry. Past experience has demonstrated that the tourism industry is sensitive to external events such as the 1982 recession in Europe and to local civil disturbances as those that occurred in Sri Lanka from 1983 to 1991. Both events caused a decline in tourist arrivals. The decline of tourist activity since 1982 made many conscious of the volatile nature of the industry. Private investors, banks and ancillary industries are now more cautious about investing in tourism.

2. The need for siting, construction and operational controls for tourist facilities. As a response to the rapid, often chaotic, environmentally and socially disruptive tourism development of the early 1980s, an interagency special committee of the CCD, UDA and the Tourist Board set out guidelines for tourist development in coastal areas. These guidelines address:

- avoidance of conflicts between tourism, fishing and industrialization
- consideration of coastal stability in facility siting
- conservation of coastal ecosystems

The effectiveness of these guidelines has not yet been tested, as they were adopted as tourism began to decline with the 1983 civil disturbances.

3. Differences in the total earnings and the distribution of benefits from different types of tourism. Young European tourists tend to spend less and often seek small, inexpensive beach resorts. Some prefer nature tourism, while the activities of others cause social problems. A second group comes from Asia and Australia, and because of their proximity to Sri Lanka, they face low traveling costs. They are generally low-budget travelers who prefer good service and beach resorts. Europeans and North Americans spend more to get there, and will generally spend more in-country, preferring higher class resorts. Group tours are predominantly from Europe, with only a few from Asia and Australia.

The nation needs to maximize foreign exchange earnings through tourism while minimizing environmental and social impacts.

This will require setting and implementing guidelines for the type of arrivals desired to match the attractions offered. Marketing must be in line with the guidelines decided upon and coordinated with the development of tourist sites.

4. The need to link tourism to the natural resource base and cultural heritage. Tourism needs to be built upon the natural attractions of the country, which include plentiful wildlife, tropical forests, rich beach and coral reef areas, and cultural traditions of interest to outsiders. The country should encourage special-interest tourism based on nature. It should strengthen management and education programs in coastal and marine parks, wildlife reserves and

Section 4.

MAJOR ISSUES AND OPPORTUNITIES TO BE ADDRESSED IN THE COASTAL REGION

sanctuaries. It should consider promoting cooperative tourism planning and development that link resource conservation with tourism development activities.

5. Cluster tourism in well-defined coastal areas. It is necessary to formulate and implement plans for areas where the informal sector predominates and the carrying capacity has already been exceeded. New construction should not be allowed in areas that are already overdeveloped. Resource conservation and environmental programs should be launched to maintain the quality of such areas.

6. Impacts on the environment. To minimize impacts, coastal management

guidelines set by the UDA and the CCD should be observed in all tourism sites. Water quality should be monitored in areas where swimming is an important activity.

7. The diversification of markets and facilities. The overdependence on the Western European market during the northern winter causes intensive seasonal pressure on coastal sites and a proliferation of beach resorts. Attracting the Australian market and tourists from Japan, Korea, Taiwan and Hongkong would spread arrivals more evenly over the year. Increasing land-based recreation facilities could induce visitors to spend more time away from the coast.

References

- Atapattu, A.R. 1991. The fisheries industry in Sri Lanka's coastal areas. A report in the series of background papers for the Coastal 2000 Strategy document "Status and Trends in the Use of Coastal Resources in Sri Lanka."
- Central Bank of Sri Lanka. 1989. Socio-economic trends and patterns in Sri Lanka.
- Central Bank of Sri Lanka. 1991. Socio-economic achievements of Sri Lanka, 1990.
- Central Environmental Authority. 1988. Sri Lanka national conservation strategy.
- Central Environmental Authority. 1990. The national conservation strategy, draft action plan.
- Ceylon Tourist Board. 1991. Annual statistical report, 1990.
- Coast Conservation Department. 1984. A census of the exploitation of sand and seashell resources in the coastal zone of Sri Lanka. CCD Internal Report No. 7.
- Coast Conservation Department. 1986. Sri Lanka master plan for coast erosion management.
- Coast Conservation Department. 1988. Sri Lanka's coastal habitats: Geographical location and extent. A report prepared for the URI/USAID CRM Project.
- Coast Conservation Department. 1990. Coastal zone management plan.
- Coast Conservation Department and the Sri Lanka Foundation Institute. 1986. The management of coastal habitats in Sri Lanka. Report of a workshop for the URI/USAID CRM Project, Colombo, May 12-15, 1986.
- Department of Census and Statistics. 1986. Sri Lanka census of population and housing, 1981. General Report, Vol. 3.
- Food and Agriculture Organization and the Asian Development Bank (FAO/ADB). 1991. Fisheries sector study for Sri Lanka. Background paper for the Fisheries Sector Development Project.
- Government of Sri Lanka. 1989. Second interim report of the Land Commission—Section on coastal land policy.
- Joseph, L. 1991. Coastal fisheries and brackishwater aquaculture. A report in the series of background papers for the Coastal 2000 Strategy document "Status and Trends in the Use of Coastal Resources in Sri Lanka."
- Korale, R.B.M. 1988. A statistical overview of employment and unemployment trends. Institute of Policy Studies.
- Korale, R.B.M. 1989. Sri Lanka in the year 2015: Demographic trends and projections. Proceedings of the First Annual Sessions of the Organization of Professional Associations of Sri Lanka, Colombo, October 1988.
- Korale, R.B.M. 1991. The people (population growth, nutrition, health, poverty, employment and education). Paper presented to the CCD/URI/USAID Workshop on Coastal 2000, Colombo, April 24, 1991.
- Lowry, K., and H.J.M. Wickremeratne. 1989. Coastal area management in Sri Lanka. Ocean Yearbook, 7.
- Ministry of Environment and Parliamentary Affairs (with support from the International Development Association). 1991. Sri Lanka environmental action plan.

References

- Ministry of Fisheries and Aquatic Resources. 1990. National fisheries development plan, 1990-94.
- Natural Resources, Energy and Science Authority of Sri Lanka and the United States Agency for International Development (NARESA/USAID). 1991. Natural Resources of Sri Lanka.
- Premaratne, A. 1984. Socio-economic survey of those engaged in the coral mining industry (from Ambalangoda to Dickwella). Coast Conservation Department Internal Report No. 3.
- Rodrigo, C., and Attanayake, N. 1988. The employment consequences of alternative development strategies in Sri Lanka. Institute of Policy Studies.
- Savundranayagam, T.G., N. Siripala, L. Joseph, L. de Alwis and P.S.M. Muthukuda. 1991. Economic significance of Sri Lanka's coastal region. A report in the series of background papers for the Coastal 2000 Strategy document "Status and Trends in the Use of Coastal Resources in Sri Lanka."
- Seneviratne, P. 1991. Tourism in Sri Lanka's coastal environment: Activities, contributions, conflicts and projections. A report in the series of background papers for the Coastal 2000 Strategy document "Status and Trends in the Use of Coastal Resources in Sri Lanka."
- Siriwardena, P.P.G.S.N. 1991. Aquaculture in Sri Lanka's coastal environment: Activities, contributions, conflicts and projections. A report in the series of background papers for the Coastal 2000 Strategy document "Status and Trends in the Use of Coastal Resources in Sri Lanka."
- Subasinghe, T.B. 1991. Agriculture in Sri Lanka's coastal areas. A report in the series of background papers for the Coastal 2000 Strategy document "Status and Trends in the Use of Coastal Resources in Sri Lanka."
- Survey Department of Sri Lanka. 1988. The National Atlas of Sri Lanka.
- White, A.T., and N. Lopez. 1991. Coastal resources management planning and implementation for the Fisheries Sector Program of the Philippines. Proceedings of the 7th Symposium on Coastal & Ocean Management, Long Beach, California, July 1991.
- Wickremaratne, H.J.M., and D. Sadacharan. 1991. An assessment of a decade of CZM in Sri Lanka. Proceedings of the 7th Symposium on Coastal & Ocean Management, Long Beach, California, July 1991.



PN-ARP-777

**Recommendations for
A Resource
Management
Strategy for
Sri Lanka's
Coastal Region

Volume II**

Editors

**S. Olsen
D. Sadacharan
J.I. Samarakoon
A.T. White
H.J.M. Wickremeratne
M.S. Wijeratne**

COAST CONSERVATION DEPARTMENT

1992

67



**Recommendations for
A Resource
Management
Strategy for
Sri Lanka's
Coastal Region
Volume II**

Edited by

**S. Olsen
D. Sadacharan
J.I. Samarakoon
A.T. White
H.J.M. Wickremeratne
M.S. Wijeratne**

1992

Published by the COAST CONSERVATION DEPARTMENT, the Coastal Resources Management Project, Sri Lanka, and Coastal Resources Center, The University of Rhode Island.

Funding for the preparation and printing of this document was provided in part by the Government of Sri Lanka, and in part by the Office of Environment and Natural Resources, Bureau for Research and Development, United States Agency for International Development as part of their cooperative program in coastal management with The University of Rhode Island Coastal Resources Center.

Printed in Colombo, Sri Lanka

Olsen, S., D. Sadacharan, J.I. Samarakoon, A.T. White, H.J.M. Wickremeratne, and M.S. Wijeratne, editors. 1992. Coastal 2000: Recommendations for A Resource Management Strategy for Sri Lanka's Coastal Region, Volumes I and II. CRC Technical Report No. 2033, Coast Conservation Department, Coastal Resources Management Project, Sri Lanka and Coastal Resources Center, The University of Rhode Island.

Cover: A photo of Sri Lanka's coast by D. Sansoni
Inside: Photos by D. Sansoni, A.T. White and H. Scheffer as noted

Library of Congress 92-082763
ISBN 955-9108-05-0

57

Contents

Acronyms and Abbreviations	
Introduction	5
Section 5. Policies and Implementing Strategies	
Long-Term Goals for Coastal Management	
Resource Management Issues to Be Addressed	7
Policy 1. Work at the National and Local Levels	8
Policy 2. Implement a Monitoring Program	12
Policy 3. Implement a Research Program	15
Policy 4. Strengthen Institutional Capacity	18
Policy 5. Elaborate and Update the Coast Erosion Management Plan	19
Policy 6. Enhance Public Awareness	19

Acronyms and Abbreviations

ADB	Asian Development Bank
AGA	Assistant Government Agent
CCA	Coast Conservation Act
CCAC	Coast Conservation Advisory Council
CCD	Coast Conservation Department
CEA	Central Environmental Authority
CEMP	Coast Erosion Management Plan
CRM	Coastal Resources Management
CRMP	Coastal Resources Management Project
CZM	Coastal Zone Management
DANIDA	Danish International Development Agency
DWLC	Department of Wildlife Conservation
EIA	Environmental Impact Assessment
EEZ	Exclusive Economic Zone
FAO	Food and Agriculture Organization
GCEC	Greater Colombo Economic Commission
GDP	Gross Domestic Product
GSL	Government of Sri Lanka
GTZ	German Technical Cooperation Agency
ha	hectare
ID	Irrigation Department
IPZ	Investment Promotion Zone
LHI	Lanka Hydraulic Institute Limited
kg	kilogram
km	kilometer
m	meter
mt	metric ton
MEIP	Metropolitan Environmental Improvement Program
MFAR	Ministry of Fisheries and Aquatic Resources
MSY	Maximum Sustainable Yield
NARA	National Aquatic Resources Agency
NARESA	Natural Resources, Energy and Science Authority
NGO	Non-governmental Organization
NORAD	Norwegian Agency for International Development
SAM	Special Area Management
UDA	Urban Development Authority
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Program
URI	University of Rhode Island
USAID	United States Agency for International Development

Introduction

This second volume of the *Coastal 2000* document sets out the policies and implementing strategies for a second-generation coastal resources management program.

Volume I gave the environmental and social context within which coastal management is being developed and a brief history of coastal management in Sri Lanka. It also described the primary issues a coastal program should address. Volume II briefly summarizes the coastal resources management issues selected as the focus for this second-generation program. It then presents six policies which together make up the strategy.

Coastal management in Sri Lanka was first mandated by the Coast Conservation Act of 1981, which gave the Coast Conservation Department primary responsibilities for:

- policy formulation, planning and research
- administration of permit procedures regulating coastal development activities
- construction and maintenance of shoreline protection works

These responsibilities are currently carried out within a narrowly defined coastal zone. The second-generation coastal resources management program, as presented in this document, calls for a broader perspective of coastal zone management in terms of objectives, participating agencies and levels of government, and the range of geographic areas and environments affected.

Coastal 2000 has evolved from discussions among key national agency officials and non-government representatives who are concerned that the condition of coastal resources in Sri Lanka is deteriorating. The consensus of these discussions is that new and more effective approaches and strategies are required to address the environmental and resource use issues at hand. While there was acknowledgment that the first-generation coastal management program under the CCD has had notable success and should be continued and strengthened, it was recognized that the program needs to be expanded and made more holistic in its approach.



Palm-fringed sandy beaches sometimes eroded by wave action are a common feature of Sri Lanka's coast.

Section 5. Policies and Implementing Strategies

Long-Term Goals for Coastal Management

The policies set forth in this document support the long-term goal of sustainable use of natural resources that can enable Sri Lanka to develop its economy, human capabilities and quality of life without sacrificing future options. The major objectives are to ensure maximum benefits to and participation of local communities; to build local and national institutional mechanisms for implementation of resource management schemes; and to improve awareness of people through education in order to equip them to solve the problems of protecting and managing resources in an integrated and sustainable manner.

It is important that the coastal management program be practical and implementable within a given time frame. Research, planning and implementation must be integrated as soon as possible so that action plans are put into effect with a minimum of delay.

Resource Management Issues to Be Addressed

An effective strategy must set priorities among the many significant issues in coastal resources management in Sri Lanka. It should not attempt to address all the issues at once. The issues that have been selected for this strategy have no hierarchy of importance. They have been selected because they are interrelated and cannot be addressed in isolation. These issues are the driving force behind the policies and strategies of *Coastal 2000* and are presented to show the progression from problem to solution. They are arranged below in an order that shows how the policies and strategies set out in *Coastal 2000* can help in forming an effective response to the issues.

1. Institutional arrangements and support for CRM planning and implementation are inadequate.

- National economic planning is only now beginning to give adequate consideration to environmental conservation.
- The information available on the use and condition of ecosystems and natural resources is neither adequate nor sufficiently up-to-date for use in natural resource management planning.
- Issues addressed by the current CZM program comprise only a small subset of the most important coastal issues.
- Provincial, district and local governmental and non-governmental agencies at present have little or no role in designing and implementing CZM plans.
- The national CZM Plan has not yet been translated into local and provincial actions, although activities at these levels will have a significant impact on the status, use and maintenance of coastal resources.
- Boundaries for the coastal zone cannot always be clearly demarcated; management has to address the important issue(s) of a site that may not be confined to a prescribed definition of "the coastal zone."

2. Economic development and increasing demand for resources in the coastal zone are causing environmental degradation.

- The linkages between land use and use of chemicals in agriculture have not been adequately considered in planning for coastal resources management.

Section 5. Policies and Implementing Strategies

- Fisheries production continues to increase even though most inshore fisheries are now fully exploited and some are overfished.
- Aquarium fish capture is not sustainable at its current level.
- No sustainable-use strategy has been prepared for marine fisheries, nor are there adequate means to implement such a strategy.
- The potential for sustainable and environmentally sound aquaculture in coastal areas has not yet been fully realized.
- The siting and construction of tourist facilities have more often than not disregarded coastal environmental concerns of setbacks, waste disposal and protection of vulnerable ecosystems.
- Temporary housing clusters are multiplying in shoreline areas.

3. The potential for economic benefits from improved resource management is not being realized.

- The potential support that the tourism industry can provide for environmental conservation and the potential for nature tourism have not yet been realized.
- Alternative and lucrative economic opportunities in coastal areas are not sufficiently developed and varied to offer options to those dependent on depleted fisheries, coral mining, decreasing mangrove forests and simple beach dwellings for existence.

Policy 1. The coastal management program will proceed simultaneously at the national, provincial, district and local levels with the collaboration required to achieve effective and participatory resource management by governmental and non-governmental agencies

Activities at the national level, guided by the experience and mandate of the CCD with support of the CEA, NARA, DWLC, MFAR, ID and UDA, will strengthen the capacities of central governmental agencies to implement policies in a collaborative manner. Such activities will efficiently provide the information, research and technical assistance required for effective resource management.

Resource management efforts in the provinces and districts will focus on issues within those jurisdictions. This will require a strengthening of the capacities of provincial and local institutions and the preparation of provincial CZM plans in collaboration with the CCD, UDA, CEA and other agencies.

Work by national and provincial agencies at the local level will focus planning and management efforts upon geographically distinct sites. This will occur through the formulation and implementation of Special Area Management (SAM) plans that address the unique combination of problems and opportunities of a specific place. Such SAM plans will build community-level support through a highly participatory process and create community-based management groups.

This multi-level approach to natural resource management calls for:

- building on successful experiences in the implementation of the present CZM Plan under the direction of CCD

Section 5. Policies and Implementing Strategies

- testing management actions and refining them while the planning and research process proceeds
- resolving problems caused by gaps and overlaps in agency jurisdiction and lack of effective collaboration
- involving the affected communities and provincial agencies in the process of resource management
- recognizing and responding to the linkages between human activities, the condition of the ecosystem, and the different levels of governmental and non-governmental institutions
- habitat monitoring and management
- implementation of guidelines for resource use
- appropriate siting of development activities
- access and resource-use conflicts
- a change in the practical and legal definition of "the coastal zone"
- guidance, incentives, regulations and procedures for provincial CZM plans
- decentralization of permit procedures
- the formulation of procedures for SAM plans and their implementation

Implementation Strategies of the Program

At the national level. The main responsibility of national-level agencies is to ensure that priority management issues are addressed. The focus will be on:

Detailed strategies to implement the national-level program are outlined in Policies 2, 3, 4 and 5 below. The objective is to



Traditional beach seine fishing on the south west.

D. Saisoni

90

Section 5. Policies and Implementing Strategies

improve the volume and quality of information available to central governmental agencies and to upgrade the capacity of these agencies to implement the CZM program. The national, provincial, district and local programs will be developed collaboratively, with research and monitoring information contributing to planning and implementation in an ongoing cycle.

- an assessment, based upon secondary sources, of trends in the condition and use of coastal resources and in current land-use patterns
- identification of the major resource management issues in the coastal region of the province



The rocky east coast has different features than the south and west coasts.

At the provincial and district levels. The CCD will collaborate with the provincial councils in a program where CZM plans will be prepared for the coastal region of each province. The first step will be for the CCD to suggest the substantive topics to be addressed and the process by which the plan will be formulated and approved. The CCD, supported by research findings of NARA and other agencies, will provide technical assistance in CZM plan formulation. Provincial-level planning will address the following topics and activities:

- mapping of areas of particular concern because of special opportunities, use conflicts, vulnerability to erosion or conditions requiring particular attention and multisectoral management. Such sites will be considered priorities for Special Area Management plans and may include estuaries and lagoons, potential aquaculture areas, beaches, important fishing grounds and coral reefs, and habitat areas for vulnerable species such as sea turtles and dugong.

Section 5. Policies and Implementing Strategies

- delineation (on maps) of areas designated for preservation
- designation of preferred locations for siting of roads, railway lines and harbors which take full consideration of the impacts of such facilities on the future development process and resulting pressures upon coastal features and habitats of concern
- identification of sites considered most suitable for tourist facilities and/or as tourist attractions
- identification of sites with major constraints for development
- designation of green belts along the coast within which construction will be prohibited or restricted

For purposes of the provincial CZM plans, "the coastal region" is defined to encompass the coastal AGA divisions. Once endorsed by the CCD and approved by district environmental agencies, the provincial CZM plans will be used as a guide for development. The process once agreed upon would generally include:

- formal application of the CCD's environmental impact assessment procedures for the area of CCD jurisdiction. In other areas of the coastal region, environmental impact assessment procedures as specified by the National Environmental Act shall apply.
- project proposals within the coastal region, which will be subjected to a consolidated review process that considers the environmental and social impacts of the project according to national criteria set by the CCD and CEA.

Decentralization of the CCD permit process. The decentralization of the existing CCD permit program will involve the provincial councils in the decision process. A decentralized program will require building a provincial cadre of trained technical staff. Whenever practical, all CCD permits, except those requiring an environmental impact assessment, should be decided at the provincial level. A right of appeal process to the director of the CCD may be appropriate.

Special Area Management plans. The CCD or another national agency can organize and promote the formulation of Special Area Management plans for priority sites in collaboration with provincial and local government and those national agencies represented at the site. SAM plans will be developed in the following stages:

- Step 1. Environmental Profile and Level One Plan. The major resource management issues and their causes will be identified through an assessment of information on ecosystems, biophysical features, social and economic conditions, and legal-institutional regimes for particular sites of importance. Implications in terms of the quality of life for the community and the condition of the resource base will be identified. Such environmental profiles require consultation with local leaders, residents, resource users, and others with special knowledge. The document will be subjected to comments from the community and be the basis for initial efforts in public education, which will focus on the consequences of human-use patterns on environmental quality and the resource base. The profile will also be the basis for identifying the needs for technical assessments and research by specialists to improve understanding of issues of critical importance to a resource

Section 5. Policies and Implementing Strategies

management strategy. An initial set of management initiatives will also be identified and implemented to begin community participation and address priority community needs and resource issues. The environmental profile and the initial management actions will together be termed a Level One Plan.

- Step 2. Level Two Plan. Integration of the results of research, recommendations of specialists, experience gained through monitoring initial management initiatives, and results of public education and training will provide the ingredients for a Level Two Plan. This plan will focus on the actions of an integrated resource management strategy and the specific mechanisms and budgetary requirements needed for its implementation. Level Two Plans will describe the management entity responsible for overseeing the implementation of the plan and specify the mechanisms by which such implementation will occur. Level Two Plans will be submitted to the CCD by the local management entity for approval, with recommendations of the provincial councils as required. The immediate and practical actions of these plans will be implemented.

- Step 3. Incremental Implementation. Level Two Plans may require financial support for implementation. The CCD or other lead agency will be responsible for seeking such funds from government sources and the donor community. The initial implementation phase will provide for careful monitoring and documentation of the results of implementing the management actions. Wherever possible, such outcomes will be quantified—for example, to document changes in employment of targeted segments of the population, changes in visits by tourists or changes in the abundance and sizes of fish. The local management entity will

continue to implement programs in training and public education, oversee development projects, and assume direct responsibility where relevant for administering elements of the CCD's permit program.

- Step 4. Plan Refinement and Evaluation. The plan will be periodically revised and updated in response to the experience gained during implementation and as new problems and opportunities emerge.

Policy 2. Implement a program to monitor the condition and use of coastal environmental systems and the outcomes of selected development and resource management projects through the collaboration of the CCD, NARA, CEA, ID, MFAR and other agencies

A second-generation coastal management program should be grounded upon detailed knowledge of the resources and activities being managed. Worldwide experience, however, has demonstrated that static—one time only—inventories are expensive and often prove to be of marginal usefulness for policy formulation and planning. Rather, it is time series data that is needed for effective resource management.

There are major differences between research and monitoring. Research seeks new knowledge to answer a specific question or to test a hypothesis. Monitoring requires repeated observations of carefully selected indicators to track trends in the condition and use of the areas and resources being managed. A well-conceived monitoring program brings many benefits:

- It provides an objective basis for evaluating the impact of management policies, actions and enforcement and for refining management plans.

Section 5.

Policies and Implementing Strategies

- It can identify emerging problems and opportunities and determine where EIAs are necessary.
- It can foster interdisciplinary thinking and inter-institutional collaboration.
- It can provide material for public education programs.

Long-term monitoring programs are most likely to succeed when they are inexpensive and rely on uncomplicated measuring techniques. The essential step in a monitoring program is to decide what variables can be monitored to serve as useful indicators for the topics of concern to resource managers. Exciting initiatives are being taken in several countries to involve citizen volunteers, schoolteachers, local officials and private sector organizations in the monitoring process. This is proving to be cost-effective and generates information that cannot be produced by central governmental agencies operating from afar. There are also major benefits in public education and in fostering a sense of stewardship among the public that is so crucial to resource management initiatives.

Content of Monitoring Program

A monitoring program should involve several institutions and levels of government, as well as the private sector and citizen groups. Remote-sensing techniques may be appropriate for tracking some variables. Decisions must be carefully made to determine:

- What variables will be monitored?
- By whom?
- Over what intervals?
- At what funding levels?
- What is the best way to set up and utilize the EIA process?

Some of the variables that should be considered for the monitoring program are:

- Quality indexes of critical habitats. The condition and extent of coastal habitats such as estuaries, lagoons, mangroves, coral reefs and beaches need to be monitored so that management can respond appropriately and in a timely manner. Parameters to be monitored may include degree and rate of sedimentation, water clarity, species diversity and density, coral and mangrove cover, rates of productivity and general aesthetic value.
- Erosion and accretion at selected sites. Changes in rates of erosion provide essential information in planning for the prevention of the movement of beach sand or other shoreline features by human activity or physical dislocations.
- Water quality. Information on trends in the changes in oxygen, nutrients and selected toxic chemicals content, or other water quality parameters is required to predict levels of pollution and to evaluate the existing water quality management program at particular sites.
- Fish landings. Trends in fish landings are crucial in the determination of sustainable levels of catch and in formulating overall fisheries management strategies. Necessary annual data include catch per unit effort, total catch by species and total effort for a given fish stock.
- Agricultural production in coastal AGA divisions. Information on basic trends in crop production and prices in coastal areas is useful for improving the efficiency of land use for agriculture, for the diversification of crops and for intensification of certain crops and techniques as alternative sources of income.

Section 5. Policies and Implementing Strategies

- Industrial production in coastal AGA divisions. Employment in coastal areas depends on the level of production and profitability of the industries operating in the region. Such information also assists in planning for the prevention or mitigation of harmful environmental impacts of industrialization.
- Hotel occupancy and tourist arrivals. The level of tourist activity is usually derived from the rate of hotel room occupancy, which is also an indicator of future trends in the industry.
- Other activities and land use in coastal areas. New settlements and unauthorized structures in shorefront sites need to be surveyed periodically so that trends do not move ahead of preventive planning. An indicator worth noting is the number of construction permit applications received by the CCD annually. Employment trends in coastal areas should also be monitored. Changes in human migration patterns and in land use are also indicative of pending changes affecting environmental management in coastal areas.



Sand mining, although regulated, still contributes to coastal erosion where it occurs.

This information is required for planning on a yearly basis for tourist arrivals, hotel development and general use of beaches. Other indicators useful in monitoring the level of tourism are rates of beach use, visits to cultural sites, visits to parks and recreation sites, and purchases of popular handicraft items.

Audience and Presentation

The program should critically assess the outcomes of selected resource management and development projects. Initial assessments of community needs often prove to be incorrect,

Section 5.

Policies and Implementing Strategies

and the resulting successes and failures are quite different from those originally envisioned. It is important that the outcomes and lessons learned from projects are identified and widely shared. Such monitoring information supports and sustains community-level participation in resource management and is valuable to national agencies. For this reason it is necessary to involve the community in monitoring project results.

Monitoring data is of little use if it is not summarized and presented in a persuasive manner. An annual or biennial "State of the Coast" report would keep the attention of the public and government focused on progress – or lack thereof. Each report could select a few topics for in-depth analysis (water quality, rising sea level, tourism potential, mineral exploitation opportunities, etc.), and then present in summary form the important findings of the monitoring program on other topics.

Policy 3. Implement a research program of direct relevance to CRM through NARA, national universities and other institutions which will provide a better understanding of ecological processes and social and cultural issues as well as provide information of critical importance to the formulation and implementation of coastal resources management plans

Shoreline Resource Use

- Estuarine sand budgets. The CCD permit program can control sand mining, but information is needed to calculate sand budgets in order to estimate annual surpluses of sand, if any, that can be harvested without causing erosion on beaches nourished by the river system. Research can provide data to develop sand budgets for the country's major rivers.

- Lime sources. Research is required to work out the technical issues and the economics of producing an economically competitive alternative for coral-based lime. Dolomite rock reserves are plentiful, but the lime produced from this source is reported to contain levels of magnesium that cause plaster to bubble. For dolomite to be a substitute for coral, an inexpensive technology must be developed to remove this deficiency. A second alternative is Miocene limestone, which does not have magnesium. In both cases, new industries – preferably at a labor-intensive, cottage scale – a transportation network and marketing strategies must be worked out.

- Mineral sands. Significant reserves of heavy mineral sands exist in both shallow water and shoreline areas. Extraction of such sands on beaches or nearshore brings erosion problems. Research is required to identify suitable technologies and develop strategies so that the associated impacts on beaches – fisheries, tourism, etc. – will be acceptable. Research is needed both to assess the significance of reserves at specific locations and to formulate environmentally sensitive exploitation strategies.

- Structural shoreline protection. To date, erosion mitigation measures have relied almost entirely on structural measures and experimental sand pumping. It is important to identify alternative methods for protecting shorelines. Other techniques include stabilization with vegetation (especially in dune areas and along riverbanks) and with artificial reefs. These techniques require testing, since experience from other nations needs to be adapted to Sri Lankan conditions.

- Sea level rise. Estimates are that sea level rise globally will be in the range of 0.3 to

Section 5.

Policies and Implementing Strategies

1.0 m by 2040. Sri Lanka's densely settled, low-lying coasts would experience massive problems even if the sea level rise is at the low end of current estimates. The impacts of sea level rise should be assessed now, since decisions on siting infrastructure, coastal protection works and other issues will be affected.

- Land use and development planning. It is important that potential and current demand for land be estimated in relation to development plans and this data be used for planning for long-term shoreline stabilization.

Sustaining Habitats

Research on coastal habitats will be a focus in the SAM plans, since they will provide for interdisciplinary issue-driven research on a number of closely linked resources and environmental processes. Within the SAM sites, research will likely be required on:

- assessment of water quality and pollution
- key spawning and nursery grounds for important fish stocks and vulnerable species
- behavior and manipulation strategies for lagoon and estuary inlets
- impacts of various fishing and mariculture practices
- development activities in the watershed which directly affect the area
- traditional-use rights and/or cultural practices relevant for coastal resources management
- opportunities for potential economic products that can be sustainably extracted

- land-use practices
- existing development plans, national policies and institutional arrangements in the area

Coastal wetlands, coral reefs and seagrass beds require special attention and should be the subjects of national surveys and assessments. Much attention has been paid to mangroves, but these are only one feature of Sri Lanka's coastal wetlands. A similar integrated approach to salt and brackish marshes is called for. A second priority is the mapping and characterization of coral reefs and the associated seagrass beds abundant along the northwest and southwest coasts. A management strategy is required for seagrasses, since they are known to be prime habitat for some demersal fish species, sea turtles and dugong and contribute to nearshore sediment stability.

Sustaining Fisheries

Of crucial importance to fisheries management is the generation of reliable data on landings and catch per unit effort. As coastal stocks hover around critical sustainable production levels, good landing data become the primary indicator of overexploitation problems for resource managers. The data collection system managed by NARA needs to be strengthened and expanded beyond its present confines of the western, southwestern and southern regions. Trends in fisheries landings should be highlighted in annual "State of the Coast" reports.

Another priority is the ornamental-fish fishery, which has great economic, social and ecological significance. Surveys of target species and coral reef habitats are urgently required to provide a baseline and to assess

Section 5.

Policies and Implementing Strategies

exploitation rates. Such surveys, together with the monitoring of catches, processing and export practices, should provide the basis for developing management strategies.

Mariculture

Significant potential exists for mariculture and aquaculture. Development has to date been ad hoc and confined mostly to shrimp production for export along the northwest coast. Major problems in mariculture and aquaculture development have emerged concerning water quality, feeds, and conflicts with traditional fisheries and users of wetlands. One estimate is that about 6,000 ha of coastal lands, much of it wetlands, has potential for pond culture. About half of these lands are in the north and east. Before mariculture development proceeds further, a national strategy is urgently needed. It must identify tradeoffs, pinpoint appropriate sites and set a policy on production for export versus production for national markets.

There appears to be great potential for fish culture. Grouper fry are currently being harvested with damaging fine-mesh push nets and exported for cage culture in other countries. Initial trials in oyster and mussel culture in Trincomalee Bay showed excellent growth rates. These fragments of information require further study and the design of a research program that can provide the foundation for strategies to promote mariculture and aquaculture to supplement the protein urgently needed in the national diet. Culture of species, like shrimp, with high export value can also be beneficial if properly managed.

A priority problem for coastal aquaculture at present is the absence of an adequate supply

of high-protein feeds. Current fish landings are insufficient to be used in the industrial production of fish meal. Research is needed to assess the potential of small freshwater cyprinids as a protein source for feeds. Preliminary assessments by NARA suggest that their stocks in newly created reservoirs are large and that these small bony fish are unsuitable for human consumption.

Protected Area Management

Sri Lanka is the final destination for large numbers of migratory birds, many of them waterfowl, that are drawn from a vast region extending from Siberia to Eastern Europe. These birds form high seasonal concentrations at a few very specific sites. Research is needed to better understand the relationships and impacts of the birds on these sites. Tree planting, manipulation of water flow and the like may be in order to prevent sudden, potentially catastrophic impacts during dry years. One aspect of this research should be to specifically assess the impacts of visitors to these sites and the consequences should the numbers of visitors increase. Priority sites for this research are Bundala, Kalametiya, Kumana (in Yala Park) and two sites in the Jaffna peninsula. All these sites are coastal.

Several issues to be addressed are:

- Impacts of visitors and habitat manipulation of coastal wetlands and lagoons. Estimates are that annual tourist visits to Sri Lanka could increase from 90,000 in 1989 to 850,000 when the civil strife ceases. Many of the possible future tourists will visit wildlife preserves. The impacts of these tourists on the ecosystem and the behavior of wildlife could be very significant. In addition, coastal development is causing increasing changes in water movement in coastal wetlands as well as

Section 5. Policies and Implementing Strategies

changes in surrounding forest cover. The research topics here are similar to those listed for SAM plans and would be applied to a broader area of coastal lagoons and wetlands.

- Migratory bird studies. No information is currently available on annual variations in the numbers of migratory birds visiting the island or their place of origin. Banding studies are needed to produce this baseline information crucial to a management program. Such a program must be closely coordinated with the Point Calimere waterfowl monitoring station in South India.
- Park buffer zones. Research is needed on management techniques for buffer zones. Candidate sites for such studies are Wilpattu and Yala National Parks.
- Management of diversified coastal ecosystems. Protected area management needs to address practical management for the multiple use of coastal sites, which include all major habitats such as beach, coral reef/ seagrass, and estuarine/mangrove sites.

Policy 4. Implement a program to strengthen institutional and human capacity to manage coastal ecosystems

The key agencies involved in coastal resources management—the CCD, NARA, UDA, Ceylon Tourist Board, CEA, MFAR, ID and DWLC—all have large gaps in the expertise required to assist with coastal resources management and development. The lack of experience and knowledge is evident when one considers the integrated nature of coastal resources management as envisioned in

this strategy. It is crucial that all possible attempts be made to increase the cadres of trained manpower to assist with resource management at the national, provincial and local levels, in both governmental and non-governmental agencies. A strategy to implement this policy should contain:

1. Opportunities for personnel at national agencies to undergo special training in CRM and to obtain master and doctoral degrees in environmental sciences, ecology, resource management and fisheries management
2. A series of national training courses in coastal resources management to build special practical skills required to carry out field studies, planning, data analysis, community organization and communication liaison work
3. The systematic training and education of provincial governmental and non-governmental officials who will be involved in the implementation of a CZM plan. Such training would include the development of skills in:
 - resource assessment and evaluation
 - resource management planning and implementation
 - community liaison and organization
 - protected area planning and management
 - project evaluation and environmental impact analysis

The training program would also provide the officials with opportunities to visit project sites outside their province and even in other countries.

Section 5. Policies and Implementing Strategies

4. The involvement of academics and researchers in the training of government personnel and in the process of planning and implementing CRM and SAM projects. The researchers should have knowledge and interest in resource and environmental management.

5. The sharing of knowledge and experience of successes or failures among local, village or provincial groups who have been involved in a coastal resources management program. Coastal conservation and resource management could be introduced as a subject for postgraduate or undergraduate studies at selected national universities.

Policy 5. Update and extend the scope of the master plan for coastal erosion management

The Coast Erosion Management Plan (CEMP) prepared by the CCD in 1984 is an important document of the first-generation Coastal Zone Management Plan. The CEMP was based on data available at that time and was not definitive in regard to work on certain coastal sectors. Much of the information contained in the CEMP has to be reviewed in the light of the large volume of data that has since been collected. Further, for many of the coastal sectors, especially in the northwest, north and east, the CEMP does not provide any detailed recommendations.

Coastal erosion management will continue to be a major preoccupation for the CCD for many years to come. The considerable commitment of financial resources that will be required for mitigating coastal erosion—at least for shorelines, where only the option of structural intervention is available—requires that such investments be supported by well-designed stabilization schemes. It is also essential that coastal development in erosion-prone areas be

properly planned by the delineation of adequate buffer zones and green belts. Development planning in such coastal sections may have to be supported by the large-scale acquisition of privately owned lands.

Updating and expanding the scope of the CEMP calls for:

- establishment of a planning team within the CCD with adequate numbers of engineers and technical staff
- initiation of research projects directed towards identifying the causes of specific erosion problems
- formulation of management schemes for stabilizing coastal beaches that are threatened
- identification and testing of alternatives for structural shoreline protection, such as stabilization of beaches with vegetation or offshore artificial reefs
- inclusion of contingencies for sea level rise as this may affect CEMP management schemes
- implementation of coastal monitoring procedures to gather information on changing coastal conditions and to measure the effectiveness of actions taken to control erosion

Policy 6. Implement a program to create awareness, both by national and provincial government personnel and NGOs, of the strategies for coastal resources management and the issues they address

An underlying theme of the Coastal 2000 Strategy is that the general public, government officials and legislators must understand the

Section 5. Policies and Implementing Strategies

issues addressed by the coastal resources management program. It is crucial that people in the coastal areas where habitats, fisheries, beaches and water quality are under threat understand the forces causing their degradation and the implications of such degradation. People must begin to appreciate the value of maintaining these resources and ecosystems in a healthy and productive state.

Strategies to implement this policy will include:

1. Public information campaigns of varied forms to highlight the value of coastal resources. Such campaigns will feature:

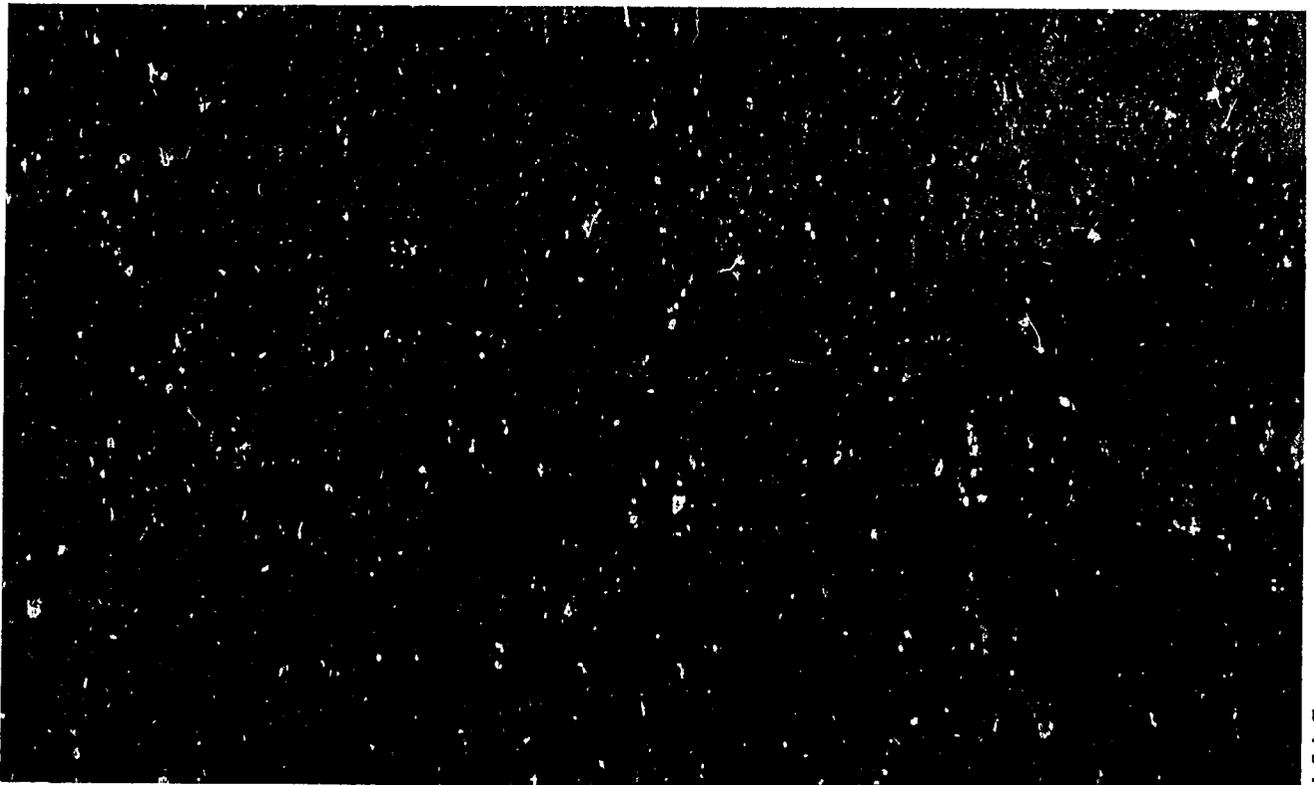
- media productions through television, radio and newspapers which discuss the issues in coastal resources management and some of

the actions that people can take to alleviate resource degradation

- posters, leaflets and small booklets designed in a simple attractive format, with photographs and drawings to target specific audiences. Each production would describe one issue and/or resource in detail so that ordinary people can understand the problem.

- intensive media coverage of site-specific Special Area Management projects to highlight the problems to be solved, the benefits to be derived from a successful project and the means by which local people can actively participate in the project

2. Opportunities for coastal residents to play an active role in the planning and



H. Scheffer

Coastal wetlands, lagoons and mangrove forests are productive ecological features along much of Sri Lanka's coast.

Section 5. Policies and Implementing Strategies

implementation of Special Area Management projects. Such opportunities would include:

- participation in public meetings to discuss resource management issues in the area and solutions for specific problems of concern to the community
- election of representatives from a community to assist with a resource management project
- organization of community groups to manage and conserve coastal resources

3. Detailed coverage of priority issues through national media and local project meetings and publications that analyze and describe the following issues and their solutions:

- coastal erosion processes and the practical difficulties of physically protecting the coastline because of the complicated dynamics of coastal sediment movements and the high cost involved
- the factors intensifying coastal erosion, such as coral mining, sand mining, inappropriate siting of construction projects, deforestation and flooding
- water pollution caused by increasing and indiscriminate release of waste water into streams, lagoons, beaches and the open ocean,

and how such water pollution affects marine life and ecosystem productivity, human health and the aesthetics of our surroundings

- exploitation of fishery resources, which should be limited in regard to intensity and area, and how catches are determined by the reproductive potential of the fish community, the habitat it resides in, and the availability of food for that species or group of fish
- the implications of human population growth on the ecosystem
- the maintenance, for the benefit of Sri Lankan society, of the essential needs of life and the aesthetic values of the environment

Agency Involvement

The implementation of a public awareness program will necessarily involve many governmental and non-governmental agencies at all levels. The CEA, CCD, NARA, UDA, DWLC, ID and MFAR should all have public awareness and education programs. NGO members can be encouraged to contribute their knowledge and enthusiasm. Community groups can increase their own awareness by appointing trained members to educate others in small meetings. Such community participation should be built into the development and implementation process of the SAM Plan.